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- Zinc Loss in Precipitation, 505.
- Zinc Metallurgy, 616.
- Zinc Production in British Columbia, 553.

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VOL. XXXVI

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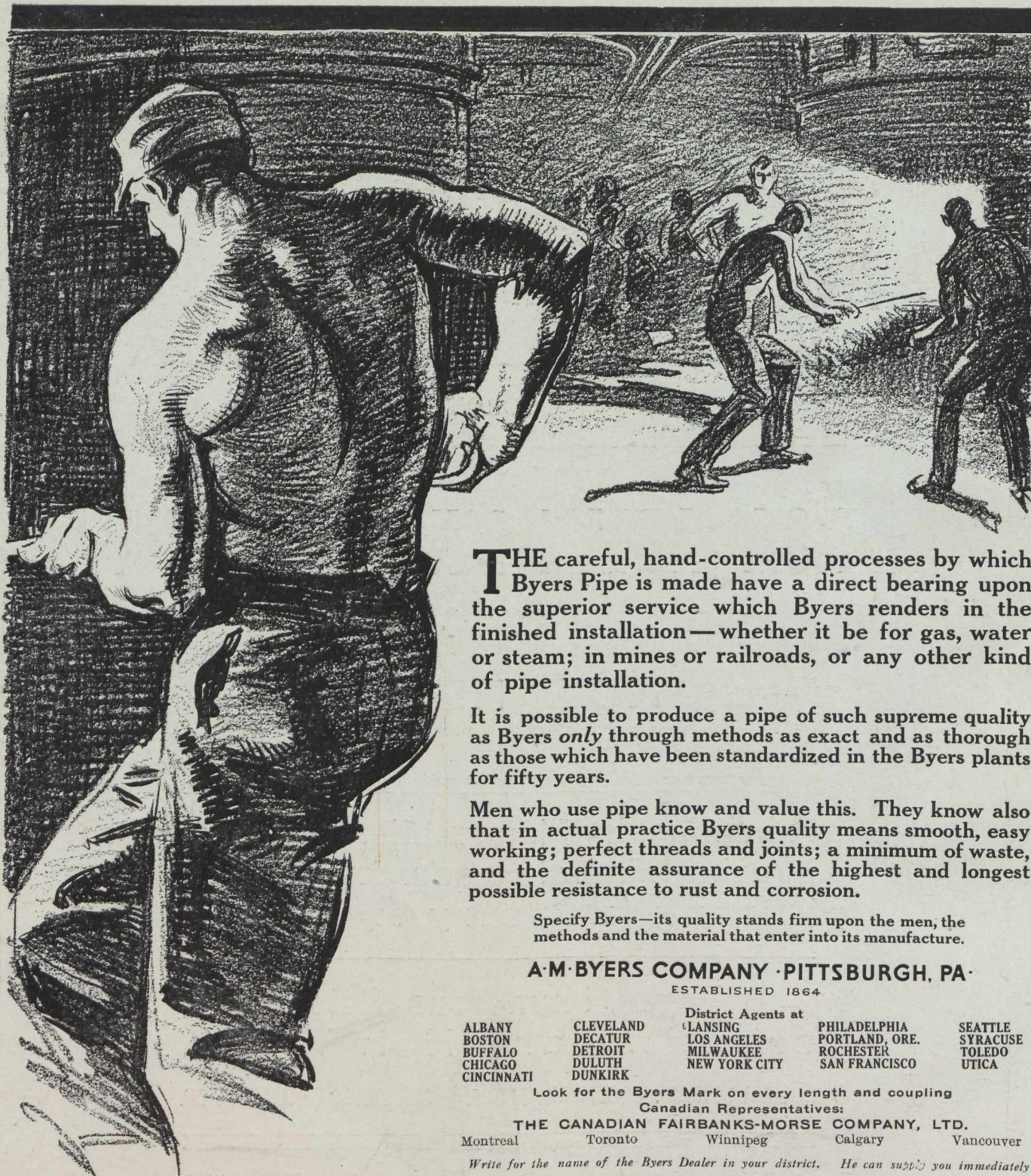
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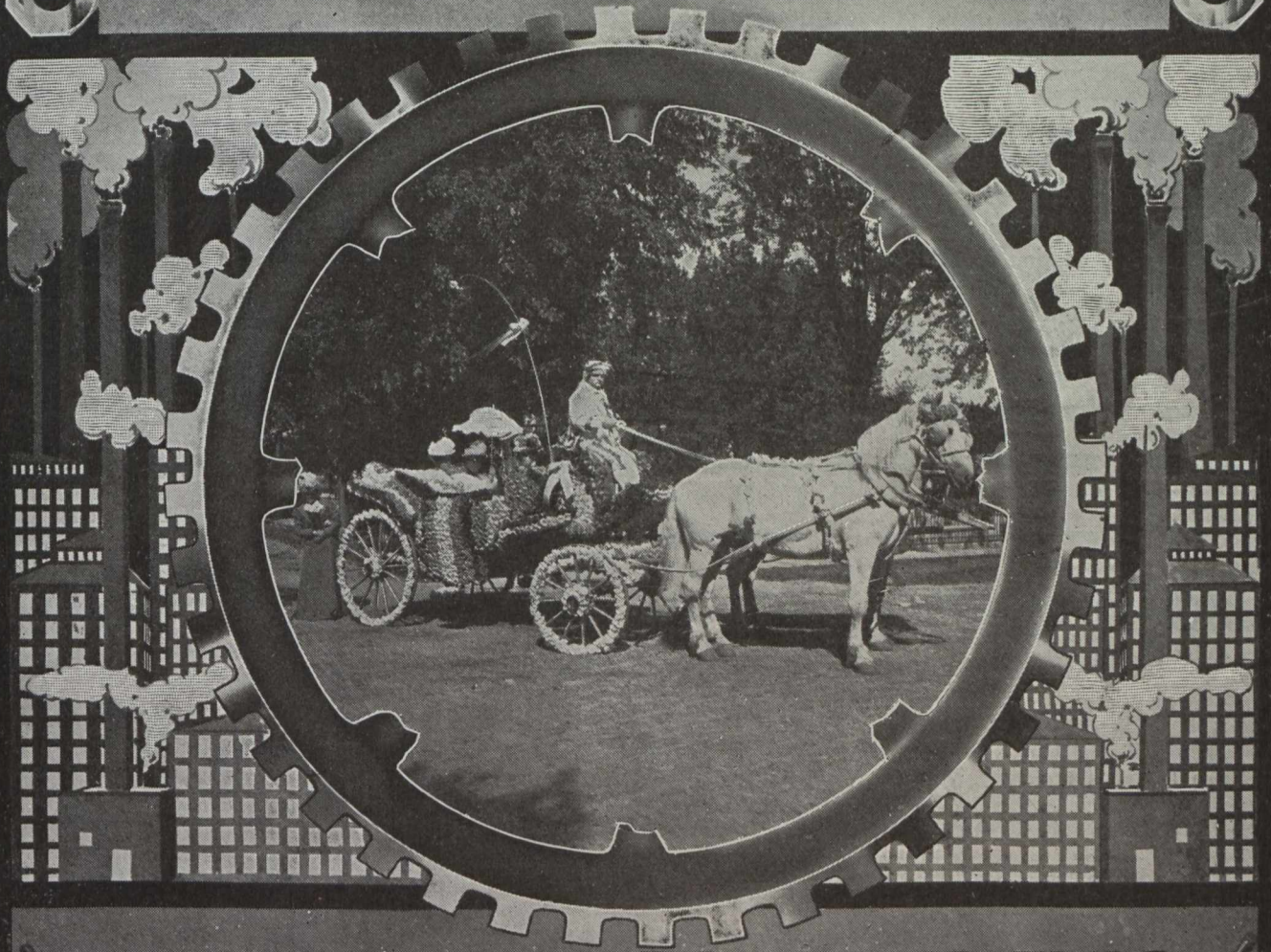
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Muckers	- - - - -	8	Walking Foreman	- - - - -	1

