

THE CANADIAN MINING JOURNAL

THE OFFICIAL ORGAN OF THE CANADIAN MINING INSTITUTE

VOL. I, No. 16, New Series

TORONTO and MONTREAL, November 1, 1907

Old Series, Volume xxviii, No. 18

The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada

Published fortnightly by the

MINES PUBLISHING CO., LIMITED

Head Offices - Confederation Life Building, Toronto,
and 171 St. James Street, Montreal.

Branch Offices Halifax, Victoria, and London, Eng.

Editor:

J. C. MURRAY, B.A., B.Sc.

Associate Editor, H. MORTIMER-LAMB, Secy. C.M. Inst.

Business Manager - - - J. J. HARPELL, B.A.

Circulation Manager - - - A. P. DONNELLY, B.A.

SUBSCRIPTIONS—Payable in advance, \$2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, \$3.00 a year.

Advertising copy should reach the Toronto Office by the 8th, for the issues of the 15th of each month, and by the 23rd for the issues of the first of the following month. If proof is required, the copy should be sent so that the accepted proof will reach the Toronto Office by the above dates.

SPECIAL CONTRIBUTORS

GEOLOGY: Dr. Frank D. Adams, McGill University; Dr. A. E. Barlow, late of Geological Survey of Canada; Professor Willett G. Miller, Provincial Geologist of Ontario; Dr. J. E. Woodman, Dalhousie University, Halifax, N.S.

CHEMISTRY: Dr. W. L. Goodwin, Director School of Mining, Kingston, Ontario; Milton Hersey, M.Sc., Official Analyst Province of Quebec.

MINERALOGY: Professor W. Nicol School of Mining, Kingston, Ontario.

MINING: S. S. Fowler, M. E., Nelson, B. C.; Fred erick Keffer, M.E., Anaconda, B.C.; A. B. Willmott, M.E., Sault Ste. Marie, Ont.; J. C. Gwillim, M.E., School of Mining, Kingston, Ont.; J. Bonsall Porter, M.E., McGill University; John E. Hardman, M.E., Montreal; Fritz Cirkel, M.E., Montreal; Dr. E. Gilpin, Department of Mines, Halifax, N.S.; George W. Stuart, M.E., Truro, N.S.

METALLURGY: Hiram W. Hixon, M.E., Mond Nickel Company, Victoria Mines, Ontario; Stafford F. Kirkpatrick, School of Mining, Kingston, Ontario; A. P. Scott, Dominion Iron & Steel Co., Cape Breton.

COAL: Hon. Robert Drummond, Stellarton, N.S.

NATURAL OIL AND GAS: Eugene Coste, M.E., Toronto, Ont.

CEMENT: Manley Baker, M.A., School of Mining, Kingston, Ont.

CONTENTS

	Page.
Editorial	481
Henderson Talc Mine	485
Difference of Three Cyphers	487
Glass and Moulding Sands	488
British Workmen's Compensation Act.....	489
Electric Zinc Smelting	492
Corliss Air Compressor	494
Mining Operations in Quebec	496
Miscellaneous	497
Coal Briquetting in U.S.	498
Personal and General, etc.	500
Mining News.....	502
Statistics, etc.....	506

OFFICIAL REPORTS.

The value of Government reports, more especially of reports having to do with mining, depends upon three qualities—timeliness, comprehensiveness and accuracy. Of these three virtues the first is not the least, and with it we have here to do. The Geological Survey of Canada, under the present Director, has issued its publications with most praiseworthy promptitude. The British Columbian and Nova Scotian Governments have been not unreasonably tardy in presenting to the public their statements of mining operations for 1906. Alberta's pamphlet came late upon the scene. Quebec's has just appeared. Ontario's is yet to come.

We can see no reason why this carelessness should be allowed. If, as is probably the case, the officials who are responsible for the appearance of the annual reports are overworked, if their time is so broken up as to prevent their giving consecutive weeks of attention to these important publications, then more help is required and must not be withheld.

In each and all of the Provinces mentioned mining is an industry of major importance. The expense of engaging competent men to improve and supervise the Departmental publications would be a mere drop in the bucket of annual expenditure. Neither lack of funds nor any other plea of false economy can hold as an excuse for the negligence that permits an annual report to be more than six months late.

Of all the Provinces Ontario has more reason to need prompt official mining information and least reason to be subjected to irritating and harmful delays. The Province is rich. Her mines are contributing large sums to her treasury. If more help is needed it is easily available; if more help is not needed then there is no other valid excuse.

Last spring, acting on the information of the Ontario Bureau of Mines, a geologist visited, inspected and reported upon Larder Lake. His report is not yet published. Its prompt publication would have obviated a vast deal of robbery and dishonesty and would have done actual good. Good its belated appearance will do yet. But, meanwhile, the district, quite irrespective of its natural wealth or poverty, has been made the hatching ground of criminally fraudulent schemes—schemes carried out, we regret to say, by Toronto brokers. This plundering of the public should have and could have been stopped by the timely publication of an honest report.

There is indeed no valid reason why Departmental reports should be even six months late, and, with business-like methods, they could be published within three or four months of the close of the calendar year.

But since there necessarily is a certain amount of uncertainty as to the precise time at which a complete annual report can be made ready, we would recommend strongly the distribution of unbound interim reports and of bulletins. The bulletins issued by the United States Geological Survey and those distributed for a time by the Dominion Survey are of questionable value. They are primarily intended for immediate transcription by the press and may be incidentally useful. But we are of opinion that reports upon important mining districts should be completed, printed and distributed with all possible speed.

The Provincial reports of mining operations are all fairly comprehensive. The British Columbian report conveniently lists the mining companies. It is well illustrated and creditably put together. Ontario's reports usually include a treatise, written by a specialist, on some one branch of the mining industry. Generally speaking the Ontario reports contain a greater amount of geological information than can be found in any others. In geological maps also Ontario's volumes are far ahead of the rest of Canada.

Quebec and Nova Scotia, especially the former, issue reports that are, both in appearance and in contents, absurdly slim and inadequate. For this the Governments and not the heads of the respective Departments, must take the responsibility. We have no doubt that the Departments of Mines in both Provinces spend all available money on their reports. But when the annual records of a mining Province like Nova Scotia can be disposed of in a cheap paper bound pamphlet of a few score pages, accompanied by neither maps nor illustrations, there is something radically wrong. To a less degree this may also be said of Quebec. Quebec, more than any of her sister Provinces, needs a presentable, carefully edited annual mining report. Therefore she must assuredly make larger appropriations for this purpose.

In one sense it is true that the excellence of the official Departmental report on mining is a function of the progress of a country's mining industry. The importance, the absolute necessity of giving to the world year by year and, we would add, in some cases month by month, authentic official records of investigations, discoveries, exploration and progress cannot be gainsaid. Money spent in such work is bread cast upon the waters. But the bread must be cast at high tide.

IRON SMELTERS FOR TORONTO

An offer has been submitted to the City of Toronto by the Moose Mountain Mining Company. The company promises to erect large smelters on a part of Ashbridge marsh if the city will grant them the ownership of 350 acres. This is the only condition. No bonus is asked. The company, whose spokesman is Mr. D. D. Mann, of Mackenzie & Mann, has entire confidence in its ability to carry out its plan. The land asked for is worthless in its present condition—as its name implies. To redeem

it, to lay foundations for large furnaces with a proposed aggregate capacity of 700 or 800 tons of pig iron per day, would occupy at least a year. Another eighteen or twenty-four months would elapse before the furnaces, stores, coke ovens, ore handling machinery could be put into working order. The prospect entails an expenditure of several million dollars for a plant to produce only pig iron. If steel is to be made larger sums will be necessary. Directly and indirectly the carrying out of this bold but perfectly practicable enterprise will mean the creation of a new industrial town within the city limits of Toronto and the employment of several thousand workmen.

The proposal has been enthusiastically received by the Toronto newspapers. Indeed it has met and will meet the approval of all thoughtful citizens.

Toronto will receive in exchange for a number of acres of marsh land an industry for which she would be justified in paying millions of dollars.

THE CANADIAN MINING INSTITUTE.

The Secretary of the Canadian Mining Institute returned recently to Montreal from an official visit to British Columbia. As will have been seen by the list published in our last issue, many new members were added to the membership of the Institute. Such visits are to be encouraged. We should see the Secretary more frequently in Ontario. Nova Scotia should also be regularly on the visiting list. An official visit, giving as it does an opportunity for personal explanations of the Institute's aims and objects, is more valuable than any number of typewritten communications. However, the Secretary deserves praise and commendation for the good results of his tour of the West. We hope that the time will soon come when the most important official of the Institute will be free to visit all parts of Canada once every six months. On this point we are to publish presently several communications.

BORROWED PLUMAGE

A subscriber has sent us a document that makes most painful reading. It is an appeal to Queen's University men to subscribe for the stock of the Combined Gold Fields, Limited. The letter is signed by Alfred Fitzpatrick, B.A., a graduate of Queen's. The stationery, as may be seen by referring to the half-tone reproduction on this page, is that of the Reading Camp Association. The names of prominent citizens appear thereon. Naturally these names have nothing to do with the Combined Gold Fields, Limited. Naturally, also, the average reader of the letter will be influenced by the fact that such names do appear.

Mr. John Sharp, late a lecturer in moral philosophy at Queen's University, is referred to as a director of the company and as general manager. Shares of a par value of \$1 each are urged upon Queen's men at the price of

10 cents. The capitalization of the company is \$3,000,000. It holds twenty-one mining claims in the Larder Lake mining district.

Some months ago, before the time had come for THE CANADIAN MINING JOURNAL to take a decided stand in these matters, there appeared in some of the Toronto newspapers a large advertisement over "Professor" John Sharp's name. The advertisement was as unbusiness-like and as remote from true mining as anything that

We do not know how the Reading Camp Association is organized. The names of its officers, however, show that it is a respectable missionary or educational enterprise. Mr. Fitzpatrick as Superintendent of Camp Education may be, no doubt is, a useful citizen.

But when Mr. Fitzpatrick prostitutes this enterprise, takes liberties with the official stationery and shamefully misuses the name of Queen's for his own pecuniary benefit, we have no hesitation in condemning

RESIDENT
TURNER, PRES. CAN. COPPER CO.
COPPER CLIFF, ONT.
1ST VICE-PRESIDENT
COVERING, VICE-PRES. GEORGIAN BAY LUMBER CO.
COLDWATER, ONT.

HONORARY PRESIDENT
SIR SANDFORD FLEMING
OTTAWA

2ND VICE-PRES.
CAPT. W. ROBINSON, W.M.
DUNCAN McMARTIN, L.S.

The Reading Camp Association

Alfred Fitzpatrick, B.A.

Superintendent Camp Education

TELEPHONE 119

P.O. DRAWER 31

New Liskeard, Oct. 9, 1907. 1907
Ontario

Dear Friend,

On the opening of the Larder Lake Mining District Prof. John Sharp and I sent in prospectors who located a number of good properties.

We have organized the Combined Gold Fields Limited, with a capitalization of \$3,000,000

This Company has 21 of our claims, each claim having about 40 acres. A discovery of mineral has been made on every claim. We have had the properties thoroughly examined by an independent expert mining engineer (Cambridge, Eng.), and his report is very encouraging

One large vein of quartz, from 20 feet to 30 feet in width, extending through the claims (80 acres), gives assays of from \$3.90 to \$10.60 per ton, the richness increasing with the depth. This claim alone promises to be rich enough to warrant an investment. We have good reason to expect that the venture will prove very profitable to all concerned.

You are no doubt aware that the richest mines of the world are low-grade propositions, in some cases their ores assaying not more than three to four dollars per ton.

It would give us much pleasure to have a large number of Queen's men associated with us as shareholders. Three of our seven directors are graduates of Queen's — Prof. John Sharp, Mr. James Hales and myself — and several other Queen's men are shareholders. Prof. Sharp is General Manager. His work so far has received very high commendation.

More money is urgently needed to sink shafts, procure stamp mills, etc., and we should like very much to have you become a shareholder and help carry on the work. You may rest assured that the directors will use every possible effort to make your investment profitable to you.

If you care to join us in this enterprise, you may have shares at 10 cents each. These shares are of the par value of \$1.00 each.

Please send your application to Mr. James Hales, Traders' Bank Building, Toronto. You incur no personal liability beyond the amount of your subscription.

Yours sincerely,

A. Fitzpatrick

Law & Company ever produced. But there was in it an element of almost pathetic simple-mindedness. We thought on reading it that here was a man, as ignorant of the ways of the world as he is of mining. We forebore from unkind speech.

However, the appearance of this circular has put "Professor" John Sharp, together with his associate, Mr. A. Fitzpatrick, in an unenviable position. The latter is obviously the chief sinner.

him without reservation or equivocation. Mr. Fitzpatrick as a graduate of Queen's is attempting to transmute into dollars and cents the University spirit. As superintendent of a praiseworthy educational scheme, he trades upon the standing of his employers in using their official stationery. And as an educated Canadian he should be heartily ashamed of himself.

It is a far cry from moral philosophy to gold mining in Larder Lake. "Professor" John Sharp appears to

have made the change with ease. But the transition seems to have robbed him of certain ethical concepts. Can Mr. Sharp think it a decent, an honest thing, for him to allow his name to be used in such a connection as this?

The circular contains not one important item of information regarding the claims. The "independent export mining engineer (Cambridge, Eng.)," and his "very encouraging report" is not information. It is simply the orthodox formula used by all wild-cats. The capitalization of \$3,000,000 may be all intended for promotion stock. Nothing on this point is specified in the letter.

How deep has "Professor" Sharp sunk on his 20 foot vein that he is warranted in stating that the ore grows richer to the deep? What tests have been made and where?

The letter is singularly silent on all these essentials. On "Queen's" and on 10 cent stock it is strong.

If Mr. Sharp has a promising mine he does not need \$3,000,000 to work it. If he had knowledge of the profession of mining and *faith in the mine* he would not ask for \$3,000,000. He would be glad to get the few thousands necessary to erect a stamp mill and then depend upon his gold bricks for the rest. But, sad as it may seem, the methods of Mr. A. Fitzpatrick and "Professor" John Sharp are alarmingly like those of Law & Company. This in itself is full condemnation.

We need only add that we shall see to it that both Mr. Fitzpatrick and "Professor" John Sharp are not allowed to benefit by their astonishing indiscretion. Both of these gentlemen and all of their associates may count upon the disapproval of those who honor Queen's for what she is. Within her walls are no money-changers.

AN INSIDIOUS ASTERISK.

Among the exchanges coming to this office are many Canadian newspapers. In several of them we have noticed the glaring advertisement of Law & Company. Lately Law & Company have become more discreet. But in looking over a Nova Scotian newspaper, dated October 19th, our eye fell upon a paragraph, purporting to be a regular press despatch and not distinguishable from ordinary telegraphic news, save by one mark—a small asterisk at the end. Looking up the column we noticed the advertisement of a corn cure with the same mark, and throughout the paper the advertising paragraphs were similarly marked.

The paragraph in question is dated from New Liskeard. It narrates vividly the enthusiasm of a Mr. F. W. Rosser after he had inspected the Highland Mary claims. It speaks of a slab of gold quartz "valued at over \$15,000 in gold to the ton."

When the promoters of a mine descend (although it were a difficult feat for Law & Company to descend at all) to patent medicine methods of advertising, fake is writ large on their enterprise.

Let us again remind the public that the owners of rich mines do not advertise. The appearance of such announcements as Law & Company's are most cogent proofs of their own lack of confidence in their alleged mines.

PEACE.

The strike of the employees of the Cumberland Coal & Railway Company at Springhill has ended. A conference between the miners and Government officials, held in Halifax at the suggestion of Premier Murray, appears to have had the happy effect of clearing up much misunderstanding. The miners decided to accept the Board of Arbitration's finding. Work is to be resumed.

While we are heartily glad that the strike is ended, we must express the opinion that unless peace is to be lasting and unless the public can be assured that hereafter the awards of the Board of Arbitration will be accepted without question, no material gain will have been made.

There is something radically wrong when workmen go out on strike so frequently as has been the case at Springhill. It is not possible that the men are altogether to blame. Nor is it expedient to attempt to analyze the history of successive troubles and apportion out the responsibility for the friction. Let the past take care of itself. For the future it must be demanded that both employers and employees avoid the very appearance of evil. Springhill has not a proud record. It will take many years of harmony and good-will to compensate for her long period of costly strife.

RESEARCH

The newly appointed Professor of Chemistry at McMaster University, Dr. J. Bishop Tingle, in an inaugural address hinted that the best investment for Cobalt mine owners would be the establishment of a laboratory of research for students of metallurgy and chemistry. This is a vitally practical point, and Professor Tingle did well in impressing it upon his hearers. Not in Cobalt alone, but over the whole length and breadth of all the mining Provinces of Canada, there are problems awaiting the trained young Canadian scientist. Some of our coal mines present a series of intricate questions in the preparation of their product for the market—the elimination of slate, sulphur and other impurities by washing; the utilization of slack and culm are examples of these. The concentration of our vast bodies of low grade iron ores is another wonderful field for investigation.

Apart from the ores of the precious metals, in the reduction and treatment of which peculiar difficulties are met in every mining camp, there is room for a great deal of pioneer work in connection with the ores of the base metals and the non-metallic minerals.

A technical college that systematically encourages the pursuit of practical and useful subjects is not merely utilitarian. It is living up to the highest ideal of life, inasmuch as it is attempting to fulfil its true purpose.

THE HENDERSON TALC MINE.

In the report of the Bureau of Mines for 1899 mention is made of the discovery of a deposit of excellent talc in the vicinity of Madoc, and the opening of a mine, the product of which was shipped to New York. The hope is then expressed "that Canadian capital will be found to operate the mine and prepare the product for market at home. This latter is yet an unfulfilled desire. In the summary of mineral production of Ontario for 1899 the talc mined is set at 100 short tons, valued at \$500.

In the succeeding year the mine is reported as having attained a depth of 53 feet. The width of the deposit of merchantable talc is put at 34 feet. The quantity raised at the two above mentioned mines during 1903 is fixed at 920 tons, worth \$2,625.

One thousand three hundred and thirteen tons, valued at \$2,919, was the quantity produced by Ontario in 1904. Apparently all of it came from the Henderson Mine. The year 1905 saw about the same quantity mined, and in 1906 1,234 tons, worth \$3,030. The output for 1907



TALC STOCK PILE.—HENDERSON MINE.

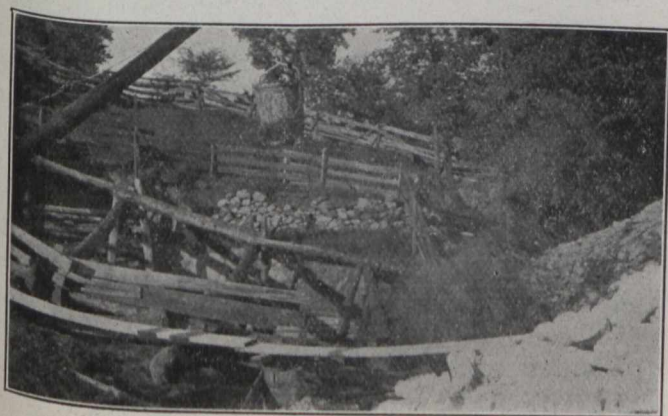
The report of the Bureau for 1900 mentions the discovery again, and dwells upon its importance and upon the purity of the talc. The shaft was then 43 feet deep, with a cross section of 18 by 20 feet. The output for 1900 was 1,000 short tons, valued at \$5,000.

In 1901 the Henderson Mine (that name still clings to it) was idle; but talc was shipped from the dump to the quantity of 400 tons.

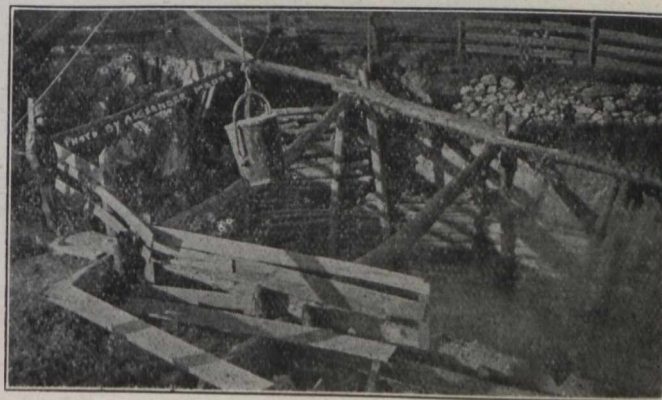
During 1902 the Henderson Mine and another talc mine near Gananoque produced together 697 tons, valued at \$930.

will total about 1,500 tons. The values per ton heretofore assigned are much below the actual price obtained for the talc.

The Henderson talc mine was discovered eight years ago by James E. Harrison, of Madoc. It is a quarter of a mile from the north shore of Moira Lake, and a mile and a half southeast from the Town of Madoc. Moira Lake, as beautiful a sheet of water as one could wish, stretches nine miles east and west, with an almost uniform width of a mile.



View of Shaft Mouth.



View of Shaft Mouth.

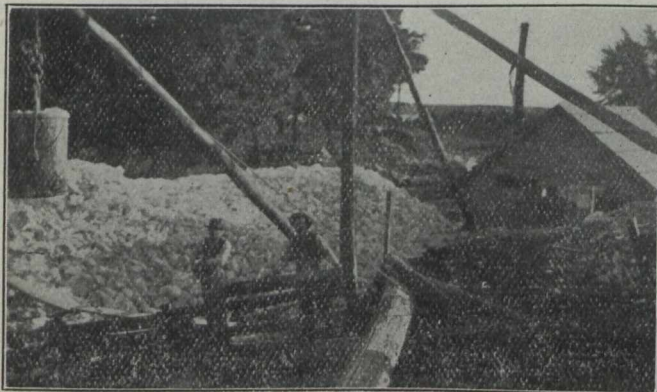
The mine on lot 14, concession XIV. of Huntingdon Township, Hastings County. It is operated under lease by Messrs. S. Wellington and William Cross, of Madoc. Mining is conducted for only three or four months of the year and the tale is consigned in lots of five or ten car loads to New York. The demand is limited to a maximum of 1,500 tons per annum. The present capacity of the mine is easily 60 tons per day. But since work is not continuous, time and money are wasted in unwatering and cleaning the shaft each season.

The working equipment consists of a stationary boiler and a steam hoist, by which two half ton buckets are operated. Drilling is done by hand, a 1 1-2 inch ratchet auger being used. The shaft is entirely in clean talc and blasting and breaking are easy.

The shaft is 105 feet deep. It bottoms in clean granular massive talc. Neither hanging nor foot wall is visible to the deep, where the shaft is 25 feet wide by 30 feet on the strike.

It was the intention of a previous operator to start drifting at a depth of 60 feet, and stations were started. But trouble ensued and the present lessees found it necessary to widen and clean out the shaft and carry it to its present depth before drifting could be begun safely.

The shaft or pit, as it is more properly, now opens about 40 feet by 35 feet at the mouth and narrows down



Stock Pile, Derrick and Power House.

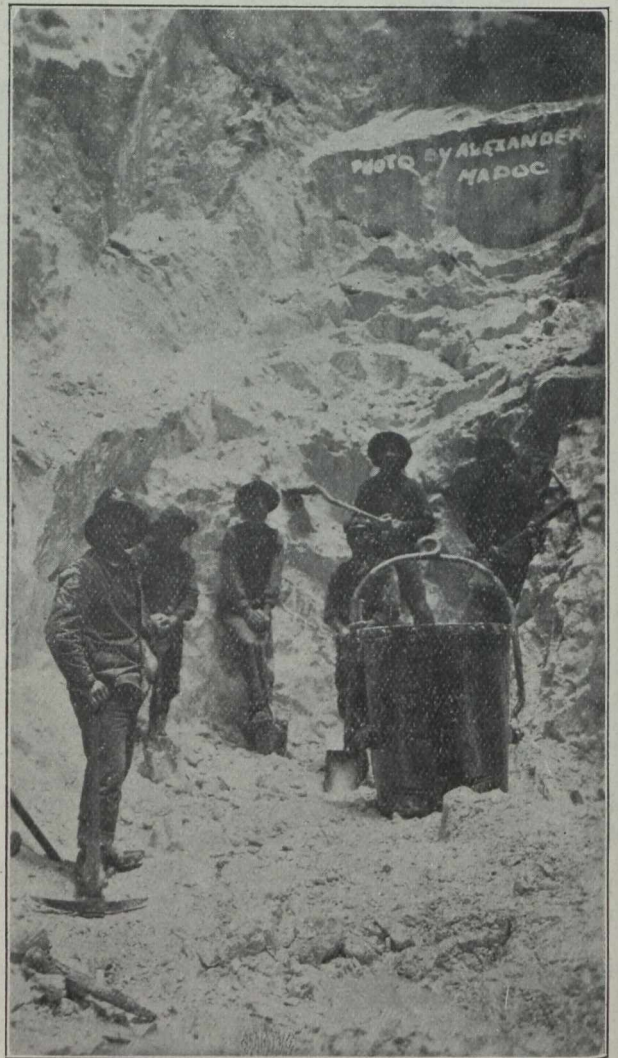
irregularly to the bottom measurements mentioned before. Drifting is to be commenced next summer and the deposit will be proved to a very considerable extent. The maximum width of the vein is about 36 feet. This measurement is obtainable near the surface, where, in the pit, the walls are visible. The strike is north 40 degrees west. The talc vein cuts across a tilted deposit of dolomitic limestone. The dip is 80 degrees south.

Three hundred feet to the northwest a large outcrop of the vein is visible. Hence the probabilities are in favor of the deposit being large enough to meet an increased demand for some years to come. It is the intention of the operators to win their supply of talc in future by drifting to the strike. This will of course develop the property to the best advantage.

The stock pile, containing between 400 and 500 tons of this gleaming white mineral, was a remarkable sight at the time of the writer's visit. The massive talc shows not a tinge of extraneous coloring matter. No impurities are visible. There are occasional inclusions of leek-green serpentine, which, however, powders pure white and is not culled from the shipments.

The United States production of talc and soapstone during 1906 amounts to 120,644 short tons, valued at \$1,431,556. The average value per ton derived from

these statistics is not reliable. The many grades of material mined and the conditions of production influenced the price in different localities. But throughout the United States there was during 1906 a marked falling off in the supply of the purer grade of talc, such as is mined at Madoc. Fibrous talc, included in the returns specified above, was mined to the extent of 64,200 short tons, valued at \$541,600 or \$8.43 per ton. The uses of fibrous talc are much less numerous than those of the white granular massive variety. Moreover, fibrous talc, of which the State of New York is the principal producer, is intrinsically less valuable. The Canadian product is sold at a high price in New York. The exact figure we are not at liberty to quote. But the market is limited and close. Hence production must be cur-



Bottom of Shaft—Henderson Talc Mine.

tailed to a specified amount. There is no doubt that in an open market the Madoc talc would bring a much higher figure.

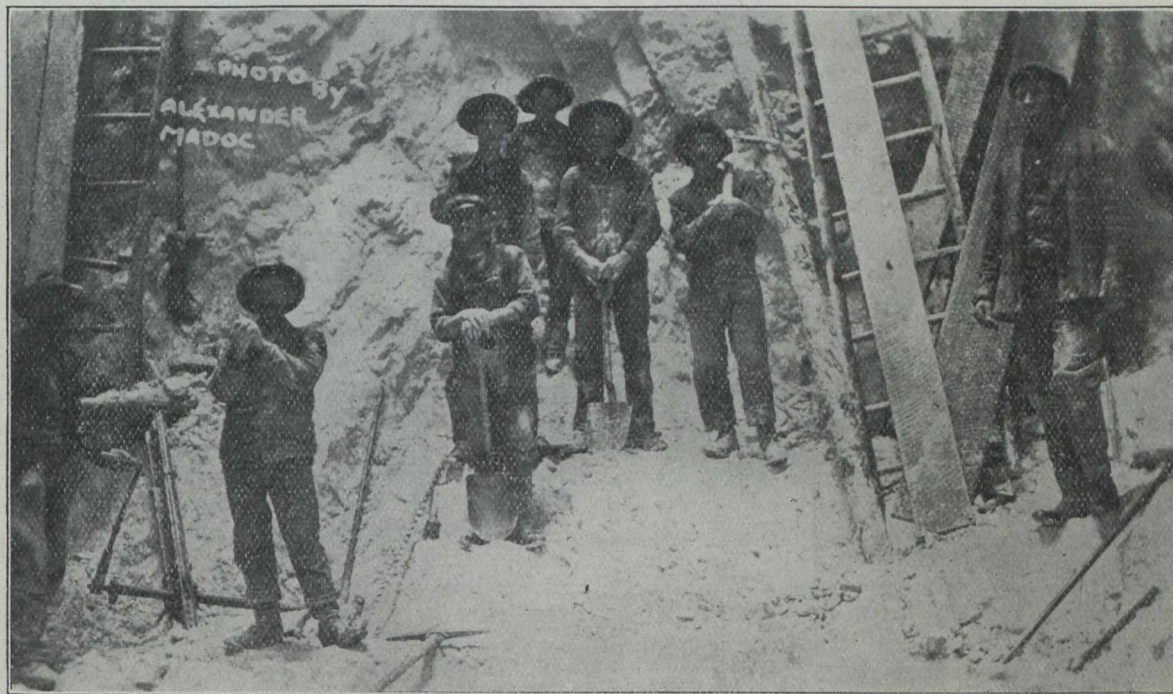
The process of preparing the crude talc for manufacture is cheap and simple. A little scent, an ingenious prying druggist convert the dried and milled talc into a relatively costly toilet powder, on the sale of which enormous profits are realized.

There is room here in Canada for the manufacture of many articles now imported from other countries, principally from the United States. A mill for grinding and preparing the talc would cost but a few thousand dol-

lars and might readily be the basis of many flourishing industries.

To illustrate this a few of the uses of prepared talc may be cited. Powdered or flour talc is used in the manufacture of electric insulators, steam pipe insulators, foundry facings, fireproof paints, "dope" for dynamite, paper, toilet powder, lubricators, etc., etc. It also plays an important part in the manufacture of leather goods

The operators of the Henderson Mine, Messrs. Wellington & Cross, are members of the Madoc Mining Association. The president is Mr. W. A. Hungerford and the secretary is Mr. R. T. Gray. Mr. A. W. Coe is first vice-president and Mr. Wellington second vice-president. The Association meets fortnightly in the Board of Trade rooms. Here opinions are exchanged and mining matters are discussed. The organization, which is closely affiliated to the Board of Trade, is informed with the



BOTTOM OF SHAFT—105 FEET—HENDERSON TALC MINE.

and of soap. Other uses to which powdered talc is put we shall not describe beyond mentioning that the mineral is made to play the part of an adulterant in certain food-stuffs. But sinful man and not the useful mineral must be blamed for this.

Hearthstones, furnace linings, laboratory tables, laundry tubs, gas tips, pencils and an almost infinite number of lesser articles are manufactured from the massive unground steatite.

spirit of mutual helpfulness. The members realize that their district needs not booming, but steady, careful attention. There are no capitalists in this handful of mining men. But there are self-reliant, strong men of high courage, who intend to win and who have a large faith in the mining possibilities of Hastings County.

Madoc is a bright, well-paved thriving country town. A visitor's first impression (and his last) is one of substantial prosperity and intelligent progressiveness.

DIFFERENCE OF THREE CIPHERS.

ALEXANDER GRAY.

That the Witwatersrand gold fields are the ultimate of concentrated riches was long since conceded by unprejudiced mining authorities. But when Mr. J. B. Robinson, the wealthiest of the coterie of magnates, identified alike with the Kimberley diamond mines and these Witwatersrand "banket" beds, proclaimed in London recently, that gold worth \$5,000,000,000,000 remained these, he blew out the boiler plates, wrecked all previous conceptions of what part the forty miles of so-called Main Reef Series are to play in this century's monetary affairs, and "pied" the calculating machines of distinguished international experts. Next day Mr. Robinson hastened to revise his "copy," ran the blue pencil through three superfluous ciphers, and the concrete fact remains that this millionaire mine owner ex-

pects a gold-getting record of \$5,000,000,000 before the mills of the Rand are dismantled and the last retorted metal poured. Thus the strain upon the credibility of scientists was relieved. A slip of three ciphers bridged the chasm between the possible and the grossly hypothetical. Another five billions in ingots will suffice to firmly establish the Witwatersrand in the same class as the Standard Oil and United States Steel trusts; and it is not at all surprising that Mr. Robinson became so entangled in ciphers he inadvertently took the limit off popular credulity. Had the Robinson figures been reaffirmed they would have overwhelmed those of Hamilton Smith, Hammond, Jennings, Legget, Hatch, and others less roseate, though all sufficient. Five billions in sight make the life of the Witwatersrand 33 years in-

stead of 3,333, as Mr. Robinson first noted, accepting the current rate of production as the average, and in any event a third of a century may reveal other sources of gold supply.

Mr. Robinson, having returned from South Africa, no doubt seeks to dispel the gloom encircling that "most distressful country," a gloom which holders of "Kaffir" scrip find ruinously expensive. His arrival during a period approaching panic was inopportune, but there is consolation in the gentleman's change of front, because it is not so long ago that he advised the voluntary liquidation of his Robinson South African Banking Company owing to the inadequacy of general business in South Africa. There were too many banks. Now there is business in abundance and no blanks. Every package contains a prize. Such are the uses of adversity. Reaction and reagents have evolved phenomenal optimism out of a decade of despair. So it is in order to realize on expectations and induce financiers to forget all the writings off revealed in balance sheets with distressing regularity.

Besides the five billions, "there are immense deposits of gold, gems and minerals as yet untapped in the Transvaal," said Mr. Robinson. Before proceeding to determine the factor of the payability of these, from the Limpopo to the Vaal Rivers and Bechuanaland to the Portuguese border, investors expect the Botha Ministry and the magnates to give them something more substantial than glowing prospectuses. Underwriting syndicates have had too many cold douches to venture further afield, and while the Witwatersrand has prestige to which it is properly entitled, there will be no rush of fresh funds until greater concert prevails between the Botha Ministry and the masters of the mining industry. Conceding the point that there is no longer danger of South Africa's "exhaustion," as has been argued by the advocates of restricted energy, Mr. Robinson emerges from his voluntary retirement and unfolds a treasure-laden vista extending to mid-century. In the interim there will be racial amalgamations and political readjustments. Should there be profitable by-products in the "immense deposits yet untapped," new groups will continue the labors begun by Rhodes, Beit, Wernher and Robinson, without intermission, perhaps with less friction.

A steady supply of yellow metal is what money markets and the arts will heartily welcome. Unfortunately Mr. Robinson's optimistic horoscope is overshadowed by economic influences decidedly adverse to expansion. Mr. Robinson cannot obscure these. He has publicly proclaimed them. His Landfontein and Langlaagte estates have potentialities awaiting demonstration. Large areas controlled by him lie fallow. Unskilled labor and high wages due to living charges are disconcerting and deterring elements. There may be \$5,000,000,000 worth of gold, but most of it is in solution—the solution of the labor and living problems. The Main Reef Leader and South Reef are the profit earners. The likelihood of mining and milling large quantities of the Main Reef itself hardly is inducement to investors, until there are revolutionary reductions throughout South Africa's economic system. According to the cables, Mr. Robinson is left to infer that the 4 and 5 dwt. rock of the Main Reef will show a profit. It might, if the proposition was a free milling one, and mining, crushing and extraction were as cheap as they are in some other countries. Neither of these essentials is in effect at the Rand. The feeding of mills from great depths is a serious item in the costs sheet. Mr. Robinson is aware of this. Low grade ore, heavy capital outlays, dear labor, never yet facilitated the payment of dividends—and they never

will. Mr. Rudd, who was associated with Mr. Rhodes in the De Beers amalgamation, and in the original exploitation of the Witwatersrand gold fields, put the case plainly when he gave the cost of bringing a deep level mine to the producing stage at a round million sterling. That there is a larger tonnage of low grade ore in the Main Reef itself than has been raised from the Main Reef Leader and the South Reef, is known, but with working costs at a sovereign, on the average, disappointed shareholders will hardly risk a favorable selling opportunity rather than await the attainment of the datum line of 15s.—working costs as decreed by Mr. Ross Browne, acting in behalf of Messrs. Wernher, Beit & Company. In that he would revive interest in the Witwatersrand Mr. Robinson has chosen the better part. To accomplish that object is going to take more time than talk.

COMPOSITION OF GLASS SANDS AND MOULDING SANDS.

A high degree of purity is required for glass sand. Its preparation, when it is not sufficiently pure, is a matter of comparatively great expense. All argillaceous material must be washed out. Massachusetts sands of exceptional purity bring \$4.50 per ton after special preparation. Prices of sands in other localities range from 60 cents to \$1.50 per ton.

Moulding sand, used in making moulds and cores for casting iron, steel, brass and other metals, varies from clayey loam to a clean, sharp, coarse sand, according to requirements. There are a great variety of sands used. Often loam, clay, oil, flour or molasses are mixed in definite proportions. The essential qualities are refractoriness, porosity and bond. The size of grain affects directly the porosity of the material. The finer and more intricate the design the finer the sand required. Too much clay and iron oxide will cause the mould to shrink and crack under the intense heat; too little will cause it to dry and crumble or collapse entirely. A good sand should show to the unaided eye grains nearly uniform in size, angular rather than round, and when spread on paper it should show no dust. To the touch the sand should feel sharp, and when moistened with water it must be capable of being formed into coherent balls. The following tables displays the composition of American glass sands and moulding sands:—

	Silica.	Alumina.	Iron oxide.	Lime.	Magnesia.
2	99.659	0.310	0.11	0.020	
2	98.87	0.21	0.08	0.24	0.12
3	97.50	1.50	0.50	0.50
4	81.50	9.88	3.14	1.04	0.65
5	84.86	7.03	2.18	0.62	0.98
6	82.92	8.21	2.90	0.62

1. Sand for clear flint glass—white, medium grain.
2. Sand for window glass—gray, medium grain.
3. Sand for green bottle glass—pale yellow, medium grain.
4. Sand for delicate moulding—fine grain.
5. Sand for medium class moulding—medium grain.
6. Sand for heavy castings—coarse grain.

President Plummer of the Dominion Iron & Steel Company is in England. He will return to Canada during the early part of December.

THE BRITISH WORKMEN'S COMPENSATION ACT, 1906.

THE LIABILITY OF MINING COMPANIES.

(Contributed)

The British Workmen's Compensation Act of 1906, which came into operation on the 1st of July, 1907, is a much more radical piece of legislation than the Act of 1897 or the Act of 1900, which were themselves perhaps as radical measures as were ever passed by a Conservative Government in the British House of Commons. The Act of 1906 extends the benefits of the Act of 1897 to almost all classes of the working population, including all domestic servants, clerks, corporation employees, and the servants of the Crown, outside the naval and military forces.

These notes will, however, be confined to considering the influence of the new legislation on the liability of mining companies, upon whom, it can be very properly asserted, the Compensation Act imposes a more onerous burden than upon any other class of employees.

In the Act of 1897 the compensation to be paid in case of disability is half the average weekly wage of the injured person throughout the whole period of disability, less the first two weeks, and in cases of death by accident a sum of not less than £150 and not more than £300, this sum being based on the average earnings of the deceased during the three years immediately preceding his accidental death.

To colliery operators probably the most important alteration to the Act of 1897 is the provisions of Chap. I., clause 2 (a), which reads: "The employer shall not be liable under this Act in respect of any injury which does not disable the workman for a period of at least *one week* from earning full wages at the work at which he was employed." In the Act of 1897 the corresponding period was two weeks.