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Average Advance per day	- - - - -	27.84 feet
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Total No. of Blasts	- - - - -	140
Rock Removed	- - - - -	2270 cubic yards

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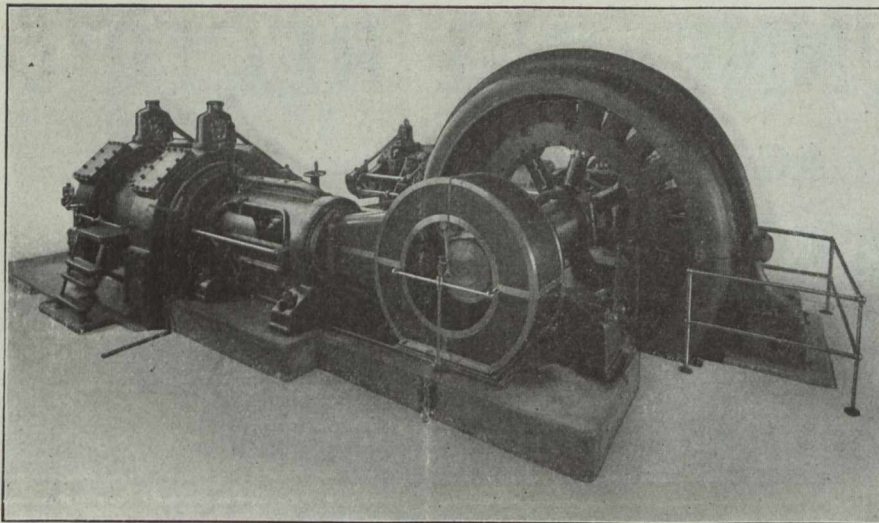
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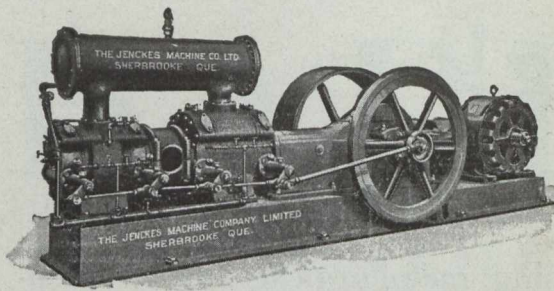
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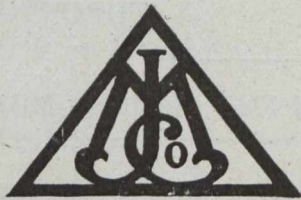
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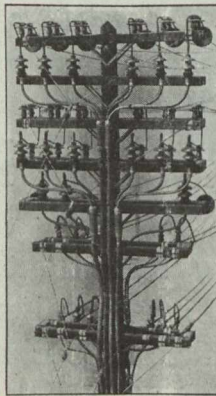