It is the experience of all mine employers that by far the greater percentage of accidents are minor accidents, involving from a few days' to a few weeks' disability. The immune period of two weeks under the Act relieved the mine owner of liability for most of these small accidents without any hardship to the miner. The shortening of the immune period to one week puts a premium on idleness and malingering, and will impose an almost intolerable burden on the mine owner. Friendly societies and sick benefit societies flourish immensely amongst the miners of the British Isles, and it is not by any means an unusual thing for a miner to be in two friendly societies, in addition to the colliery relief fund. Suppose he is so injured as to be laid off for a month. He will receive at least \$4 per week from each society, \$2 from the relief fund, and half his average wage from the colliery office under the Compensation Act, say \$5. This will give him a weekly income of about \$15, considerably more than he would earn by working. Under these circumstances it is easily understood how difficult it is to effect a cure. The Act provides that prompt notice shall be given of any accident received, however slight, but it does not provide any penalty for non-compliance with this provision, nor does failure to report an accident invalidate a claim for compensation. It is very difficult in some cases to say whether the injury complained of was received when at work or not, particularly in the case of internal strains and sprains, or say a poisoned thumb, which may easily have arisen from causes entirely outside of a man's employment. Where a man has alleged injuries, and is drawing his "compensation," there is

nothing to prevent his taking a holiday at the seaside at his master's expense, and this is indeed very often done. If in such a case the weather at the seaside is fine, and the \$15 per week mentioned before is forthcoming, it may take quite a number of doctors to work a cure.

The temptation to malingering which is occasioned by the provisions of the Compensation Act is bearing very hardly on the old established colliery relief funds, and on the friendly societies, the calls upon which have considerably increased since the passing of the Act, for a very obvious reason. The colliery relief funds were supported by voluntary subscriptions from the men collected through the pay rolls, augmented by grants from the colliery companies and landlords. Most of these relief funds have had the handling of large public subscriptions collected after the great explosions that have marked the history of British coal mining. They have done a notable work in the past, but now that the chief reason for their existence is removed by the provisions of the Compensation Act, they will in all probability decline and gradually be wound up. It is very obvious that the subscriptions of the colliery owners will cease.

The cost of compensating those permanently injured is now much larger than it was when the Act was first passed, because the number of persons permanently injured is cumulative, and the full burden of this class of compensation has not yet been felt.

Much hard feeling has been caused by the dismissal of aged workmen about the mines, but it cannot be said that the mine owners had any choice in this matter. When a man passes a certain age even a slight injury may prove a permanent disability when added to the decay of advanced years. We have known colliers hale and hearty at 65 and 70 who began work below ground at the tender age of seven years, but no employer could afford to retain workmen of this age, and run the risk of their becoming permanent pensioners on his pay roll. Formerly these men were employed as watchmen, axle greasers, etc., and in light work suited to their powers, but now one can find very few men around the English mines who are over sixty.

The most difficult cases to regulate in the permanent disablement class are those alleged to arise from internal strains. When such cases have been compounded for a lump sum there have been some rather miraculous cures. In a case recently reported in the *Colliery Guardian* it is stated that a man died in hospital from the result of an alleged strain received at work, but the post-mortem proved that he had really died from Addison's disease. Such cases are peculiarly difficult when the man is over 50 years.

A difficult feature is that in many or in most cases the examining and certifying doctor is the colliery medical officer, who is indirectly the servant of the workmen. He naturally does not wish to displease them, and is often placed in a difficult position. Generally, where a doubt exists the workman will get the benefit of it. The new law provides for the appointment of medical referees to be chosen by the State, who shall not be in private practice. How this will work out it is as yet too early to form an opinion. Political wire-pulling will without doubt have a good deal to do with the appointment of these officers. A prominent miner's leader the other day

referred to these gentlemen as "detective doctors," and appeared to very much resent their appointment.

The death claims payable under the Act are perhaps the least onerous. Chap. I., clause c, runs as follows:—"If it is proved that the injury to a workman is attributable to the serious and wilful misconduct of that workman, any compensation claimed in respect of the injury shall, *unless the injury results in death or serious disablement*, be disallowed." The words italicized are new in the Act of 1906, and it would appear that all deaths by accident at work come under the provisions of the Act as to compensation, even when due to serious and wilful misconduct. In a case recently tried before an English Court it was shown that a workman who had been killed by a blast in the mine had apparently committed deliberate suicide. His fellow-worker testified that his manner had been depressed, and that while he could not suggest that the man had committed suicide, he did not think the death was accidental. The judge held that such a death would be repellent even to a man who contemplated suicide, and awarded compensation to the extent of £120 to the deceased's widow, who had not for some time been living with her husband.

Since the passing of the 1897 Act there has fortunately not been any colliery explosion in the British Isles attended with any great loss of life. The safety lamp and the application of scientific research to mining have rendered the modern mine a comparatively safe place, apart from the constant accidents from falls of roof and

side. We hope the days of such catastrophes as the Old Oaks, Lundhill, Swaithe Main and other memorable explosions in England are gone forever, but the Courrières disaster was a hideous reminder that such things may again occur. Under the Compensation Act the mine operator is liable for such large payments in a case of this sort that it would in all probability mean bankruptcy for even the wealthiest companies when added to loss of output and damage to property. Under the provisions of the Act of 1906 the claims of dependents of injured or deceased workmen are preferential under the Bankruptcy Act, and have a first claim on the assets of the company involved.

It will thus be seen that the Workmen's Compensation Act of 1906 is likely to become an "Old Man of the Sea" on the shoulders of the coal mining industry in Great Britain. It is moreover, a distinctly unfair burden, for it bears on the colliery operator alone, whose position of late has not been a happy one. The owner of the coal bears no part of the expenditure. His royalty cheques must be paid, come what may, but the colliery operator has to face a yearly increase of municipal and county taxation, higher wages, higher freight charges, increased cost of material, the Compensation Act, and over all increased foreign competition, unhampered by socialistic legislation.

It is not at all unlikely that legislation of a similar character may become a live question in Canadian politics very shortly. Drafts of bills based on the British



BRITISH JOURNALISTS AT COBALT TOWNSITE MINE.

Workmen's Compensation Act of 1906 have been presented in several of the Provincial Legislatures. Such being the case, it may be timely to endeavor to forecast the probable cost of such a measure to Canadian coal operators. There are no accurate figures available by which a calculation could be made from Canadian data, as no record has ever been attempted of other than very serious and fatal accidents. We must therefore use English data very largely in attempting to forecast what this probable cost would be were such legislation to go into effect in the Dominion.

Mr. Markham, the miners' representative for South Wales, stated in the British House of Commons when the "fortnight clause" was under discussion that the cost of the 1897 Act in South Wales had been 1½d. or 3 cents per ton, and from other calculations we have made this figure is about correct. Taking the annual coal production of Canada at 10,000,000 tons, a mark that will very soon be attained, will give a cost to the operators of \$300,000 annually, more than half of which would be borne by the coal operators of the Province of Nova Scotia alone. In this Province the cost of the relief societies at the collieries averages from .8 cents to 1 cent per ton, and the relief paid is from \$3 to \$3.50 per week, which is about half of what would have to be paid under a Workmen's Compensation Act. Doubling this cost per ton, therefore, on 10,000,000 tons, we get a figure of \$200,000, but one must consider that the death claims paid under the British Act are from \$750 to \$1,500, as compared with from \$60 to \$100 by the relief societies. If the tons raised per man killed are taken at 200,000 tons, we have 10,000,000 divided by 200,000 equals 50. As very few miners in Canada earn less than \$500 per annum, we take the figure of \$1,500 death compensation which gives \$75,000, making a total in this second calculation of \$275,000. But it is difficult to figure what the payments under a Workmen's Compensation Act would be from relief societies data, for under the constitution of these same societies malingering is reduced to a minimum, because the members watch one another, whereas under a Compensation Act, the incentive to do this is removed. The *Colliery Guardian* for 11th May, 1906, quoted in an editorial on the subject of malingering from a circular issued by the South Wales Coal Owners the following significant figures:—

Employees injury and compensated per 1,000—

1899	26 per 1,000
1900	39 per 1,000
1904	54 per 1,000
1906	60 per 1,000 (estimated)

The circular states the belief of the coal owners that this figure will increase to 200 per 1,000, which by the way is the actual percentage borne by the members who have been injured and relieved to the total membership of the West Riding Permanent Miners' Relief Fund (Yorkshire), a society having in the neighborhood of 30,000 members.

With reference to long disablement cases the South Wales Coal Owners' circular states that the percentage of men disabled for periods over twelve months was in 1903, 6.72 per 10,000, in 1904 14.87, and in 1905 17.66 per 10,000, and this notwithstanding a steady decline in the actual number of serious accidents, such as fractures, which in 1904 was only 221 compared with 258 in 1900. Internal injuries and strains, correct diagnosis of which is difficult, are responsible for the most persistent cases.

An Act such as the one under consideration bears more hardly on the coal owner than on anyone else. The work of a miner is accomplished under certain acknowledged

risks, which he accepts, and in consideration of which he is paid a higher wage than perhaps any other laboring man. He is more subject to minor accidents than any other workman, accidents of from one to three weeks' duration of disability. The principal of compensation according to wages earned works therefore to his great advantage, and to the mine operator's equal detriment. Eventually a compensation bill must react upon the miner, for coal operators cannot continue to pay high wages and compensation for accidents pro rata without raising the price of coal or forcing a reduction in wages.

The present system of accident relief among the majority of Canadian mines is provided by joint contributions of the men, the employers, and the Government; a scheme very similar to that which obtains in Germany, and which has been found to work very well both there and here. The chief evil of such an Act as the Compensation Act of 1906 is its marked tendency to foster malingering, which it does chiefly by reason of an absolute divorcement of responsibility from the workmen, and the laying of the entire onus on the shoulders of the employers. It would seem that the most equitable arrangement for Canadian conditions would be an amplification of the present colliery relief funds. Any legislation along the lines of the Compensation Act of 1906 is quite uncalled for, and would seriously hamper the growth and development of coal mining in Canada, and would confer a very doubtful benefit on the miner. In England its effect has been to sap the moral integrity and the manly independence that used to characterize the "collier laddie." In saying this, we refer to minor accidents and some permanent cases. The death compensation payment is not open to this objection. In some cases the sums paid over to widows have been shamefully squandered, but some provision for widows and dependants of men killed at work should in all justice be provided. But it should not all be expected from the coffers of the coal operator, whether death occurred through "serious and wilful misconduct" or not, as it now is. Even a "coal baron" has his rights.

It is often urged that the provisions of the Compensation Act are such as to ensure greater safety to the workmen, because of the extra care taken by the employer to guard against his liability. In the case of factories or where there is much machinery this may be more or less true, but it is not so true of the actual work of mining, where more than perhaps in any other avocation the ceaseless vigilance of the miner himself is the best guarantee of his safety, and it is not equity to saddle the mine operator with the consequences of his employee's neglect. Everybody who knows the inside of a mine knows also that careless and reckless men are to be found among miners, or else why have we laws by which men are bound to take reasonable precautions for their own safety and why do prosecutions occur for breaches of these laws? That a man can be punished by law for misconduct of this kind, and yet if it happens that he is seriously disabled or killed by reason of such misconduct his employer must pay therefor, are anomalies the non-legal mind cannot quite comprehend or reconcile.

Goldfield's Production.

The total production of Goldfield from the inception of the camp up to June 1st, 1907, amounted to \$12,762,000. This year's production will be about \$16,000,000. September returns gave \$1,350,000 as compared with \$1,600,000 for August and \$2,000,000 for July.

ELECTRIC ZINC SMELTING.*

FREDERICK T. SNYDER.

(Mineral Point Meeting, September, 1907.)

Your secretary, Mr. Girling, and Mr. George S. Parker, have kindly asked me to tell you something of the efforts that we have been making to improve the metallurgy of zinc. As some of you know, we are responsible for the design and development of the high intensity magnetic separators which are now operating on a large basis at Leadville in Colorado and at Valerdena and Santa Barbara in Mexico, raising the grade of unroasted zinc ore.

It was while confronted by the difficulties of this separation that it occurred to us to strike directly at the root of the principal troubles of zinc reduction (the clay retort) and attempt to put the extraction of zinc on the basis of large stack furnaces. Iron, copper, lead are smelted in bulk in single furnaces, putting through from 200 to 500 tons in each 24 hours. The reason why zinc ore cannot be smelted in an iron or lead blast furnace is well known—the oxygen of the blast burns the reduced zinc black to oxide as fast as it is formed. In such furnaces the object, and the only object, of the blast is to furnish heat by burning the coke in the charge. If this heat be put into the stack by means of an electric current, as it is put into the filament of an incandescent light, the blast is not required and zinc as reduced will remain metal and may be condensed and removed.

Without going into the technical details of this electric stack method, I may say that these furnaces look like an ordinary lead or copper water-jacketed furnace, but are provided with electrodes for carrying in electricity in place of the tuyeres for carrying in a blast. The ore is fed in at the top and is entirely melted down, the residues being tapped as slag. The zinc condenses on the inside of the walls and spelter and runs down and is drained off. No blast is used, all the heat being put in with an electric current.

This solution, simple as it is, required an unexpected length of time to put into practical operative apparatus, but has now reached a form where we are warranted in considering what it means commercially to the mine owner. It is an economic truth that in the long run improvements in process accrue to the benefit of the owners of raw material. Excessive smelting profits soon attract new capital, which reduces the net return to a normal interest basis. But no amount of investment can increase the grade of mineral in a deposit. To render the lower grade available for shipment a reduction must be made in the total cost of extracting and delivering the contained metal to the consumer.

For the purpose of arriving at definite figures, we can consider the result of two plants, each of 25,000 tons annual capacity, operating under equivalent traffic conditions in the Illinois coal field, one using retorts and the other an electric stack furnace. Incidentally it may be remarked that single electric zinc furnaces of 50,000 tons annual capacity now appear practical.

The first cost of the present type of retort plant, including land, buildings and machinery, but excluding working capital, will be some \$400,000. The equivalent first cost of the electric stack plant, including steam-driven electric generating machinery, will be substantially the same. Of this \$160,000 is the cost of the stack plant and \$240,000 the cost of the electric generating plant. Where current can be purchased from an exist-

ing power plant, the total cost of the electric stack plant is considerably less than half the cost of a retort plant.

General operating cost items for salaries, interest and depreciation are substantially the same for the retort plant and the electric stack furnace.

The operating cost item of labor in a modern retort plant burning coal with mechanical roasters may be taken at \$4 per ton of raw ore. The labor in a stack plant may be kept well under \$3 per ton. While this result might naturally be expected from using one compact vertical iron-jacketed furnace in place of 2,000 horizontal clay retorts, it also depends on items not so obvious. The area of the stack plant is much smaller and distances over which material has to be handled are less and the continuous treatment admits the introduction of ore-handling machinery. With the electric stack furnace the sulphur does not have to be roasted as low as with retorts; 6 per cent. of sulphur in the electric stack furnace will give as good an extraction of zinc as 1 per cent. sulphur with retort furnaces. This practically doubles the duty per square foot of hearth area of the roasters. The weight of the stack slag is less than one-half the weight of the retort residues and less than one-quarter of the bulk. The results of operating the electric stack furnace are to a large extent independent of the skill of the furnace men, being determined, as in lead and copper smelting, by the metallurgist. This renders the electric stack plant, when starting up or in the event of labor troubles, much less dependent on a supply of specially skilled employees.

Considering fuel, it may be taken that a regenerative retort plant will burn 4,200 pounds of coal per ton of raw ore. Of this 600 pounds will be used in roasting. With the electric stack furnace it takes 1,200 horsepower hours of electricity per ton of raw ore, or 50 horse-power per day of 24 hours. The Fisk street station of the Chicago Edison Company is delivering one horse-power for one hour in electricity at the switchboard with the consumption of less than 1 1-2 pounds of medium grade coal. This amounts to 1,800 pounds of coal per ton of zinc ore and is practically constant, whether the ore is high or low in zinc. So, aside from roasting, the electric stack plant uses one-half the coal that a retort plant uses. As roasting for stack smelting takes less than one-half the coal that roasting for retort work requires, the total coal consumption of the electric stack plant is not more than one-half that of the retort plant. The saving is substantially one ton of coal per ton of ore, amounting to 75 cents.

With the retort plant 800 pounds of reducing material will be used per ton of raw ore; with the electric stack plant 200 pounds, assuming in each case a furnace charge carrying 50 per cent. of zinc. With normal prices this saving amounts to 55 cents per ton of raw ore.

With the electric stack plant there are no clay retorts and all cost items incident to their manufacture are absent. The items involved in the supply of new retorts amount to 40 cents per ton of raw ore. With a stack plant, however, an item of expense is present which is absent in a retort plant. To smelt 25,000 tons of ore will require 100 tons of electrodes, costing \$50 per ton delivered, which is equivalent to 20 cents per ton of raw

*Transactions Tristate Mining Association.

ore. Repairs and renewals on iron work and machinery will be substantially the same in each plant.

Summing up these differences of operating costs, it appears that the electric stack plant costs \$2.50 less per ton of raw ore to operate than the retort plant.

When we consider the results of operation, the electric stack plant produces results of equal interest. With reference alone to the zinc tenor of the ore, the lower the grade of the ore the more slag produced, and the higher the grade of the ore the higher zinc percentage will the slag contain. Within practical working limits, changes in these items substantially counterbalance each other. In other words, the amount of zinc lost per ton of ore is a fixed amount, independent of the grade of the ore, and is less than 50 pounds per ton of ore. With a retort plant it is also substantially independent of the grade of the ore and with good work may be 150 pounds. The increased recovery due to the stack plant, with zinc at 4 cents, will have a value of \$4.00 per ton of ore.

With the electric stack plant, iron in the zinc ore improves the operation of the stack furnace. Up to the point where the percentage of iron equals one-half the percentage of silica, iron is required in the stack furnace charge and has to be added if absent. With an ore running 50 per cent. in zinc, and no lime, this means that an electric stack furnace requires an iron contents of 8 per cent. The higher iron limit with the stack furnace, as compared with the retort furnace, will in some properties render it possible to cut out magnetic separation and in any event renders rougher concentration practicable.

With the electric stack furnace, any lead in the ore is reduced and saved separately, at the same time as the zinc. This makes it practicable to do rougher concentrating work and let the lead go in with the zinc, taking out only the gangue. With zinc concentrates containing 3 per cent. of lead, 50 pounds per ton of raw ore, or 2 1-2 per cent., will be saved in electric stack smelting and lost in retort smelting. At 4 cents per pound this is an item of \$2. In addition, the lead penalty will be saved to the owner of the ore.

Lime is required in the charge in an electric stack furnace and is permissible in the roasting, as low sulphur is not required. With limey ore this saves the penalty to the mine owner. It also makes a saving of zinc, as with no lime penalty, close work is not so imperative, and less zinc is lost in the mill tailings. These items may reach \$1.50 per ton.

Summing up these savings of metals in the electric stack plant over the results of a retort plant, makes a total of \$7.50 per ton of shipping ore. This, taken together with the reduction of operating expense, makes a net difference between the retort plant and the electric plant of \$10 per ton of ore. This is the direct result of using electricity for heat in place of coal, and involves no other important changes in the present metallurgy of zinc. This \$10 does not include the present smelting profit but is in addition to and independent of the profit which the zinc smelter now makes. In other words, a smelter using electric stack furnaces can afford to pay the mine owner \$10 more for each ton of zinc ore than can a zinc smelter using retort furnaces.



BRITISH JOURNALISTS IN FRONT OF COBALT'S OPERA HOUSE.

A STRAIGHT LINE CORLISS AIR COMPRESSOR.

H. A. WAINWRIGHT, M.E.

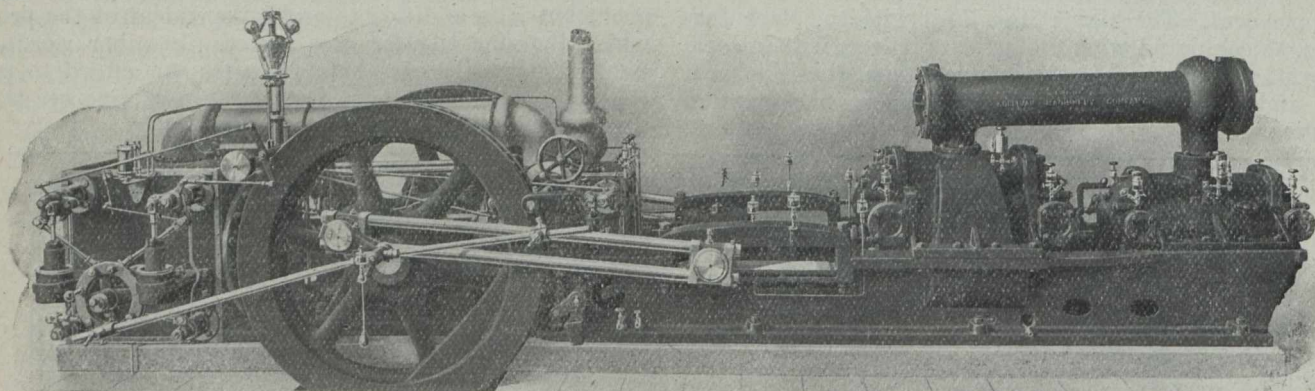
All engineers recognize in the Corliss engine the most economical means of compressing air by steam power. In the cross-compound type, one horse-power may be produced on from 14 to 16 pounds of feed water per hour, when running condensing, or 20 to 23 pounds non-condensing. But the price of the Corliss unit appears large to many operators, even in regions where the cost of the fuel saved would pay for the entire machine in a short time. Slide valve compressors are, therefore, often installed, which require two to three times as much fuel to do the same work.

The development of an air compressor combining high economy with moderate price has advanced but slowly. In some cases the principles of good mechanics have been distorted to the sacrifice of durability, ease of action and mechanical efficiency, in order to reduce construction costs. In others, various substitutes for the full Corliss valve gear have been offered. It is conceded that some of these compromise machines may fairly claim a certain degree of economy in operation, and that when a

as a "tandem compound steam, two-stage air, Corliss straight line compressor." To put it differently, tandem compound steam cylinders with full Corliss valve gear on both have been attached to the flywheel end of the standard Sullivan two-stage straight line compressor, the high pressure steam cylinder occupying the same position as the single Meyer valve cylinder of the "WB-2" machine. The photograph shows the arrangement.

DESIGN OF STEAM CYLINDERS.

The high pressure steam cylinder is of special design, to make room for the Corliss valve bonnets and dash pots between the cylinder and flywheels, and in order to do this, the steam chest is offset to one side. The dash pots for closing the steam valves are set directly on the main frame and the motion rods for operating the exhaust valves are arranged in the usual way, except that they are longer. Back bonnets are provided as usual and the frame is so designed that either one or all of the steam or exhaust valves may be removed without disturbing the valve setting. The low pressure steam cylinder is attached to the end of the frame by means of rigid distance pieces. The bottom feet of this cylinder are on the same level with the bottom of the main frame, and



test is made under ideal running conditions, they make a good showing as compared with a Corliss compressor.

The conditions of everyday operation, however, are not one time in a hundred like those prevailing in a test. In the latter case, the steam pressure, air pressure, and speed are all constant, whereas in the former the fluctuation in any or all of these factors is likely to be extreme. Sometimes these extremes oppose one another, sometimes they may be high or low together. It is on account of this fluctuation that the Corliss compressor uses so much less coal in the course of a day's run. Its valve gear brings the cut-off in the high and low pressure steam cylinders under the automatic regulation of the governor. There is no wire-drawing of the steam, nor is there throttling action at any time.

A NEW TYPE.

A compressor has at last been designed, however, which embodies the economy of the Corliss cross-compound type in a form which permits moderate price without the sacrifice of good engineering. The credit for this achievement belongs to Mr. S. T. Nelson, one of the mechanical engineers of the Sullivan Machinery Company, and the superintendent of its western factory at Chicago. The new machine, known as the "Class WC," is described

its weight is supported by an extension of the foundation. Practically the same pattern is used for making this cylinder that is used for the Sullivan cross-compound Corliss machines. It embraces all of the regular valve gear usually furnished with the latter type of machine.

There are no adjustments between the flywheels and the steam cylinders which require attention while the compressor is in operation. The piston rod stuffing boxes are packed with fibrous metallic packing, which needs only occasional care. The main bearings and other parts which cannot be oiled by hand while running, are lubricated by a system of pipes, leading from a cluster of oilers mounted at a convenient point, so that the engineer can tell at a glance when one of them is empty.

The eccentrics for operating the valve gear on both the high pressure and low pressure steam cylinders are located on the crank pin on the outside of the flywheels, so that they are easily accessible. The eccentrics, rocker arms, valve stems and all connections located between the flywheels or between the main bearings on the "WB-2" type are dispensed with in the "Class W.C." The governor pulley is all that is located on the shaft in their place. The removal of these parts allows the use of two piston rods between the high and low pressure steam cylinders, which are necessary in order to straddle the

crank shaft, which is kept in its original position in line with the cylinders.

STEAM REGULATION.

The governor is located on a separate mounting, and is a combined speed and pressure regulator. In appearance, it is of the Corliss fly-ball type, but it operates in unison with the pressure attachment. Either may also operate independently of the other when necessary.

The exhaust steam from the high pressure cylinder is carried around the outside of the cylinder barrel to the top by a passage cast with the cylinder, and discharges into a covered receiver pipe, extending from the top of the high pressure to the top of the low pressure cylinder.

AIR EFFICIENCY.

From the standpoint of air efficiency, this compressor takes the same high rank as the class WB-2 machine. The inlet valves on both low and high pressure cylinders are of the semi-rotary pattern, positively driven by motion rods from an eccentric pin on the engine flywheel. The action of these valves permits the cylinder to fill itself completely at each stroke, with air at the temperature of the atmosphere, and there is no wire-drawing or leakage. The discharge valves are of the automatic poppet type, so arranged as to reduce clearance losses to a minimum. They are removable by hand, together with the valve seats, so that the maintenance of a perfect fit is a simple matter.

The ideal of isothermal compression is approximated in these machines by means of unusually adequate cooling apparatus. This consists of heavy water-jackets on the air cylinders, and an inter-cooler of ample proportions, containing copper water tubes, across which the air must pass several times in its course from the intake to the discharge cylinder.

The "Class WC" compressor is built very substantially, being self-contained on its heavy frame and on the distance pieces connecting the two steam cylinders. These parts are sufficiently massive to sustain the low pressure cylinder of themselves, without the aid of foundations, if such a necessity should arise.

The straight-line type unites with its well-known advantages of engineering excellence the features of low weight, simplicity, and minimum foundations, as compared with duplex machines. These qualities render it possible to sell these compressors at a comparatively low price, to transport them readily and at small expense, and to erect them without elaborate and costly preparations at the desired site. They are built at present in sizes ranging from 909 to 2,450 cubic feet of free air per minute.

The Delaro plant of the Delaro Mining and Reduction Company is in full operation. It is designed to treat arsenic and cobalt ores. Arsenical ores are its specialty. A full description of the plant will appear in our issue of November 15th.



GROUP OF MINERS—FOSTER MINE, SUDBURY, ONT.

MINING OPERATIONS IN QUEBEC FOR THE YEAR 1906.

The report of the Superintendent of Mines for Quebec has just appeared. In summing up the year's production, Mr. Obaliski notes that production has risen from \$3,755,000 in 1905 to \$5,500,000 in 1906. Interesting discoveries of gold-bearing quartz are reported as having been made near Lake Opasatica, north of the County of Pontiac. The existence of cobalt ores at Chibogomo is taken as a hopeful sign that the great northern region from Temiskamingue to Mistassini when opened up by railways will prove a rich field.

In 1906 the country to the north of the County of Pontiac was explored. A map of this county accompanies the report.

The following are the principal mining and smelting operations reported for 1906:—

The Radnor and Drummondville charcoal iron furnaces produced 7,851 tons of pig iron, valued at \$177,643. The ore smelted was principally bog ore. In connection with iron ores the report calls attention to the adaptability of the Gröndal process of concentrating and agglomerating iron ores to the magnetic sands of Quebec.

The Canada Paint Company and the Champlain Oxide Company produced 1,962 tons of calcined ochre, worth \$19,620.

Of chrome iron ore the output was 8,961 tons, valued at \$91,834, classified thus:—

1st class ore	417 tons	\$ 4,743
2nd class ore	4,054 tons	34,375
Concentrates	4,490 tons	52,716
		\$91,834

The first class contains about 50 per cent. sesquioxide of chrome, the second class about 45 per cent., and the concentrates 49 to 54 per cent. Prices were low, the 50 per cent. ore being worth \$13 at the mine and the 45 per cent. \$9.

The only copper mines operating were the Eustis and Nicholls mines at Capelton. The production was 32,527 tons, of which 24,642 tons were shipped to the United States and the remainder treated at Capelton for sulphuric acid and matte by the Nichols Chemical Company, which produced 374 tons of matte, containing 53 per cent. of copper. Some good prospects of copper ore are mentioned.

In lead, zinc and silver very little was done. The Wright galena mine and the zinc and galena mines of Calumet Island showed symptoms of activity.

Gold production was nil. Quebec may, however, become a modest contributor to our gold supplies very soon.

The production of asbestos has again increased, and prices have continued high. Nearly all the mines are in operation and new companies have been formed. At Thetford the King, Bell, Johnston and Beaver mines have been in regular operation and have increased their output. The Shawinigan Water Power Company now supplies electric power to the Thetford companies.

The underground work of the Bell Asbestos Company is a new feature.

According to the company's reports, the total production of asbestos for 1906 was as follows, in tons of 2,000 pounds:—

	Tons.	Worth.
1st class crude	1,477	\$324,380.00
2nd class crude	2,450	321,355.00
Fibre	18,542	815,962.00
Paper stock	39,906	681,956.00
Total	61,675	\$2,143,653.00
Asbestic	21,119	18,875.00
Total	82,794	\$2,162,528.00

Two thousand men, receiving \$750,000 in wages, were employed for periods of from eight to twelve months. All the asbestos got out is sold at once. This industry is thus very flourishing, and the increased production was about 25 per cent. more than last year.

The production, exclusive of asbestic, for the previous years was as follows:—

	Tons.	Worth.
1904	35,479	\$1,186,795.00
1905	48,960	1,475,450.00
1906	61,675	2,143,653.00

The amber mica industry has prospered. Talc, phosphate and graphite are in statu quo. Limestone (cubic

Kind of Minerals.	Wages paid.	No. of workmen.	Quantities shipped		Gross value.
			or used.		
Bog iron ore	2,200	120	18,331	61,175	
Chromic iron	37,200	110	8,961	91,834	
Copper ore	95,000	250	32,527	176,681	
Asbestos	747,600	1,950	61,675	2,143,653	
Asbestic			21,119	18,875	
Mica (lbs.)			530,086	168,887	
Calcined ochre	12,000	56	1,962	19,620	
Phosphate			575	4,025	
Graphite	23,800	83	125	8,300	
Slate (squares)	16,000	50	5,469	24,446	
Flag stones (yods.)	1,700	50	2,400	2,050	
Cement (barrels)	136,000	300	405,103	625,570	
Granite (cb. yds.)	238,761	653	51,873	560,236	
Lime (bushels)	33,500	124	556,000	96,000	
Bricks	300,000	1,462	94,000,000	525,000	
Tiles and pottery				270,000	
cubic yards)	155,882	515	97,710	223,580	
Totals	1,829,443	5,679		5,019,932	

Important changes have been made in the mining law with the view of facilitating its application, but without altering the principle.

On the 7th February, 1907, an order-in-council was passed classifying all minerals, except building materials, as metals. The price of mining lots was changed as follows: Superior metals, \$10 per acre when more than 20 miles from a railway, and \$20 when under that distance; inferior metals, \$2 and \$4 respectively. The fee for mining licenses was raised to \$10. An amendment to the mining law was submitted to the Legislature, and

came into force on the 23rd March. It fixes the maximum area of land to be granted under a prospecting license to the same person, within a radius of 100 miles, at 25 square miles or 30 lots of 100 acres. Not more than 400 acres of mining lands can be sold to any one person in the same year within a radius of 100 miles. Miners or owners of inferior metals under mining patents have the first right to the purchase of superior metals.

A fee of \$10 is exacted for registration of all transfers of mining rights.

Every application for a prospecting or for a mining license must be accompanied by the required fee and give an accurate designation or description of the land. The application must be addressed to the Honourable Minister of Mines. Reports must be sent in on the expiration of licenses.

COAL MINED BY MACHINES.

One of the notable features presented by the statistics of bituminous coal production in 1906, as in 1905, was the increase in the use of machines and in the quantity of machine mined coal. The percentage of increase in the production of machine mined coal in 1905 over 1904 was greater than the percentage of increase in the total production. In 1906 the quantity of machine mined coal was 15,451,075 short tons greater than in 1905, while the total production of bituminous coal increased 21,534,643 tons, showing that 72 per cent. of the increase in 1906 over 1905 was in the machine mined produced. The statistics also show that the average output for each machine in use increased from 10,258 tons in 1904 to 11,258 tons in 1905, and to 11,638 tons in 1906.

The total quantity of coal produced by the use of machines in 1906 was 118,847,527 short tons, as against 103,396,452 short tons in 1905 and 78,606,997 short tons in 1904. The increase in 1906 was 15,451,075 short tons, or 15 per cent. The increase in 1905 over 1904 was 24,789,455 short tons, or 31.5 per cent., while that of 1904 over 1903 was only 623,103 tons, or 0.81 per cent. The number of machines in use increased from 7,663 in 1904 to 9,184 in 1905, and to 10,212 in 1906.

The percentage of the machine mined tonnage to the total production in the States in which machines are used has increased steadily each year. In 1899 this percentage was 23; in 1900 it was 25.15; in 1901, 25.68; in 1902, 27.09; in 1903, 28.18; in 1904, 28.78; in 1905, 33.69, and in 1906, 35.1.

Of the 10,212 machines in use in 1906, 5,911, or 58 per cent. were of the pick or puncher type; 4,144, or 40.5 per cent. were chain-breast machines, and 157, or 1.5 per cent., were long wall.

In the number of machines in use and in the amount of machine mined tonnage, as in the total production of coal, Pennsylvania stands far in the lead, with 45 per cent. of the number of machines and 45.6 per cent. of the machine-won product in 1906. The amount of coal mined by machines in Pennsylvania increased from 49,335,660 short tons in 1905 to 54,146,314 short tons in 1906. West Virginia ranks second in the number of machines in use, with 1,322, closely followed by Ohio, with 1,255. The position of these two States is reversed in the amount of coal mined by machines, Ohio's production by machines in 1906 being 20,004,416 short tons, while West Virginia's was 15,565,113 tons. Ohio stands first in the percentage of machine mined coal to the total product. Illinois, the third State in coal producing importance, ranks fourth in the production by the use of machines. Kentucky, the eighth in rank among the coal producing

States, takes fifth place in the number of machines used and machine mined tonnage, and second in the percentage of the machine mined coal to the State total. Indiana comes next to Kentucky in the use of mining machines. The six States mentioned contribute over 90 per cent. of the total machine mined coal.

As a rule an increase in the use of mining machines is accompanied by an increase, both for the year and for the day, in the average production per employee. Striking exceptions, however, are shown by Alabama and Colorado. In Alabama the percentage of machine mined coal to the total decreased from 13.36 to 12.52 and the production per man remained the same; in Colorado the machine percentage decreased from 14.14 to 13.22, and the tonnage per man increased from 3.14 to 3.32.

TITANIUM.

Titanium, although generally spoken of as one of the rare elements, is really one of the more common ones. According to Dr. F. W. Clarke, chemist of the United States Geological Survey, it forms 0.43 per cent. of the surface rocks of the globe, and is much more plentiful than lead, zinc, copper, and other metals classed as "common." A great many schists and gneisses carry titanium, and it is found in appreciable quantities in clays—not only surface clays, but also those that have been dredged from the sea bottom.

Many iron ores contain titanium, and ores containing one per cent. or more have generally been avoided by miners, owing to difficulties experienced in smelting, due to thick, pasty slags; but it is claimed that when properly handled titaniferous ores give no more trouble with slags than other iron ores. It is said that steel and iron made from iron ore smelted in a blast furnace running on the titaniferous ores of the Adirondacks took a prize at the London Exhibition of 1851. The addition of titanium to cast iron greatly increases its strength, and an alloy called ferro-titanium is now manufactured at a number of places in this country and Europe for use as an agent by which to introduce the titanium into the iron. It is believed that titanium is used by various firms to increase the tensile strength and elastic limit of steel, and although much secrecy is maintained concerning the matter, it seems probable that some steels that are imported as vanadium steels are in reality titanium steels. As titanium, unlike other metals used for the same purpose, such as vanadium, molybdenum, and tungsten, is plentiful and cheap, its successful use in steel hardening should establish a large market for it.

Several firms are now experimenting with titanium filaments in incandescent electric lamps, but the reduction of titanium to a metal is so difficult that the lamps have not yet been extensively placed on the market.

Titaniferous magnetite and titanium carbide, the titanium of which is derived from rutile, are used as electrodes in arc lamps. When one electrode is made of these substances a block of carbon is used for the other. The best known rutile deposit in this country, the one which produced the greater part of the titanium output in 1906, is at Roseland, Nelson County, Va. A few pounds were produced in Chester County, Pa., where the product is said to occur in comparatively large crystals and to be very pure.

A new use for titanium as a detector of minute quantities of fluorine has been worked out in the chemical laboratory of the United States Geological Survey by George Steiger.

COAL BRIQUETTING IN THE UNITED STATES.*Paper read at Toronto Meeting of A.I.M.E.*

(Continued from last issue.)

Early in 1906 the Renfrow Briquette Machine Company was incorporated under the laws of the State of Missouri with \$1,000,000 capital; W. C. Renfrow, president; J. M. Smith, secretary and treasurer, and E. D. Mizner, superintendent. This concern is a close corporation, and the company will not offer for sale any machines until after the Kansas City plant has proved successful. As far as can be learned, the construction of the Kansas City plant was brought about by the willingness of its president Mr. J. H. Durkee, to accept a Renfrow machine without a guarantee, simply on the strength of the work done at the coal testing plant. There are, of course, still some difficulties to be overcome, as in the case in the operation of any new plant, but in the main the mechanical operations of this plant are satisfactory, and the Renfrow Company has been able to deliver what it contracted to do. Financial difficulties have threatened the life of the plant under the present organization, but Governor Renfrow has affirmed that he will not allow this plant to fail for this reason. A contract has been signed to deliver one of the machines to a company at Detroit, but under the terms of the contract no date is fixed for the delivery of this machine, and no guarantee from the Renfrow Company has been acquired. Governor Renfrow is also authority for the statement that the Detroit machine will not be delivered until after the Kansas City plant has been successfully operated and put on a commercial basis.

The Renfrow Briquette Machine Company has no plant of its own, but has under consideration the establishment of a factory in St. Louis. All of the other machines above mentioned were built in machines shops under contract. The Kansas City machine was built by the Excelsior Tool & Machine Company at East St. Louis, and all of the other machines by the Ramming Machine Company, of St. Louis.

NORTH DAKOTA.

During 1905 ex-United States Senator W. D. Washburn, president of the Washburn Lignite Coal Company, erected a small plant at Minneapolis for experimental work in the briquetting of North Dakota lignite. The plant was too small to be operated successfully from a commercial standpoint. Several hundred tons of briquettes were made on this press without the use of a binder. The briquettes proved a satisfactory fuel for domestic purposes and for stationary boilers, but were not adapted to locomotive use, because the heavy exhaust draft in the locomotive has the effect of disintegrating the briquette before combustion and causes the throwing off of large sparks. This small experimental plant represents the extent of Senator Washburn's efforts to briquette North Dakota lignites.