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Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

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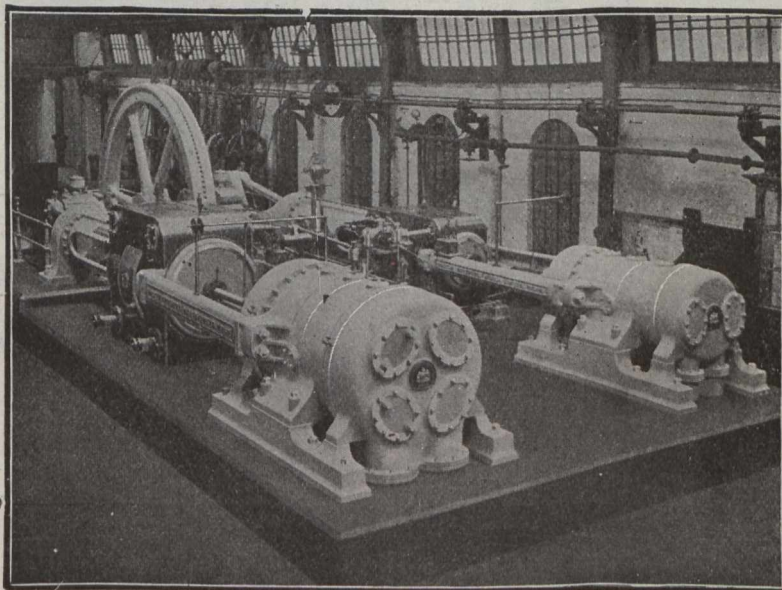
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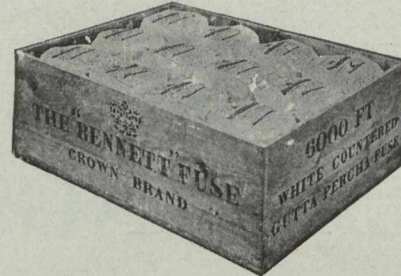
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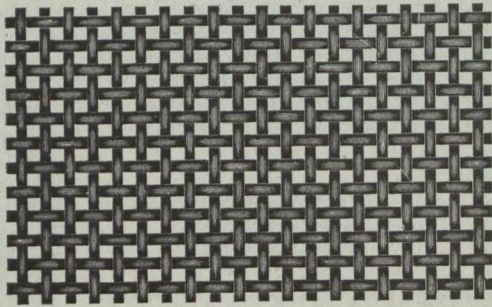
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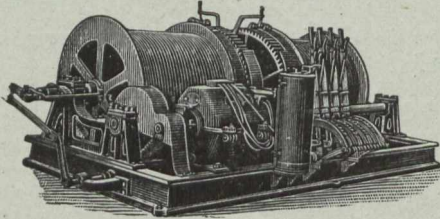
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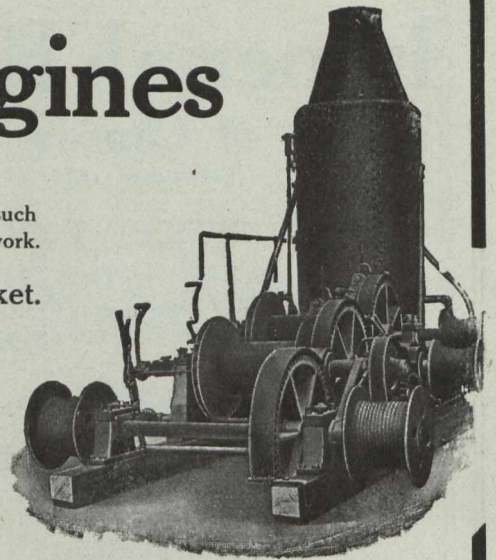