Mr. Robert L. Stewart, also of Minneapolis, who is interested in lignite properties near Kenmare in Ward County, reports that he has been conducting a series of experiments with a view to the briquetting of this fuel, and as a result of his investigations the American Briquetting & Manufacturing Company has been organized, which contemplates the construction, during the present year, of a briquetting plant in North Dakota, convenient to the lignite deposits, the plant to have a capacity of 1,000 tons of briquettes per day. Mr. Stewart says that the briquettes can be manufactured at a cost not

to exceed \$2 per ton f.o.b., this cost including the expense of mining the lignite and delivering it to the briquetting plant.

TEXAS.

Three companies have been organized in Texas recently for the purpose of briquetting the lignites which occur in great abundance through the eastern part of that State. These are the International Compress Coal Company, of Houston; the American Lignite Briquette Company, of San Antonio, and the Eureka Briquette Company, of Rockdale. The plant of the last mentioned company has been erected and is ready for operation at the time of the writing of this report, except for the fact that the drying apparatus has been found too small, and the plant has been shut down pending the erection of a larger drier. The details of the plant have not been obtained.

The American Lignite Briquette Company, while incorporated at San Antonio, will locate its plant at Rockdale, and the plant will be operated in connection with the lignite mines of J. J. Olsen & Son. The company has purchased a press made by the Klein Briquette Company, of St. Louis, and the plant will probably be in operation by the time this report is ready for distribution.

The International Compress Coal Company has been negotiating for the construction of a plant, but no actual building had been begun at the time of writing this report. All of these plants expect to use asphaltic pitch made from heavy Texas oil.

FLORIDA.

In September, 1905, the Orlando Water & Light Company, of Orlando, completed the installation of a plant for the treatment and briquetting of peat, which occurs abundantly in the low-lying lands of Florida. The plant is located about 3 miles from Orlando, on the border of a peat bog, from which its supply is drawn. As originally installed, this plant consisted of a macerating machine or pug mill, in which the fibre of the peat is entirely destroyed, and a brick press. The briquettes, as they came from the press, were about the size of an ordinary building brick, and when dried in the sun shrunk to about one-fourth their former bulk and lost from 75 to 85 per cent. in weight. The briquetting feature of the plant was abandoned in the summer of 1906, as it was found that this part of the work represented 75 per cent. of the total cost, and that a satisfactory fuel could be made without briquetting. The method of treatment at the present consists simply of "machining" the peat in the pug mill and dumping it in masses of several hundred tons. As the peat dries it shrinks and cracks into large irregularly rectangular blocks, which are broken off from the heap and stored. When thoroughly dried these blocks make a good hard fuel, which, it is stated, may be used for both locomotive and stationary boilers, for household purposes, and for the manufacture of gas. Tests of the machined peat for producer gas at the United States Geological Survey coal testing plant gave excellent results.¹³

The machine used at the Orlando plant was built by the Moore & Wyman Elevator & Machine Works, South Boston, Mass., under patents issued to the late T. H. Leavitt, of Boston.

¹³Report on Peat, by M. R. Campbell, *U. S. Geological Survey, Mineral Resources of the United States, 1905*, pp. 1319 to 1322.

USE OF THE DIVINING ROD.

Numerous devices are used throughout this country for detecting the presence of underground water—devices ranging in complexity from the forked branch of witchhazel, peach or other wood to more or less elaborate mechanical or electrical contrivances. Many of the operators of these devices, especially those that use the home-cut forked branch, are perfectly honest in the belief that the working of the rod is influenced by agencies—usually regarded as electric currents following underground streams of water—that are entirely independent of their own bodies, and many uneducated people have implicit faith in their ability to locate underground water in this way.

In experiments with a rod of this type, one of the geologists of the United States Geological Survey found that at points it turned downward independently of his will, but more complete tests showed that the down-turning resulted from slight and—until watched for—unconscious changes in the inclination of his body, the effects of which were communicated through the arms and wrists to the rod. No movement of the rod from causes outside the body could be detected, and it soon became obvious that the view held by other men of science is correct—that the operation of the “divining rod” is generally due to unconscious movements of the body or of the muscles of the hand. The experiments made show that these movements happen most frequently at places where the operator’s experience has led him to believe that water may be found. The uselessness of the divining rod is indicated by the facts that the rod may be worked at will by the operator, that he fails to detect strong currents of water running in tunnels and other channels that afford no surface indications of water, and that his locations in limestone regions where water flows in well-defined channels are rarely more successful than those dependent on mere guesses. In fact its operators are successful only in regions in which ground water occurs in a definite sheet in porous material or in more or less clayey deposits, such as the pebbly clay or till in which, although a few failures occur, wells would get water anywhere.

Ground water occurs under certain definite conditions, and as in humid regions a stream may be predicted wherever a valley is known, so one familiar with rocks and ground water conditions may predict places where ground water can be found. No appliance, either electrical or mechanical, has yet been successfully used for detecting water in places where plain common sense or mere guessing would not have shown its presence just as well. The only advantage of employing a “water-witch,” as the operator of the divining rod is sometimes called, is that skilled services are obtained, most men so employed being keener and better observers of the occurrence and movements of ground water than the average person.

Tungsten.

During 1906 the prices paid for tungsten ore ranged from \$5 to \$9 per unit for the contained tungsten trioxide. The market for tungsten ores is expanding, and seems now to be as sure as for the staple ores. Buyers have had difficulty in obtaining supplies for future deliveries. As a filament in an incandescent lamp, metallic tungsten has been given a new use during the year. In this it has proved remarkably successful.

CANADIAN COINS.

By statute the weight of silver, copper or bronze coins for circulation in Canada are fixed as follows:—Silver coins, from the fifty cent piece down to the five cent piece, must be composed of thirty-seven fortieths of fine silver and three fortieths of copper, a millesimal fineness of 925.

Name of coin.	Weight in grains; subject to testing provisions.
Fifty cents	179.3336 grains
Twenty-five cents	89.6668 grains
Ten cents	35.8667 grains
Five cents	17.9334 grains

The pieces of fifty cents are to be weighed separately with a remedy of 1.024 grains.

The pieces of twenty-five cents are to be weighed separately with a remedy of 0.594 grains.

The pieces of ten cents are to be sampled in groups of one dollar’s worth and weighed against the standard dollar weight of 358.6673 grains with a remedy of 2.844 grains. The prices of five cents are to be sampled in groups of one dollar’s worth and weighed against the standard dollar weight of 358.6673 grains, with a remedy of 3.485 grains.

The one cent piece is to be composed of mixed metal, of copper, tin and zinc in the following proportions:—

95 per cent. of copper.

4 per cent. of tin.

1 per cent. of zinc.

Its weight will be 87.5 grains, with a testing provision or remedy of 140 grains. It is to be sampled in groups of eighty and weighed against a weight of one pound avoirdupois.

VANADIUM IN THE UNITED STATES.

Vanadium, one of the rare metals, is used principally for hardening steel, especially in connection with chromium. The addition of a very small quantity of vanadium to chrome greatly increases its tensile strength, affording a steel that is much used in the axles and other parts of the higher priced automobiles, as well as for the stronger parts of other machines.

Rosecolite, a vanadium mica, occurs in commercially valuable deposits in Southwestern Colorado, where it was mined and reduced in 1906. The ore contains about 2 per cent. of the metal. The product, an iron-vanadium compound, is shipped from the reduction plant at Newmire to Niagara Falls and smelted by electricity to a ferro-vanadium containing about 25 per cent. of vanadium and selling for \$5 per pound of the contained vanadium. Another Colorado plant, at Cedar, produces vanadium as a by-product in the concentration of carnotite ores, about 20 per cent. of the concentrates being vanadium oxide. Vanadinite and other ores of the metal are found in small quantities in Colorado and Utah, as well as in the Southwestern States.

Vanadium salts are used in medicine, in ink and dye-making, in coloring glass, and in chemistry. Vanadic acid is used as a pigment, affording a golden bronze that is very little inferior to true gold bronze.

The occurrence and production of vanadium and other rare metals in the United States is discussed by Frank L. Hess, geologist, in an advance chapter from “Mineral Resources of the United States, Calendar Year 1906,” just issued by the United States Geological Survey.

THE ORIGIN OF DEPOSITS OF PYRITES.

(Toronto Meeting, 1907.)

BY A. B. WILLMOTT, Sault Ste. Marie, Ont.

On studying the literature concerning the origin of deposits of pyrites, it becomes evident that there are several theories, each with strong supporters, and that even for the same deposits observers are not agreed. For a number of our deposits in Ontario the mode of origin seems to be fairly clear. This paper deals with the occurrences in Ontario, and only incidentally with others.

The four important theories regarding the origin of pyrites may be tabulated as follows:—

1. Impregnated beds.
2. Veins.
3. Sedimentary beds.
4. Magmatic segregations.

The first assumes that iron and sulphur as a soluble salt has found its way into porous beds, and been there precipitated as the sulphide. The country rock has in most cases been more or less replaced. Fracturing of the rock has promoted circulation. The mode of formation is similar in most respects to the second or vein deposits, and there are cases where the two methods are indistinguishable. The third theory assumes the precipitation of iron sulphide from solution as a bed at the bottom of shallow water. Other chemical and mechanical sediments occur above and below such beds. This theory in common with the first and second, pre-supposes the iron and sulphur in the form of a soluble salt, and precipitation brought about through a change in conditions. The fourth theory supposes that the iron sulphide has separated out of a cooling igneous mass. Several physical principles are suggested to account for the segregation. The following citations and quotations are given to illustrate current opinions.

Beck¹ in his treatise on ore deposits cites no instance of a pyrites deposit formed by sedimentation, magmatic segregation, or deposition in a vein. Under his division of Epigenetic Ore Deposits in Stratified Rocks, exclusive of veins, he gives a number of examples. These are sub-divided into those occurring (a) In crystalline schists; (b) as impregnations within non-crystalline strata. Both varieties are considered to be due to ore-bearing solutions depositing their load in porous strata. The deposits at Bodenmais, Germany; Sain-Bel, France; Ducktown, Tennessee; and several in Norway are described as examples of the first. As examples of impregnations within non-crystalline strata, Beck mentions the deposits of Rammelsberg and Meggen, Germany, and of Rio Tinto and others, Spain. Beck quotes other authors holding different views on some of these deposits, whose opinion he, however, controverts.

Beck² sums up his conclusions upon epigenetic ore deposits as follows:—

“The two fundamentally opposite genetic views, whose rivalry at the present day is keener than ever before in the history of economic geology, have been presented and weighed one against the other in the descriptions which we have given of numerous stratified deposits of sulphide ores of the most diverse composition and age.

“The sedimentary theory assumes that strata consisting of sulphide ores, sometimes of considerable thickness, have been deposited on the bottom of the ocean or sometimes of a shallow coastal sea, exactly like limestone or rock salt beds, or at any rate purely chemical precipitates of such sulphide ores were deposited by sea

water in small particles associated with the normal sediments.

“The other is the infiltration theory, according to which such deposits are due to a subsequent mineralization of ordinary sediments, at a much later geologic period, by means of an infiltration of ore solutions derived from fissures.

“We believe that the reader must have gained the conviction that the conditions of structure and position actually observable argue, in most instances, rather in favor of the second hypothesis. This is particularly true of the beds of sulphide ore in crystalline schists. The lack of constancy of position in otherwise uniformly stratified ore deposits, the limitations of the beds to portions of rock strongly influenced by dislocations and traversed by eruptive rocks, the occasional occurrence of offshoots (ueberschneidungen) at the boundary of such ore bodies with the sediments, the occasional presence of vein-like spurs and stringers, and above all the microscopic relations of the ores to the other rock constituents, which often point to a later segregation of the metallic compounds—all these speak in favor of the infiltration theory.”

Beck then considers to what extent chemical precipitates of sulphidic ores are now being made, and concludes that there is nothing now forming which would account for the vast pyrite accumulations of earlier ages.

Kemp³ groups “Pyrite Beds” with magnetic deposits, which they closely resemble in form and occurrence. “Some pyrites lenses may have accumulated in a way analogous to the bog ore hypothesis, cited under ‘Magnetite,’ but instead of the iron being precipitated as the oxide, it has probably come down as the sulphide from the influence of decaying organic matter, and has subsequently shared in the metamorphism and solidification of the wall rock. At the same time it must be admitted to be an obscure point. By many they are thought, with more reason, to have originated like a bedded fissure vein whose overlapping lenticular cavities have been veins are on lines of dislocation beyond question. Reformed by the buckling of folded schists. The Ducktown placements of pinched beds of limestone are always to be considered, and the presence of intruded dikes, though disguised by metamorphism, is always to be kept in mind.”

In the following chapter he describes pyrite or pyrrhotite beds (veins) with intermingled chalcopyrite, and writes: “Whether the deposits are true beds or veins parallel with the foliation is as yet a matter of dispute. The resemblance to magnetite suggests a bed and this view is generally taken by German writers. The California mines occur closely associated with the auriferous (pyritous) quartz bodies, which are always esteemed veins. But as detailed knowledge increases, it is more and more appreciated that the ore bodies are mostly if not entirely veins, and have been deposited along lines of dislocation.”

J. H. L. Vogt has been the leading exponent of the theory of magmatic segregation of pyrite deposits, and also of pyrrhotite. Doctors Coleman and Barlow, of our own Institute, are strong supporters of this origin of our Sudbury pyrrhotites.

From the quotations given it is evident that the present tendency is to consider all pyrite deposits as veins or impregnated beds. In this paper the position is taken that for many of our Ontario deposits a sedimentary origin must be predicated. If some deposits are undoubtedly sediments it probably follows that at least some of the foreign deposits which have been explained both on

the sediment and impregnation theories were made in the former way.

Turning now to the Ontario deposits, several may be considered in detail. Among the most important is that near the Helen iron mine, Michipicoten. The ore is a mixed hematite and limonite, which in places holds pockets of fine granular pyrites resembling artificial con- and is free from impurities. The pockets found vary from a few cubic feet up to chimneys 20 feet across and 100 feet high. The line of separation between the pyrites and hematite is usually very marked. At times there is a gradual transition. At points in the hematite mine hard ore is found carrying considerable intermixed pyrites. Usually this ore is somewhat banded and quite silicious. North of the hematite ore body there is several hundred feet of banded hematite and chert standing almost vertical. To the east of the iron mine a steep hill rises 400 feet, along the brow of which a band of impure cherty siderite is seen. Scattered through this siderite is a considerable amount of pyrites. The siderite weathers much more rapidly than the pyrites.

On the west the iron ore now being mined is bounded by a diabase dike which crosses the iron formation nearly at right angles. West of the ore body there was originally a small pond known as Boyer Lake. This pond was about a quarter of a mile long, hardly as wide, 133 feet deep, and rock-rimmed throughout. Diamond drill holes have shown, beneath forty feet of mud in the bottom of this lake, 140 feet of pyrites fines. Exploration is not complete, but a pocket of over 100,000 tons has been shown. The only explanation of the origin of this rock-rimmed basin is by solution.⁴ The siderite, with its pyrites, which is found at both the east and west ends of the lake, undoubtedly was continuous, and has been removed. The loose granular pyrites can best be accounted for as a residual product. That the pyrites is much more stable than the siderite is abundantly proved.

Adjoining Boyer Lake and along the strike of the iron formation is another pond, Sayer's Lake, of similar size and description. On the north side of the lake a railway cutting shows a small deposit of pyrite, pyrrhotite, and carbonaceous shale. On the south side a short tunnel discloses pyritic quartz rock, which in places is almost pure pyrites. This material resembles the pyritic quartz mentioned before as occurring in the iron ore body, except for the lack of hematite. Where the outlet of Boyer Lake has been lowered a similar silicious pyrite, carrying 30 to 35 per cent. sulphur, occurs.

Everywhere along the Michipicoten iron range similar associations are found. A mile west of the Josephine siderite with large amounts of pyrites occurs. Near this a railway cut shows a lens of silicious pyrites carrying 25 per cent. sulphur. It is enclosed within the iron formation, and is undoubtedly part of it. One mile east of the Josephine banded silicious pyrite occurs. At Paint Lake oxidation of silicious pyrites has given rise to a bog deposit on the shore of the lake. For further descriptions reference must be made to the writings of Coleman, Bell and myself in the reports of the Bureau of Mines⁵ on the Michipicoten Iron Range. The great majority of these numerous occurrences along the iron range are too lean to be of commercial value as sulphur ores.

The Goudreau Lake deposits in Township 27, Range 26, west of Missanabie on the Canadian Pacific Railway, are perhaps the largest in Ontario. Comparatively little work has been done, but from the known areas, and allowing a depth of only 100 feet, one million tons of pyrites exist. Much of this may be too low in sulphur

to be of commercial value, but the prospect is very encouraging to the owners. The deposits are six in number and cover an area two miles in length by one in width. The country rocks are mainly Keewatin schists with some intruded greenstones. Characteristic iron range rocks also occur. The richer pyrite bodies are marked by depressions 10 to 50 feet in height. The smaller ones are only a few feet across; the larger, as on the Bear claim, are 250 feet. In some cases these depressions are roughly circular or oval as at deposit A; at others they are long and narrow as at C, where the depression is 500 feet long, and about 40 wide. Some little ponds in the vicinity of several of the deposits may fill the depressions due to weathering of pyrites, but this is not yet proven. The resemblance of these weathered pits on a small scale to Boyer Lake near the Helen is striking.

The ore is silicious, and granular silica similar to the iron range rocks, is frequently found. The character of the ore is exactly like the better quality of hard pyrites found at the Helen. Bands of siderite have not yet been noticed, but at several of the deposits crystalline limestone occurs near the pyrite. A diamond drill hole, put down at an angle of 42 degrees under deposit A, passed through three narrow bands of pyrites separated by calcareous schist, before reaching the main deposit 96 feet thick. A vertical hole from the bottom of the pit, after passing through a few feet of broken and oxidized material, went through four feet of ore higher in sulphur and much less dense than the usual ore. Either it is a layer from which the silica has been dissolved, or a bed formed by the precipitation of solutions from the gossan above.

Typical material from these deposits analyzes as follows:—

Silica	6.00 p.c.
Iron	44.36
Sulphur	40.28
Lime25
Magnesia53
Copper	Trace
Arsenic	Nil.
Lead	Nil.
Zinc	Nil.

That these deposits are only an extreme phase of the Helen iron formation is, I think, admitted by all who have seen them. The agreement is founded on the similarity of the adjoining rocks; the presence of banded chert and magnetite, though only in a small degree; the similarity of the silicious pyrites. The silicious pyrites along the south side of Sayer's Lake at the Helen, and the deposits along the south side of the lake at deposit B, Goudreau Lake, are extremely similar in appearance and mode of occurrence.

At Kaministiquia, 20 miles west of Port Arthur on the Canadian Northern Railway, the Davis Sulphur Ore Company opened a shaft on a pyrite bed. Here, also, the accompanying rocks are those typical of the iron formation as it occurs all through Ontario in the Keewatin. Hand specimens of this ore can be exactly matched at Michipicoten. Undoubted iron range rocks occur in close proximity.

At Strawhat Lake, near Atikokan, on the Canadian Northern Railway there is another occurrence of pyrites resembling those at Goudreau Lake. This deposit was originally opened by prospectors who were searching the iron range for iron. That the deposit is part of the iron range cannot be doubted. It must have been formed

with it, though possibly secondary concentration might be argued.

Near Schrieber, on the north shore of Lake Superior, is a pyrite deposit of a different character. The ore is associated with an eruptive diabase, and is considerably mixed with pyrrhotite carrying small amounts of nickel and copper.

Associated with the iron ranges in the Temagami Reserve are several belts of pyrites. These have been described by Professor Miller⁶, and it need only be stated that in character and associations they resemble other pyrite beds found with the Keewatin iron formations. Several openings have been made at points on Temagami Lake, but the ore has proved rather too low in sulphur. In this it resembles the great majority of occurrences along the iron ranges. Only in places has the pyrites been accumulated sufficiently free from quartz to be of value. At these places, naturally, the resemblance to the pyritous chert of the iron ranges has been so much modified that it is not easy to recognize the connection. The deposit at Net Lake is, I believe, only a richer part of the pyritous cherts of the Temagami iron range. To be certain one should trace out the belt which I have not done.

In Hastings County are a number of deposits, several of which were originally opened for hematite iron. The deposits occur as beds in various green schists and are frequently associated with limestones. The boundaries of the ore bodies are not always distinct, but the ore gradually diminishes outwards until too poor to be of value. Parallel beds occur. The ore contains more lime and less silica than the deposits in Northern Ontario. The writer has not observed the pyritous chert of the iron ranges anywhere in the vicinity. The enclosing rocks are, however, very similar to those of Goudreau Lake.

In Lanark County there is a deposit differing from those so far described. It occurs in crystalline limestone and has the appearance of a vein rather than a bed. The crystals of pyrite are frequently large, well formed, and very pure.

Other large deposits in Ontario, as those at Nickel Lake and Dinorwic, the writer has not seen, and so will pass over; also other pyritous cherts of frequent occurrence. The ore runs 40 to 50 per cent. in sulphur, but not differing from those already described.

The large number of deposits in Ontario and the more important in size, are, as shown above, closely associated with the iron ranges. Following along the strike, pyritous chert succeeds sideritic chert and is succeeded by silicious pyrite. More commonly these changes are noticed in crossing the strike. Cross sections of the range made by diamond drills show many alterations—banded cherts and hematite, pure hematite, pyritous hematite, silicious siderite with and without pyrite, pure pyrite, cherts free from all iron. No regularity of sequence has yet been noted if any exists. Descriptions of the Ontario iron ranges by Coleman, Miller, Bell and the author in various reports of the Bureau of Mines all agree on this close association. Van Hise⁷ regards the pyrite as a chemical sediment and in part the source of the iron ore bodies. He writes:—

“In the Michipicoten district of Ontario, pyrite and marcasite occur rather plentifully within the original iron-bearing carbonates, and also very abundantly with quartz in associated rocks. Pyritic quartz rocks also occur in the Vermilion district in subordinate quantity. The iron sulphide to some extent has undoubtedly been

a source of the ores. But however one may emphasize the importance of ferrous silicate and iron sulphide as a source of the ore bodies, it still remains true that the iron-bearing carbonates are the dominant original sedimentary rocks out of which the iron-bearing formations and ore bodies have been produced.”

The rocks of the Helen iron formation have been more carefully studied than those of the corresponding formations in other parts of the Province. As all are closely similar, the description of the Helen series may be taken as applying to all. I quote from Dr. Bell⁸ rather than from the earlier reports by Coleman and myself.

“The Helen formation consists of a series of allied and related rocks named in order of their importance in the region as follows:—Banded chert, massive granular chert, sideritic chert, pyritous chert, banded jasper, rusty quartzite, gruneritic and other amphibolitic schists, cherty siderite, and iron ores—hematite, magnetite, pyrites and even pyrrhotite. Between these rocks there is every phase of gradation. Besides these ferruginous rocks the formation includes a number of argillaceous rocks, phyllites, and biotitic and epidotic schists—all undoubtedly sedimentary—which are found not only interstratified with the ferruginous rocks, but also both above and below them, although always in intimate connection with them.

“The sideritic chert consists essentially of two minerals—quartz and siderite, with which are almost always associated chlorite, sericite, pyrite, oxidation products of pyrite and carbonate, and sometimes microcline and other feldspars. Examined microscopically, some of the quartz is seen to be elastic, but most of it is chemically precipitated, often in the form of chalcedony. Both microcline and chlorite, the former in rounded grains and the latter in plates with frayed edges, are fragmental, and their areas have been greatly reduced by the invading carbonate. Pyrite is frequently an inclusion in both the chlorite and carbonate, and it occasionally develops in secondary veinlets in association with chlorite, carbonate and quartz. Some of the sideritic cherts contain so much chlorite that they pass into cherty sideritic phyllites, or so much microcline that they become sideritic arkoses.

“The massive grayish, pinkish or whitish chert, when quite pure and undecomposed, is holocrystalline, and beneath the microscope is seen to consist of an interlocking mosaic of quartz. This is the ‘sandstone chert’ of the Michipicoten prospector. It is often markedly rusty, due to the oxidation of iron carbonate, and less frequently iron pyrites, both of which are nearly always present. With an increase of one or other of these minerals, the rock passes into a sideritic chert or pyritous chert.”

These iron-bearing rocks are mainly chemical sediments, though some mechanical sediments are included. The adjoining rocks at Michipicoten are quartz porphyry schists supposed to have originated as volcanic tuffs. These, no doubt, fell as ashes on both land and water, in the latter case being rudely stratified. At intervals the volcanic activity naturally diminished and chemical precipitates formed a relatively larger portion of the sediments. Solutions of lime, iron, silica, and sulphur were carried to the water there to be precipitated. The recurrence of volcanic activity would overwhelm the chemical sediments in the mechanical ones. In this way the small lenses of siderite and silica in the tuffs adjoining the iron formation proper can be accounted for. Then came a long period of volcanic inactivity

when chemical sidementation again predominated. Silica and cherty siderite and pyritous chert were precipitated until beds several hundred feet thick were formed.

How the silica, iron and sulphur were dissolved and precipitated is not absolutely clear. Presumably the iron was partly transported as a carbonate and partly as a sulphate. Winchell⁹, Clements¹⁰, and Bell¹¹ have speculated on this point. How was the silica dissolved and how precipitated? The intimate mixture in the cherty siderite suggests that both the iron carbonate and the silica were precipitated together. The iron sulphide was doubtless reduced from the sulphate through the action of carbon. Considerable is still found in the shales adjoining the iron formation. Pyrite and silica were, however, precipitated together as shown by their intimate mixtures.

The pyrites in the iron ranges can be satisfactorily accounted for as a chemical precipitate. Can it be otherwise accounted for? The only alternative would be as a precipitate in porous beds introduced after their folding. One notes, however, that all the beds are not equally porous, and yet the pyrites is found in compact siderite, in very porous chert, in loose hematite and in hard, compact almost flinty quartz. Where the beds are brecciated one would expect to find abundant pyrites, and there is often none, as at Sayer's Lake. Soluble rocks like the siderite should contain pyrites in larger amounts than the compact flinty cherts, but the reverse is the case.

In Temagami, Professor Miller¹² finds two parallel iron ranges several miles apart, and separated by an intrusive greenstone mass. They dip in opposite directions, as the legs of an anticline. Overlying and parallel with them are two belts of pyrites. The occurrence can be explained as a bed of iron and silica covered by one of pyritous silica, the two folded into an anticline and the summit eroded. Or if the pyrite is not a bed, then one must suppose that solutions came up several miles apart, and impregnated beds parallel to the two iron beds. Obviously the former is the more likely.

We conclude, then, that for a number of our Ontario pyrite bodies the origin has been one of chemical sedimentation. For Strawhat, Lake Kaministiquia, Helen, and the Michipicoten range, Goudreau Lake, and the Temagami ranges this seems proven. For the Hastings occurrences there is not so good proof, though nothing is known pointing more strongly to another origin. The similarity of the Virginia deposits in Louisa County to those of Hastings appeal to me strongly. Possibly they may be replacement deposits, as suggested by Nason¹³, but the writer has seen nothing about them unexplainable as a sediment.

REFERENCES.

- (1) The Nature of Ore Deposits, R. Beck, translated by W. H. Weed, 1905.
- (2) *Ib.*, page 521.
- (3) Kemp. Ore Deposits of the United States and Canada, 3rd edition, 1900, pp. 184-189.
- (4) Coleman. Bull. Geol. Soc., Vol. 13, pp. 293-304.
- (5) Reports of the Bureau of Mines, Ontario, 1900, 1901, 1902, 1905.
- (6) Bureau of Mines, 1901, pp. 169-173.
- (7) Twenty-first Annual Report U. S. Geo. Sur., p. 319.
- (8) Bureau of Mines, 1905, 307-8.
- (9) Bull. VI., Geo. Sur.

(10) Vermilion Iron-bearing District, pp. 190, 227-234.

(11) Bureau of Mines, 1905, p. 311.

(12) Bureau of Mines, 1901, p. 173.

(13) Eng. and Min. Journ., July 28th, 1906.

URANIUM.

The current idea that uranium ores derive their value from their content of radium is probably due to the fabulous value ascribed to radium in many publications—a value based, perhaps, upon prices paid for it as a chemical and physical curiosity, since they are not justified by any uses thus far found for it.

The principal known deposits of uranium ores in this country are in Colorado, where carnotite and uraninite (or pitch blende) furnish the product. A reduction plant near Cedar, in San Miguel County, is operating on carnotite ores running 2 per cent. or less of uranium and having also a vanadium content. Deposits of carnotite near Meeker, in Rio Blanco County, discovered in 1906, were described by Hoyt S. Gale, of the United States Geological Survey, in Bulletin No. 315. The uraninite, or pitch blende, is mined in the Kirk, Wood, and German mines, in Gilpin County, Colorado. Small quantities of uranium have been found in the Black Hills as uranium phosphate (autunite). Other small deposits, of mineralogic interest only, have been found in Connecticut, North Carolina, Texas and California.

So far but few uses have been found for uranium ores. Experiments made with the metal as a steel-hardening material do not show that any particularly valuable qualities are added to the steel that are not given by the use of other elements that are at present cheaper. Uranium in the form of an acetate is used as an indicator in various determinations in organic chemistry, and other salts are used in iridescent glass and pottery glazes.

The occurrences and uses of uranium ores are described by Frank L. Hess, geologist, in an advance chapter from "Mineral Resources of the United States, Calendar Year 1906," just issued by the United States Geological Survey.

COAL BRIQUETTING IN CANADA.

The largest and most successful coal briquetting plant in America is built on Canadian soil. It is situated at Bankhead, Alberta.

The plant is the property of the Bankhead Mines, Limited, and has been running since March, 1907, producing 300 tons of briquettes in 24 hours. An additional unit is being installed, which will be completed and running about February 1st, 1908. This will increase the output to 500 or 600 tons per day. The process used is that of the Zwayer Fuel Company, which briquettes the dust from the anthracite operations of the Bankhead Mines. Coal tar pitch having a melting point of 140 degrees F. is used as a binder. The resulting briquettes are a hard, clean fuel, which is used on the locomotives of the mountain division of the C. P. R. and by the domestic trade. Excellent results are obtained wherever the briquettes are used.

Notwithstanding the very high cost of binder, due to the long transportation and the high wages paid in this section of the country, these briquettes are made and sold at a profit.

BOOK REVIEWS

A MANUAL OF FIRE ASSAYING. CHARLES H. FULTON, PRESIDENT OF THE SOUTH DAKOTA SCHOOL OF MINES. XII. X, 178 PAGES, 6 BY 9 INCHES. ILLUSTRATED; \$5.00 POST-PAID. HILL PUBLISHING COMPANY.

Upon the subject of fire assaying many good books have been written. In few of these books, however, have the authors freed themselves from a tendency towards empiricism. Indeed much of the literature of fire assaying is on a level with the cook-book standard.

Mr. Fulton has broken a path for himself. The book is broad in scope, practical in treatment, well illustrated, clearly printed and of encouragingly modest bulk.

In the first chapter, "Assay Furnaces and Tools," coke, gasolene and wood-burning muffles are illustrated. Longitudinal and cross sections of the brick-built furnaces are included. The cost of operation is estimated for each kind. This is a useful departure. The ingenious Keller multiple scorifier tongs are shown on page 14 and the Keller cupel charging device on page 15. By means of the former, lots of twenty-five scorifiers may be handled at one time. The latter device will charge 20 cupels with lead buttons simultaneously.

Chapter VI. is valuable. It treats of assay slags lucidly and simply. Chapter VII., on "Cupellation," contains information of the utmost importance to the assayer. For instance, the influence of impurities upon the cupellation of gold and silver is tabulated. Beginning with tin, which induces a loss of 2.0 per cent. gold and 13.9 per cent. silver and ending with tellurium, whose corresponding figures are 55.8 per cent. and 67.9 per cent., each of the most usual metallic elements is mentioned.

Space will not permit us to enumerate the many practical hints brought out by Mr. Fulton. Undoubtedly the material for this volume has been carefully selected. Moreover, it has been put into excellent shape.

The two concluding chapters upon "The Assay of Ores and Alloys Containing Platinum, Iridium, Gold, Silver, etc.," and "The Assay of Tin, Mercury, Lead, Bismuth and Antimony," round out the book very satisfactorily.

A pleasant evidence of modernity is the absence of antiquated wood cuts. The apparatus mentioned and represented is strictly up-to-date. No doubt this is a consequence of Western environment.

EXCHANGES.

The Toronto correspondent of the *Mining and Scientific Press*, October 19th, has a word of commendation for THE CANADIAN MINING JOURNAL. We are thankful for this. We are fighting for decency and honesty. Our Californian contemporary has removed the fur from many financial felines. Its approval is worth having.

"A Modern Illinois Coal Plant" is described in the October *Mines and Minerals*. The powder magazine of Saline County Coal Company is described as built of brick, clay, and concrete foundations. It has a tile coping, composition roofing, steel-faced door and tamped dirt floor. It has a capacity of two car loads of black powder. No dynamite is stored.

The *Mining World*, October 19th, contains the first of a series of articles on "The Asbestos Industry of Quebec," from the pen of the *World's* indefatigable travelling correspondent, Mr. Ralph Stokes. "The mines,"

writes Mr. Stokes, "are now in an enviable position of independence, with a market of assured strength and no prospects of menacing outside competition."

The *Engineering and Mining Journal*, September 28th, opens with the second of a series of articles by W. R. Ingalls on "Lead and Copper Smelting at Salt Lake." The incidental defects of the large Garfield copper smelter of the American Smelting & Refining Company are due, according to the writer of this article, to the fact that the company has too many engineers and does not trust its work entirely to a single competent man.

The *South African Mines, Commerce and Industries*, August 3rd, takes up the question of ventilation in the deep mines of the Rand. The prevalence of miners' phthisis is attributable to the "minute and deadly fragments which Main Reef ore powders into when bored by machine drills." The miners themselves are responsible for much of this. The men retain their prejudice against the use of respirators and sprays.

The *Mining Reporter*, September 12th, remarks upon the new mine tax law of the State of Arizona: "Under the new mine tax law, which has occasioned but little dissatisfaction, the larger concerns . . . are assessed higher and are withal bearing a more just share of the territorial government expenses." None of these larger companies, indeed, made any complaint. But a loud outcry was heard over the valuation of none-producing claims, fixed at \$20 per acre.

"The Montreal River Silver District" is the subject of a well-illustrated article in *The Engineering and Mining Journal*, September 21st, by Reginald Meeks. "If the curses of 'wild-catting' and over-capitalization do not choke the legitimate enterprises, the district, as a whole, will undoubtedly prosper. But even at this early date there are rumors of companies being organized with capitals ranging from \$1,000,000 to \$5,000,000, without the least thought concerning the obligation these capitals mean."

In the *Journal of the Franklin Institute*, September, an article on "The Schuyler Mine" is concluded. A convenient method of determining ash is graphite is also described on another page. Combustion is effected by means of a stream of oxygen from an "oxone" generator. Oxygen made from chlorate of potash and manganese dioxide will also serve the purpose. About one-third gram of graphite is taken for analysis and mixed with about twenty milligrams of fine, carefully ignited magnesia. The stream of oxygen is delivered to the crucible by means of a clay pipe stem.

Writing of the gold measures of Tangier, Nova Scotia, in the *Mining and Scientific Press*, October 5th, Mr. George A. Paekard mentions the quartz veins of the district thus: "The sedimentaries consist of slate and more or less metamorphosed sandstone, locally termed 'whin.' The veins occur in the slate, often near or at the contact with the whin. As far as I have had an opportunity to observe them, these slate 'belts' are not over seven feet wide. The quartz veins vary from a fraction of an inch to eight feet in width. They are made up of white quartz, with up to 2 per cent. of sulphides, and a varying, though considerable, quantity of included slate derived from the walls. The sulphides are pyrite, pyrrhotite, chalcopyrite, arsenopyrite and galena. The district differs from some others in Nova Scotia in that here the proportion of arsenical sulphides is very small."

The *Engineering and Mining Journal*, October 12th, opens with an article on the Mansfield copper mines in Germany. At these mines a new row of deep-level shafts

is being sunk. They are circular and of 6 m. diameter. Hoisting is done on double-deck cages, four trucks being raised at a time. Most of the shafts are equipped with cross-compound, conical-drum steam winding engines. The ventilation of the mines is secured chiefly by natural means, supplemented by Rateau fans at the surface at some of the shafts. The underground haulage is done by horses. Heap roasting of the ore brings the copper content to 3 per cent.

PERSONAL AND GENERAL

Mr. J. Groves has been appointed manager of the Brown Alaska Company's Nobles mine.

Mr. Norman McKenzie has been appointed superintendent of mines at Dominion No. 2 Colliery.

Dr. Frank D. Adams, Logan Professor of Geology at McGill University, arrived in Montreal from England on October 15th.

The head office of the Foster Mining Company has been removed from the Traders Bank Building to Room 74 Home Life Building.

Mr. J. H. Plummer, president of the Dominion Iron & Steel Company, sailed for England on the Empress of Britain on October 18th.

Mr. Harris, formerly superintendent of the Hall Mines smelter, is now filling a similar position under Mr. T. Kiddie at Hadley, Prince of Wales Island.

Mr. John McMartin and Mr. H. Timmins, of La Rose Syndicate, are in England. They are reported to be negotiating the sale of two of their mines.

Mr. H. J. Fuller, president of the Canadian Fairbanks Company, Limited, sailed on the 18th of October for England on a six weeks' visit.

Mr. A. F. C. Ross, auditor of the Canadian Mining Institute, has been elected president of the Dominion Association of Chartered Accountants.

Canadian correspondents are informed that Mr. J. D. Kendall, consulting mining engineer, has removed to Friars House, New Broad St. London, E. C.

Mr. J. Macaulay, who until recently was in charge of the La Plata mine at Nelson, has left for the east, the property being operated under the direction of Capt. T. H. Thethewey.

Among the visitors to Montreal this week were Mr. Alexander Dick, of the Dominion Coal Company, and Mr. H. E. Rice, superintendent of the Dominion Iron & Steel Company's rod mill, at Sydney, C.B.

Mr. J. F. Robertson, who since May last has acted as assistant to Mr. F. Keffer, engineer of the British Columbia Copper Company, is now on the engineering staff of the Mond Nickel Company at Victoria Mines, Ont.

Among recent visitors to Victoria was Mr. Arthur Hebdan, secretary of the Southern Cross Mining & Smelting Company, a British enterprise owning properties on Vancouver Island. It is stated that the company has completed arrangements for the erection of a smelter near the mouth of Alberni canal.

A meeting of the committee appointed at the last annual meeting of the Canadian Mining Institute to prepare and offer certain suggestions to the Ontario Government with a view to securing an amendment of the Act, "Supplementing the Revenues of the Crown," will be held at the King Edward Hotel, Toronto, on October 31st and November 1st.

Dr. J. MacIntosh Bell, Director of the New Zealand Geological Survey, passed through Toronto recently on his way to New York. Before returning to New Zealand Dr. Bell will deliver a series of lectures at Harvard, Yale and Princeton Universities. The past few weeks Dr. Bell spent in visiting Cobalt and other mining districts.

At the Spokane Interstate Fair, which was held early in October, the prize for the best mineral display was awarded to the Kootenay district. This exhibit, which had previously been shown at the Nelson Fair, was arranged and collected by Mr. N. V. Cavanaugh, assisted by Mr. H. E. Wade, to whose efforts much praise is due.

Mr. W. Fleet Robertson, Provincial Mineralogist for British Columbia, reports great activity on the west coast of Vancouver Island and in the mining districts of the Queen Charlotte Islands group, where a number of new and promising copper properties are being opened up. At Rainy Hollow in the Atlin district several properties have been bonded to the representatives of British capital.

Mr. F. B. Vrooman, president of the British-American Dredging Company, operating in the Atlin district, B.C., has returned to London after spending some time inspecting the company's property on the Hootalinqua River. Mr. Vrooman stated in an interview that the company expected to have three dredges in operation next season, and that he had a high opinion of the gold dredging potentialities of this section.

Dr. W. G. Miller, Provincial Geologist; Mr. T. W. Gibson, Deputy Minister of Mines, and Mr. E. T. Corkill, Inspector of Mines, have returned from Deloro, in Hastings County, where they inspected the new smelting plant, now almost completed, of the Deloro Mining & Reduction Company. With this and other smelters now working, or nearing completion in the north country, the camp will soon be free from the American smelters.

Mr. E. T. Corkill, Inspector of Mines for the Province of Ontario, reported recently upon his return from a visit of inspection in Western sections of the Province that the Port Arthur blast furnaces, which have been in operation since June last, are now treating 150 tons of magnetite from Atikokan daily, while shipments will ere long be commenced from the Northern Pyrites Company's mine, north of Dinorwic. Mr. Corkill also states that prospecting for gold is active in the Sturgeon Lake district.

Mr. Frank G. Stevens, erstwhile in charge of properties in British Columbia and well known to many of our readers, has been for some time past general manager of the El Favor mine in Mexico. In a recent report to the directors of the company, Mr. Stevens states that operations have resulted in the development of positive ore reserves to the value of \$7,439,440, while probable ore is valued at \$8,841,740. Development work at the property last year yielded a result of opening up ore bodies to the gross value of \$3,978,000.

The judges, Messrs. Hobart and Going, have recommended the Council of the Canadian Mining Institute to award prizes as follows to student members who presented papers at the last annual meeting of the Institute, namely: President's gold medal and prize of \$25 to Mr. Frank E. Lathe, of McGill University, for his paper on "Basic Open Hearth Steel Manufacture as Carried Out by the Dominion Iron & Steel Company at Sydney, Cape Breton"; and prizes of \$25 each to Messrs. W. J. Dick, of McGill University, and Mr. G. R. McLaren, of the School of Mining, Kingston, for their papers entitled respectively "The Cariboo Consolidated Hydraulic Plant,

Bullion, B.C.," and "Underground Mining Methods at the Quincy Copper Mine, Michigan." Papers by Mr. C. V. Brennan and Mr. G. D. Drummond, both of McGill University, were also highly commended.

Mr. C. R. Devlin, representing Nicolet in the Federal House of Commons, has been invited by the Hon. Mr. Gouin, Premier of Quebec, to accept the portfolio of Mines, Colonization and Fisheries in his Government, in succession to Mr. Jean Prevost, who resigned recently. Mr. Devlin has been actively associated for some years past with public affairs, having been elected to Parliament first in 1906, later acting as Dominion immigration agent in Ireland, from which position he resigns to represent Galway in the Imperial House.

Mr. Geo. R. Naden, M.P.P., representing Greenwood in the British Columbia Legislature, has returned after spending the summer in the Telkwa district. Referring to the mining possibilities of this new field, Mr. Naden states that surface indications are most promising, and in the Bulkley valley, on the Babine range and elsewhere are large deposits of ore rivalling in size those of the Boundary district, while carrying higher values. Already much surface prospecting has been attempted, one company having expended over \$50,000 this summer in work of that character; but actual and important progress is, of course, dependent on the completion of the railway.

Mr. J. B. Tyrrell has opened an office at 9 Toronto street, Toronto, Ont., where he will henceforward be open for engagement as consulting mining engineer. Mr. Tyrrell is a mining engineer of ripe experience, a professional man of the highest type. Our readers will remember recent articles of his written expressly for the JOURNAL. In one of these Mr. Tyrrell wrote of the evaluation of mining property, and it is in this department of mining and in practical economic geology and the examination of mineral deposits that Mr. Tyrrell has made his name. However, it need hardly be added that Mr. Tyrrell is well qualified in all the branches of his profession. Mr. Tyrrell graduated from Toronto University in 1880, since when he has been continuously engaged in geological and mining work.

At a meeting of the Council of the Canadian Mining Institute, on Saturday, October 5th, Mr. George R. Smith, the past president, and manager of Bell's Asbestos Company, was presented with a handsome silver tea service, purchased from a fund started on the occasion of the Institute's excursion to Cobalt in March last, and to which a number of members subscribed. Accompanying the gift was an address, appreciative of Mr. Smith's services to the Institute, and a list of subscribers. The presentation was made by the secretary. Several of the gentlemen present, including Dr. J. B. Porter (in the chair), Mr. Dresser, Mr. Hopper and Mr. Stevenson Brown also spoke in testimony of Mr. Smith's unflinching zeal in promoting the welfare of the Institute, not only during his term of office but since the incorporation of the Society, of which he was a charter member. In reply Mr. Smith said that while thanking the subscribers for this kind expression of good-will, he felt that the Institute had already honored him above his deserts in having elected him to the office of president for two successive years. This, he felt, was the highest honor and the greatest compliment the Institute could bestow to any member and nothing he had done nor could do in the future to help forward the work of the Institute would, in his estimation, offset the debt he owed the Institute for the honor they had done him in electing him to that office. The Institute, Mr. Smith added, had grown to be regarded as one of the most influential and

important of our national institutions and one that was materially assisting in the development of the resources of the country. To be associated with such work was a privilege; to every mining man who had the interests of our Canadian industry at heart it should also be a duty.

Queen's University has conferred upon Mr. A. P. Low, Deputy Minister and Director of the Dominion Geological Survey, the honorary degree of LL.D. No person familiar with Mr. Low's brilliant work can doubt that he is one of the foremost living field geologists and explorers. His unique work in the sub-Arctic has marked him as a signally efficient explorer. As an administrator, although he has not recently enjoyed the best of health, Dr. Low has demonstrated that he has lost none of his virility and keen-sightedness.

CORRESPONDENCE.

To the Editor, CANADIAN MINING JOURNAL.

Dear Sir,—I have read your suggestions in regard to the Canadian Mining Institute in your issues of July 15th and August 1st, and also the letters in answer, which you have published since, from several members of the Institute. Permit me to congratulate you on the stand you have taken.

The questions raised by you, as you say in your issue of August 15th, are: Can the Institute be made more useful? Does the Institute, as a corporate entity, take as active a part in the mining affairs of the country as many of its members desire it should? If not, what are the remedies? All matters of personal feeling should not be allowed to effect these important questions in the slightest.

These questions, Mr. Editor, as a good many members of the Institute will remember, were raised by me at the meeting in Montreal in March, 1905, in my presidential address, in which I said, in part:—

"Could we not, all of us of the Canadian Mining Institute, the only incorporated Institute representing the mining men of the whole country, do more than we are doing to hasten a more rapid and healthy development and progress of this immense mineral wealth of Canada? I have no hesitation in saying yes, we can do much more and it is our duty to do it . . . We (the Institute) have done a great deal in the past, but we can do, and must do more in the future . . . In my opinion the time has come for the members of the Canadian Mining Institute to adopt such changes in the constitution and by-laws of the Institute as will conduce to these results."

These changes, I briefly stated in the same address to be, in my opinion:—

"(a) A larger representation of the members on the Board or Council of the Institute.

"(b) The formation of strong branches of the Institute in the different Provinces and in some of the important mining districts of the country."

In support of these suggestions I went on in this address to show that, in the past, only a few members have been active in Canadian Mining Institute affairs, and that in future we should re-arrange matters in order

that a good many more members from all over the country would in some way join these few, and I added:—

“It will readily be seen that the above proposed changes or additions to our by-laws will accomplish this, not only by enabling more of us to meet in Council in Montreal, Toronto, and other places in the central parts of the country as often as necessary, but also by means of branches we shall be in constant communication and interchange of ideas with members residing in the outlying districts. These, in the meetings of their branches, which can be held several times a year if necessary, will bring up and discuss all the interesting subjects connected in any way with their local mining interests and industries, and their chairmen, secretaries and full organizations will always be in touch with the central organization. Thereby the necessary activity and life will run through the Canadian Mining Institute from the Yukon to Cape Breton, together with the necessary spirit of mutual help and unanimity of purpose, so essential to permanent achievements.”

Then, at the end of the address, I gave at length the example of the Canadian Manufacturers' Association, which, as everyone knows, has been and is a most successful and powerful association, and which was and is conducted on the lines suggested, viz., a large executive board or council of 100 representatives from all parts of Canada, elected at the annual meetings on the per capita basis of one for every fifteen members, and with

local branches organized in leading Canadian centres with authority, under the constitution and by-laws, to deal finally with any local question, while representations with regard to general questions are dealt with merely by recommendations which are forwarded to the Executive Council for final decision.

I was glad to see, Mr. Editor, that your influential paper, the official organ of the Canadian Mining Institute, is again attracting the attention of the members to these most important points to the mining community of this country, and that, to judge by the letters you have published (if we except the one of the Secretary, which would have been better left unwritten), prominent members of the Institute concur in your views.

Let the good work go on and let us have a broader, more lively and more powerful Canadian Mining Institute. In these days of rapid extension of our mining and metallurgical industries a greater Canadian Mining Institute will be most useful, and recent events have shown that it is also a necessity, in order that we may properly fulfil these portions of our mission as laid down in the charter of the Institute, viz.:—

“To take concerted action upon such matters as affect the mining and metallurgical industries of the Dominion of Canada. To encourage and promote these industries by all lawful and honorable means.”

Yours sincerely,

EUGENE COSTE.

SPECIAL CORRESPONDENCE

ALBERTA.

EDMONTON.—This month sees at Edmonton quite a revival in the coal trade. Numerous small mines which have been closed down for the summer months are now opening up. The methods of mining are very primitive, the majority of the mines being opened along the outcrops of the various seams. The typical mine consists of two tunnels driven level course in the coal from the bank of the Saskatchewan River. From one of these tunnels a small shaft is raised to act as an air shaft. Natural ventilation is employed to produce the small current of air necessary to keep the mine free from smoke. The mine timber is cut on the banks of the river in the vicinity of the mine, and as the roof is generally good very little timber is required. The Saskatchewan River is deep enough to allow the passage of shallow draught steamers, and these steamers are employed to tug the coal barges from the mines into Edmonton.

The method of screening the coal is very crude. A tippie of poplar poles is erected from the mine mouth to the edge of the river, and a chute constructed from the end of the tippie so that the coal when dumped from the mine cars runs by gravity over a short bar screen and into the waiting barge underneath.

In winter when the river freezes over sleighs take the place of barges, and haul the coal on the ice right into the heart of the city.

The seams being mined vary from 5 to 8 feet in thickness, and are high grade lignites. The coal makes a splendid domestic fuel and has also been used on locomotives with a fair measure of success.

Ten to fifteen men are employed in each mine, and the output rarely exceeds 50 tons per day.

Last winter it was estimated that 750 tons per day was being hauled from the various small mines.

Most of this was consumed in Edmonton, but a considerable quantity was also shipped to points east along the Canadian Northern Railway as far as Saskatoon.

The price realized for this coal is \$4 per ton f.o.b. cars Edmonton. This is a very high price, but owing to the small primitive plants in use and the long haul into town and the necessary unloading from barges to wagons and from wagons to railway cars, the profit to the mine operator is not so large as it otherwise would be.

There is a splendid opening for a few large mining companies to step in, sink shafts and erect modern plants alongside one of the three railways with which the Edmonton district is supplied.

BRITISH COLUMBIA.

THE KOOTENAYS.—The general situation here is very critical, as far as the metaliferous mines and the smelters are concerned. The prices of copper, especially, and of silver and lead have dropped to an extent that makes it a difficult matter to mine and ship our ores, contending, as we have to, with an extraordinarily high price for mine supplies and labor. Were it not for the very low charges that are in vogue here to-day for smelting and transportation, all of the copper mines, at least, would be closed down tight, and that would mean a shut-down of the smelters. As it is the mines and smelter of the Dominion Copper Company at Boundary Falls have just closed down. While these people were mining a low grade of copper ore their mining and smelting charges only ran somewhere around two dollars, or slightly under, per ton. While the very low price of copper was probably the chief reason for their cessation of operation, it is reasonable to suppose that other factors of the present general state of affairs had a hand in it. The stress here increases hourly, and we would not be a bit surprised to see other Boundary mines close down for a time, if conditions as they are at present continue to prevail. The Boundary ores are principally copper ores, while those shipped from Rossland are what are known as gold-copper ores, so it is expected that if any of the low grade properties can breast

the tide of hard times for a period it will be the Rossland mines, and the case is critical with them too.

The Consolidated Mines at Rossland are shipping about 3,500 tons of gold-copper ore per week, and have been doing active development work on the claims recently acquired. Some valuable ore has been located on the Idaho claim, adjoining the Centre Star, but this was not an unexpected development by any means, as the surface showing on the Idaho is an exceptional one for this district and the claim has shown up well wherever development work has been done on it.

Le Roi mine is shipping approximately 2,500 tons of ore per week to the smelter at Northport. Considerable development is being done, and they are still operating the diamond drill on the Spitzee Group, which they have under bond. Mr. Larson, superintendent, has returned from his holidays, and denies that there is any truth in the rumor that he may leave the LeRoi Company.

At the White Bear they have laid off a few of their small force. It was rumored that they had closed down, but Superintendent Demuth states that they will continue to operate for a while yet.

The everyday development is being pushed on the Giant-California properties and the Jumbo. These properties have some very good ore, of an altogether different nature from the Consolidated and Le Roi properties, and it is hoped that they will locate good bodies of it.

The supply of coke and other fuel is a little more plentiful now and the smelters are running along without any trouble.

The big saw mills of the district are nearly all closing down for the winter.

The coal mines along the Crow's Nest seem to be very busy. There is a great demand for their product, and it is stated that they will not be able to produce too much to supply the various demands this fall and winter.

On the property of the Alberta Coal & Coke Company near Lundbreck, Alberta, the cross-cut which they have been driving to cut five seams of coal has finally pierced these seams. The coal

is said to be of a good hard quality, and the total width is about 75 feet. The output of the company is rather small at present, and is being supplied to local consumers. This company controls nearly 6,000 acres of coal land. They are employing about 30 men. There are some very rich zinc properties on Arrow Lake, which would be working now if the owners and American capital could get together. The owner of the principal property, a Northport man, has been offered \$100,000 for his prospect, but is holding out for \$400,000. The ledge is 400 feet wide, 300 feet of which will run 18 per cent. and 48 feet will average 40 per cent. zinc.

Work on the V. V. & E. Railway is being pushed westward, and a contract has been let for the blasting of a practically solid roadbed out of a perpendicular mountainside near Hedley. This will be quite an expensive and stupendous piece of work.

Mr. W. Y. Williams, consulting engineer for the Granby Company, has just paid a visit to the Independence proposition on Bear Creek, in the Similkameen District, which the Granby people have under bond. It is stated that the company will keep a force of seven or eight men at work drifting on the ore body all winter.

The Similkameen is the coming mining district here. As soon as the railways are able to handle freight in that district we will begin to hear something of the rich mines they have there. The propositions now being opened up are mostly copper, but some of them are very rich in gold, for instance the mine near Hedley of the Daly Reduction Company, which runs very high in gold values. The placers of this district have not played out yet by any means, either. Most of the placer mining, however, is done now by Chinamen, the white prospectors busying themselves with the big lode mines. A Chinese miner on Old Granite Creek the other day picked up a \$57 gold nugget. It is stated that frequent finds are made by these yellow miners of fair sized nuggets.

A very good coking coal is also found in the Similkameen district, and no doubt in the near future we can look to that section for a part of the coke and fuel supply of the Province.

GENERAL MINING NEWS

NOVA SCOTIA.

GLACE BAY.—Since December 31st, 1893, the Dominion Coal Company has mined and sold 25,500,000 tons of coal. The labor for the mining the this coal has cost the company \$22,000,000. It pays the Province of Nova Scotia a royalty of 12 1-2 per cent., as against 10 per cent. paid by all other coal mining companies. The total royalties thus paid out since 1893 amount to \$3,154,500. It employs 5,000 men, as against 1,800 in 1893. It pays annually \$2,996,400, as against \$707,400 in 1893.

WESTVILLE.—On October 12th, in the Drummond coal mine, John P. McDonald, a miner, was struck by a loaded box and instantly killed.

PORT MORIEN.—The North Atlantic Colliery Company shipped its first cargo of coal on October 17th. One hundred tons of fresh mined coal was sent by schooner to Newfoundland. A three-masted schooner is now loading 600 tons for Quebec. The daily output now is 150 tons. This will shortly be increased to 200 tons. One Ingersoll undercutting machine is used. Air is supplied by a Norwalk compressor of capacity of 30,000 cubic feet of air per minute. The pumps are run by compressed air. Deeps, levels and rooms are being thoroughly cleaned and retimbered. A new Babcock and Wilcox boiler is being installed and the old boilers are being cleaned and rebuilt. The water supply is to be taken from Sand Lake. The new smoke stack, 100 feet in height, has been placed in position. The new haulage rope is 14,000 feet long.

SPRINGHILL.—Negotiations have again fallen through, owing partly to the fact that Manager Cowans has refused to confer with the men and partly to the unwillingness of the men to abide by the findings of the Board of Arbitration. The officials of the company have been doing duty at the engines and pumps. The Pioneer Lodge, to which the workmen belong, is preparing for a long struggle.

ONTARIO.

WABIGOON.—The action brought by Harold A. Wiley against Anthony Blum for a \$150,000 claim on the sale of the Laurentian mine, was dismissed without costs.

PORT ARTHUR.—The West End and Beaver silver mines, the former of which has been producing for some time, are both looking well. At the latter one hundred and fifty sacks of high grade ore have been sacked from the old workings.

The shaft of the Wright zinc mine, north of Pearl River, is down 219 feet. The vein has been traced for 500 feet. It is 5 feet wide. Machinery is soon to be installed.

The Mining Recorder at Port Arthur reports that in the past six weeks 218 mining licenses were issued from his offices. For the current year a total of 298 have been issued. In the large number of mining claims filed the majority recently have been on discoveries of iron ore. Among these the large deposit of hematite at Long Lake is the most prominent. In Conmee Town-

ship deposits have recently been located. Gold claims have been filed at Sturgeon Lake and English River. The Tip Top copper region, soon to be opened up by a Government road, will become a substantial shipper. The East and West End Silver Mountain and the Beaver mines are in operation.

SAULT STE. MARIE.—A prospector named Michael has returned from Michipicoten Island with fine specimens of native copper and silver. If further prospecting gives satisfactory results a company with a small but sufficient capital will be organized.

COBALT.—The Arigid mine has laid off all its employees except Superintendent Hoskin. It is rumored that the property is to be sold to the Jacobs.

On the 50 foot level of the Trethewey a six inch vein of native silver has been cut.

A royalty of \$51,992 has been paid by the O'Brien Mining Company to the Ontario Government, being the amount due up to September 30th. Under the agreement the Government received 25 per cent. of the value of the ore mined, after certain handling charges have been deducted. The total amount of the royalties which this mine has contributed to the Provincial exchequer since December last is \$222,745.

Seventy men are now employed by the Cobalt Lake Mining Company, as compared with forty-nine in July. Eight drills are running night and day.

The projected Kerr Lake branch of the T. & N. O. will probably be completed early in the coming year.

The main shaft of the Ruby Silver Mine has reached the 53 foot level. Drifting has been started on two veins.

The main shaft of the Green-Meehan is sunk to 114 feet. Drifting has been done at the 100 foot level. Two machines are being run double shift.

The Cobalt Concentrators have secured the contract from the Foster Cobalt Mining Company, Limited, to build a concentrator. The plant will be similar in process to that which is being erected on the Nipissing. The details of its capacity and site have yet to be arranged.

The Erie mine has suspended operations and the sale of the property is rumored.

The Coniagas Mines, Limited, in its appeal against income assessments levied by the Town of Cobalt, argues that, as it paid \$4,000,000 for the mine, no income could be taxed until capital expenditure had been returned by the product of the mine.

BRITISH COLUMBIA.

BOUNDARY.—In the past year the Great Northern and the C. P. R. have spent more than \$100,000 in and around Phoenix camp in providing new spur lines, etc., for the large ore shippers. The new Rawhide spur cost about \$20,000, and the Great Northern's spur to the Granby mines cost \$100,000.

Contrary to newspaper reports, the White Bear mine has not been closed down. The report was due apparently to the laying off of six men.

Within the past year the higher price of coke, labor and cost of living generally has brought up the cost of producing copper very materially. Companies formerly producing copper at a cost of from 9 to 10 cents per pound cannot now bring their costs below 11 and 12 cents. When future developments of the coal fields of Alberta and British Columbia bring the price of coke down and make the supply more regular, the cost of copper producing will decrease. This is probably the only factor besides larger and more efficient plants that will tend to lower costs.

SIDNEY INLET.—The Indian Chief group of mines, belonging to the Vancouver Island Copper Company, has a promising bornite showing. The mine is being equipped with a 4,00 foot tram with

a daily capacity of 500 tons. The tram goes directly down to the shore.

VANCOUVER.—W. D. Mathews, president of the Consolidated Mining & Smelting Company of Canada, gave an interview on the condition of the Province. He stated that British Columbia, more than any other part of the Dominion, should be interested in having labor conditions which would enable capitalists to meet on equal terms on that line other section having the same natural resources; yet the conditions were exactly the opposite from those that should prevail. In the face of this fact there had been a depression in business along lines in which the Province was interested, making matters increasingly difficult. Silver had recently dropped 7 cents per ounce, lead had gone down \$15 per ton, and copper was 12 cents below former quotations. The lumber business was also uncertain. Taking all these facts into account, there must shortly be a readjustment of wages to meet the changed conditions, and the sooner this necessity was realized and accepted by all classes the better it would be for the future of the Province.

GRANBY.—The annual report of the Granby Consolidated Mining & Smelting Company includes the following financial statement:—

Assets—Cost of land, real estate, machinery, buildings, dwelling and equipment, \$15,180,913.81; stocks, bonds and bills receivable, \$895,674.69; fuel and store supplies, \$130,536.88; cash and copper, \$853,280.70. Total, \$17,060,406.08.

Liabilities—Capital stock, \$15,000,000; in the treasury, \$1,500,000; issued stock, \$13,13,500,000.00; dividends collected on liquidator shares, \$883.67; accounts and bills payable, \$783,764.76; surplus, \$2,775,757.65. Total, \$17,060,406.08.

The mine development is reported as 9,700 feet. Instead of the estimated 25,000,000 pounds of copper only 16,403,749 pounds were produced, 3,250,000 pounds less than the previous year. The net profits, however, were higher than previously, but not at all as large as might have been if the coke supply had been regular. The cost per pound of copper produced after deducting the value of gold and silver was 10.14 cents during the last year, as compared with 8.35 cents in the preceding year. The eight furnaces of the smelter are now in shape to handle more than 1,000,000 tons of ore per annum. This should mean a copper production of 30,000,000 pounds per year.

During last winter, when prices were high, the furnaces suffered from snow blockades and in the spring the fuel shortage hit them hard.

The sinking of the new Victoria three compartment shaft and the installation of an electric haulage system on the 400 foot level were among the year's most important new work completed.

Dividends during the year aggregated \$1,620,000, represented by four quarterly disbursements of 2 per cent. and an extra dividend of 1 per cent. For the period ending June 30th there was a surplus of \$2,775,757.

The company received an average price of 22 cents per pound for its copper. Its metal production included 257,378 ounces of silver and 35,083 ounces of gold.

Last year's directors, consisting of George F. Baker, Jr., George Crawford Clark, George Crawford Clark, Jr., Jay P. Graves, H. L. Higginson, B. Hoehschild, Arthur C. James, J. Langeloth, George Martin Luther, William H. Nichols, W. H. Robinson, Sanford H. Steele, Edwin Thorne, A. L. White and Payne Whitney, were re-elected.

The officers elected were are follows:—J. Langeloth, president; Jay P. Graves, vice-president and general manager; George Martin Luther, vice-president; George Crawford Clark, Jr., vice-president, and Northrup Fowler, secretary.

The purchase by the Granby Company of a large interest in the Crow's Nest Pass Coal Company insures an adequate supply of coke for the future.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

Commenting on the recent meeting of the Iron and Steel Institute in Vienna, the *Iron and Coal Trades Journal* compares the conditions under which the iron industry is carried on to-day with those existing when the Institute was founded thirty-eight years ago. Then the total make of pig iron throughout the world was less than 12,000,000 tons, while the world's make of steel was not more than 250,000 tons. To-day the world's make of pig iron is over 60,000,000 tons, while the total steel output is probably not less than 45,000,000 tons. Since its inception the Iron and Steel Institute has materially assisted in giving a general impulse to the introduction of new methods, new processes, new appliances, and more economical systems, and through these, our contemporary points out, the expansion reflected in the figures quoted has largely been brought about.

In an address to the National Association of Colliery Managers, the president, Mr. G. H. Winstanley, F.G.S., referring to the institution by the King of a "kind of mining Victoria Cross," said that it was of course the duty of colliery managers to make it very difficult, by increasing the element of safety in mines, for that docreration to be attained. Meanwhile official statistics of mining progress show that very remarkable and gratifying improvement in the general safety of British mines. Fifty years ago the proportion of lives lost annually was one in about every two hundred and fifty employed in and about mines. The average for the last ten years has been about one annually in every seven or eight hundred employed. And whereas from explosions, one life in every thousand employed was the average fifty years ago; the average at the present time is only one in nearly forty thousand.

The make of pig iron in the United Kingdom for the half year ending June 30th, 1907, was 5,194,731 tons, as compared with an output of 4,905,424 tons for the corresponding period of 1906, and with an output of 4,621,600 for the first half of 1905.

AUSTRIA.

Among resolutions passed by the Miners' International Congress, we note the following: That the employment of children under fourteen in the mining industry and of persons under sixteen underground should be prohibited by legal enactment; that female labor in mines should be prohibited; that a pension be paid miners after twenty-five years' work in the mines; that the principle of a minimum rate of wages be generally applied. The representation at the Congress included 58 delegates from Great Britain, 2 from the United States, 17 from Germany, 19 from Austria, 10 from Belgium and 6 from France.

BELGIUM.

The output of pig iron from Belgium blast furnaces during the eight months of the present year is 950,640 tons, or a slight increase over last year's returns for the same period.

FRANCE.

The eight-hour working day in mines is a bill providing for which has passed the popular assembly, has yet to be approved by the French Senate, and there is good reason to believe that the proposal will there meet with considerable opposition.

UNITED STATES.

According to figures compiled by the *Mining World* (Chicago), one hundred and twelve metal mines and works in the United States distributed profits during the nine months of the present year, ending with September, aggregating the considerable total of \$71,944,260. Our contemporary affirms that since incorporation these properties have paid \$546,885,672 in dividends on an issued capitalization of \$604,318,405, or nearly ninety per cent. These returns do not include dividends declared by the Amalgamated Copper, Copper Range Consolidated and other large corporations deriving profits from shares held in mines and metallurgical works.

In September five mines in the Coeur D'Alene district, Idaho, paid dividends aggregating \$811,000, making the total distribution of profits for the year \$4,559,500. A new and important discovery of galena is reported to have been made on the Vienna-International mine.

The State Geologist of Indiana reports renewed interest in the iron industry of that State. At Gary a number of blast furnaces are being constructed, at which point cheap fuel is obtainable.

The report of the Camp Bird, Limited (Colorado), just issued, shows earnings of £176,681, out of which two interim dividends, each amounting to £102,500, were paid. The net value of the ore reserves is placed at £703,525.

The output of the Montana copper mines has been reduced to 40 per cent. of the normal production, the smaller and independent concerns having also been forced to curtail shipments, the smelters having declined to treat their ore.

The United States Steel Corporation has decided to adopt the Koppers system of coke ovens on a large scale, and several thousands of these ovens, of the latest regenerator construction, are to be built in connection with the large new steel works to be erected at Chicago and elsewhere. The special features of the Kopper oven are: The distribution of the heating combined with easy means for regulation; the accessibility of all parts of the construction for inspection; and the large output of coke, by-products, and surplus combustible gas.

The Corporation has also, despite the less favorable prospects of the market, enlarged the scope of its plant for building a steel plant at Duluth; and instead of a plant comprising one 500 ton blast furnace, the furnace plant will have two furnaces, and the steel plant and finishing mills will be correspondingly larger.

Butte, Mont.—Oliver Crane, Master in Chancery, who heard the testimony of the famous smoke case, wherein it is sought to close the Washoe smelter of the Amalgamated Copper Company, has announced a draft of his findings of fact and set October 25th as the date on which he will hear objections to them and make final settlement. Upon the operation of the settlement depends the running of all the mines with the exception of several Clark properties.

JAMAICA.

The United States Consul at Kingston reports that promising copper areas have been acquired and being worked by American interests near Clarendon.

MEXICO.

Operations at the Greene-Cananea mine have been curtailed in consequence of copper market conditions.

AUSTRALASIA.

The report of the Department of Mines of Victoria for 1906 has recently been issued. The gold output of the State for the year is given as 772,290 ounces, the chief producing fields being: Bendigo, 221,187 crude ounces; Ballarat, 164,065 crude ounces; Beechworth, 134,812 crude ounces; Castlemaine, 99,386 crude ounces; Gippsland, 97,180 crude ounces; and Maryborough, 80,267 crude ounces. The number of men engaged in the industry were 25,304.

Dividends paid by Western Australia mines during the first seven months of 1907 aggregated £1,031,084. All reports from this State are most satisfactory and an exceptionally good year's results are anticipated.

YUKON TERRITORY.

WHITE HORSE.—Extensive ledges of copper-bearing rock have been discovered this season at the mouth of Williams Creek, between Dawson City and White Horse. A settlement named Bornite City has sprung up.

SOUTH AFRICA.

According to the official report on the mining industry of Natal in 1906, the output of coal in the year was 1,238,713 tons, or an increase of 109,306 over 1905. The colony possesses 24 productive collieries, employing 6,557 persons. The establishment of iron and steel works in the Vryheid district is arranged for, iron ore deposits of good quality having been discovered to the north-east of Holblane Mountain.

It is estimated that the new tax imposed by the Cape Assembly on diamond and copper companies will yield the Government a revenue of £360,000 per annum.

A deposit of cinnabar, occurring in a zone of sandstones associated with quartz and quartzites, which can be traced for some miles on the strike has been discovered west of Hector's Spruit on the Delogoa Bay line. The ore is said to average from 6 to 7 per cent. and it is proposed to treat it by the Elmore process.

South Rhodesia gold production to the end of July reached 2,335,573 ounces.

STATISTICS AND RETURNS

Following are the ore shipments and smelter receipts in South-eastern British Columbia district for the week ending October 19th and year to date, in tons:—

Shipments—	Week.	Year.
Boundary	33,989	1,017,802
Rossland	6,938	218,570
East of Columbia River	5,940	119,515
Totals	46,867	1,355,887

Smelter receipts—	Week.	Year.
Grand Forks	21,966	551,660
Greenwood	6,809	276,169
Boundary Falls	3,185	158,394
Trail	6,582	197,796
Nelson	11,340
Northport	2,938	77,826
Marysville	600	25,200
Totals	42,080	1,298,385

Cobalt shipments for week ending October 19th were:—La Rose, 5 cars, 141 tons; McKinley-Darragh, 4 cars, 132 tons; O'Brien, 1 car, 32 tons; Drummond, 1 car, 32 tons; Kerr Lake, 1 car, 40 tons. McKinley sent 1 car to Perth Amboy, 3 to Denver, 3 to Toronto; O'Brien, 1 to Deloro; Drummond, 1 to Perth Amboy. Kerr Lake, 1 to Perth Amboy. The total is 368 tons, of which 131 tons, or over one-third, were sent to the Denver smelters.

The output of the collieries of the Crow's Nest Pass Coal Company for the week ending October 18th was 24,133 tons; daily average, 4,022 tons.

The output of the collieries of the Crow's Nest Pass Coal Company for the week ending October 11 was 19,612 tons, a daily average of 3,268 tons.

The production of gold at the Rand in September is officially announced at £2,284,425. The out-turn in August was 555,037 fine ounces, and in September last year 505,111 fine ounces.

The following table gives the output of gold at the Rand (in fine ounces) for a series of years:—

	1907.	1906.	1905.
January	537,638	428,638	369,258
February	493,542	407,668	363,811
March	538,497	443,723	399,823
April	537,019	439,243	399,166
May	524,477	461,202	416,395
June	507,559	475,975	412,317
July	532,711	491,793	419,505
August	555,037	509,115	428,581
September	538,034	505,111	416,487

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

	Week ending Oct. 12	Since Jan. 1 Ore in lbs.
Buffalo	60,000	1,998,830
La Rose	87,000	1,316,852
McKinley-Darragh	144,720	504,980
Nipissing	61,010	4,151,301
Townsite	42,000	192,078

The total shipments for the week were 394,730 pounds, or 197 tons.

Following are the weekly shipments from Cobalt camp, and those from January 1 to date:—

	Week ending Oct. 19	Since Jan. 1 Ore in lbs.
Drummond	64,830	108,920
Kerr Lake (Jacoubs)	59,950	433,730
La Rose	281,710	1,598,562
McKinley-Darragh	266,260	771,240
O'Brien	64,575	2,345,580

The total shipments for the week were 737,325 pounds, or 368 tons. The total shipments since Jan. 1, 1907, are now 20,087,875

pounds, or 10,043 tons. In 1904 the camp produced 158 tons, valued at \$136,217; in 1905, 2,144 tons, valued at \$1,473,196; in 1906, 5,129 tons, valued at \$3,900,000.

New Dividends.

The International Coal & Coke Company have declared a dividend of two per cent. on all outstanding stock in their books on October 20th, to be paid in Spokane on November 1st.

Commercial Items

The Canadian Rand Company, Limited, of Montreal, have opened up a show room at 11 St. Nicholas street, where they display a complete line of air compressors, rock drills and Imperial pneumatic tools. A small stock of repair parts will also be carried in stock for the convenience of local customers. This is the only place in Montreal where such a stock is displayed, and it should add impetus to the already immense sale of Rand mining machinery.

The J. R. Alsing Company, 136 Liberty street, New York, founded in 1869, and organized under the laws of the State of New York, have changed their name to the J. R. Alsing Engineering Company under the laws of the State of New York, and increased their capital stock from \$20,000 to \$100,000. The officers will be the same as in the old company. The enormous increase in their business made them make the above change.

METAL, ORE AND MINERAL MARKET.

Aluminium, No. 1 grade ingots—45 to 47 cents per lb.
 Antimony—10 1-4 to 12 cents per lb.
 Arsenic, white—7 3-8 to 7 3-4 cents per lb.
 Barytes, crude—\$18 to \$20 per short ton.
 Bismuth, metal—\$1.75 per lb.
 Cadmium, metal—\$1.50 per lb.
 Carbons for drills—\$70 to \$80 per carat.
 Carborundum, powdered—8 cents per lb.
 Chromium, metal pure—80 cents per lb.
 Cobalt, f.o.b. Cobalt, Ont., unrefined—30 to 40 cents per lb.
 Corundum—7 to 10 cents per lb.
 Feldspar, ground—\$14 per short ton.
 Flourspar, lump—\$8 to \$14 per long ton.
 Graphite, domestic—\$50 to \$150 per ton.
 Gypsum, lump—\$7 per short ton.
 Infusorial earth, ground—\$20 to \$45 per long ton.
 Lead—4.75 cents per lb.
 Manganese, pure metal—75 cents per lb.
 Mica, ground—\$50 to \$80 per short ton.
 Mica, scrap—\$10 to \$15 per short ton.
 Molybdenum, pure—\$1.70 per lb.
 Molybdenite ore, 90 per cent. pure—\$4.50 to \$5 per unit.
 Nickel, metal—45 to 65 cents per lb.
 Platinum, ordinary metal—\$27.50 per ounce.
 Platinum, scrap—\$22 per ounce.
 Pyrite—10 to 11 1-2 cents per unit for 38 to 45 per cent. sulphur, lump ore or fines.
 Quicksilver—\$40.50 per 75 lb. flask.

Sulphur—\$19 to \$23 per long ton.
 Talc—\$15 to \$25 per short ton.
 Tungsten, pure metal—\$1.30 per lb.
 Tungsten, ore, 60 per cent. pure—\$9 per unit.
 Tin—31 1-2 cents per lb.

MARKET NOTES.

Silver.—October 3rd, 66 1-2; October 4th, 66 1-2; October 5th, 66; October 7th, 65 1-4; October 8th, 65; October 9th, 64 7-8; October 10th, 63 5-8; October 11th, 63 1-4; October 12th, 62 3-8; October 14th, 60 3-8; October 15th, 61 1-4; October 16th, 61 1-4.

Mexican dollars, 47 5-8 cents.

Sterling exchange, \$4.8635.

Pig Iron.—Pittsburg, Bessemer pig, \$22; No. 1 foundry, \$21.50; No. 2, \$21.

Iron Ore.—Bessemer, old range, \$5; Bessemer Mesabi, \$4.75; non-Bessemer, \$4.30; silicious non-Bessemer, \$2.50.

Spelter.—Market steady. New York, 5.50 cents per pound; London, £21 15s.

Lead.—Market weak. New York, 4.75 cents per pound; London, £18 5s. for Spanish.

Tin.—Tin has dropped seriously. New York, 31 1-2 cents per pound; London, £138 10s. for spot.

Copper.—No improvement in the market. New York, lake, 13 1-2 cents per pound; electrolytic, 13; London, £60 for spot.

On October 16th the London price of bar silver reached the lowest point since August, 1906. At that time it was quoted at 27 1-4d. The closing of the Mexican mints to the free coinage of silver caused a decline of bar silver to 25 7-16d. in April, 1905. The continued buying of the Indian Government brought up the price to 30 5-16d. in December, 1905.

The Government of New Zealand is now offering a bonus on the production of marketable copper from ores mined and smelted in the country; and a bonus of four pence a pound on the production of the first hundred thousand pounds of quicksilver, free from impurities, from any New Zealand mine. In respect to copper, the conditions are that if 1,000 tons are produced on or before June 30th, 1909, the bonus payable will be £1,000; after that date, £500 will be paid on respectively the second and third thousand tons produced.

At the congress of miners of the centre of France, held recently at Commentry, one of the questions discussed was what attitude should miners assume in the event of war being declared. Finally a resolution to the following effect was passed: "The National Federation of the Miners of France ought to respond to a declaration of war by a general strike." This in no wise discounts some of the unpatriotic utterances of certain anarchistic delegates to a labor convention at Winnipeg.

According to a report of a commercial agent of the United States Government, Afganistan is an extraordinarily rich mineral country. It is known to have mines of rubies, topaz, lapis lazuli, marble, iron, lead, copper, antimony, and other metallic ores, as well as sulphur and several of the earthly alkaline and metallic salts. Coal is also found. The lead, iron and precious stone mines are partially worked by the Government with modern machinery, but the mining of the country is mostly carried on by the crudest of methods and the bulk of the mineral wealth is not yet touched. The Amir continues to gradually purchase mining machinery as he has funds; but both Government and people are opposed to granting any concessions to foreigners.