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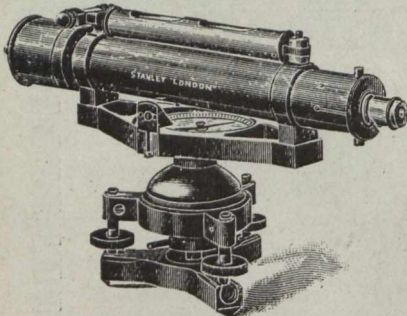
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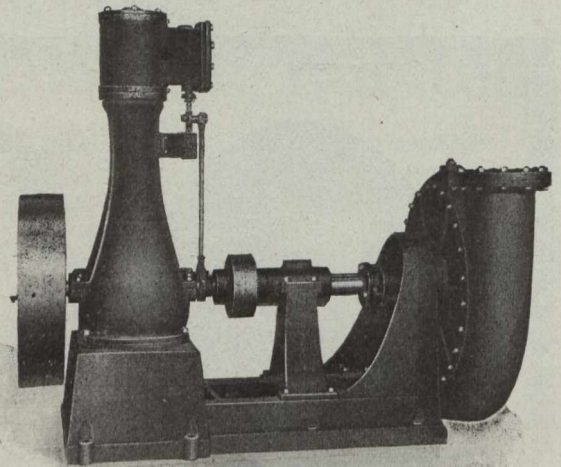
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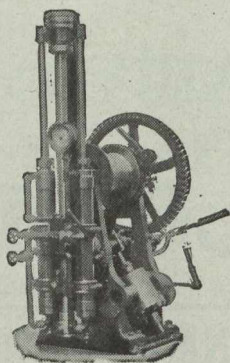
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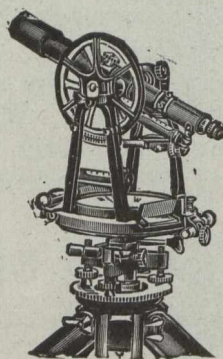
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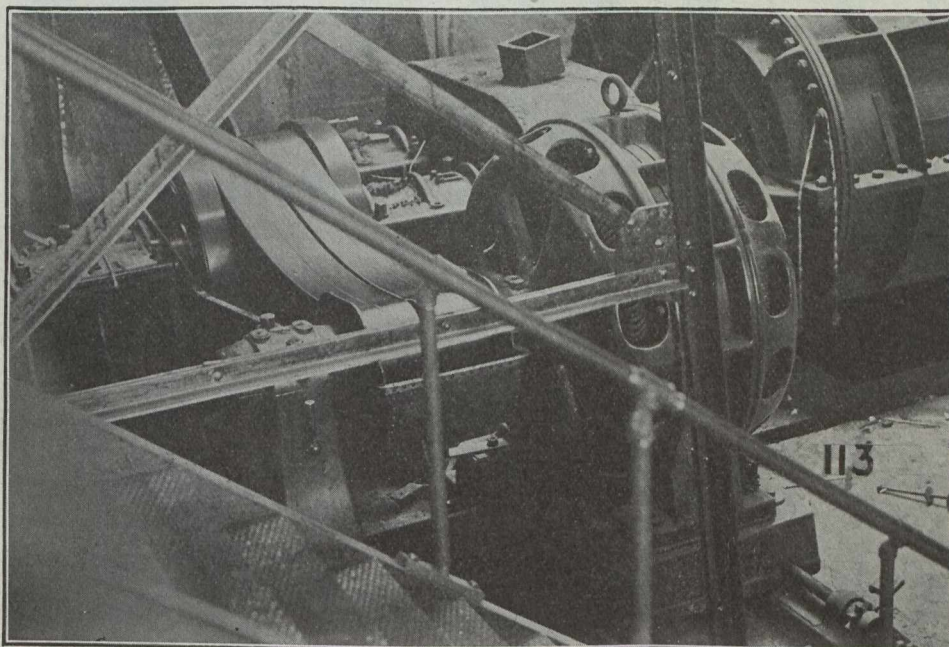
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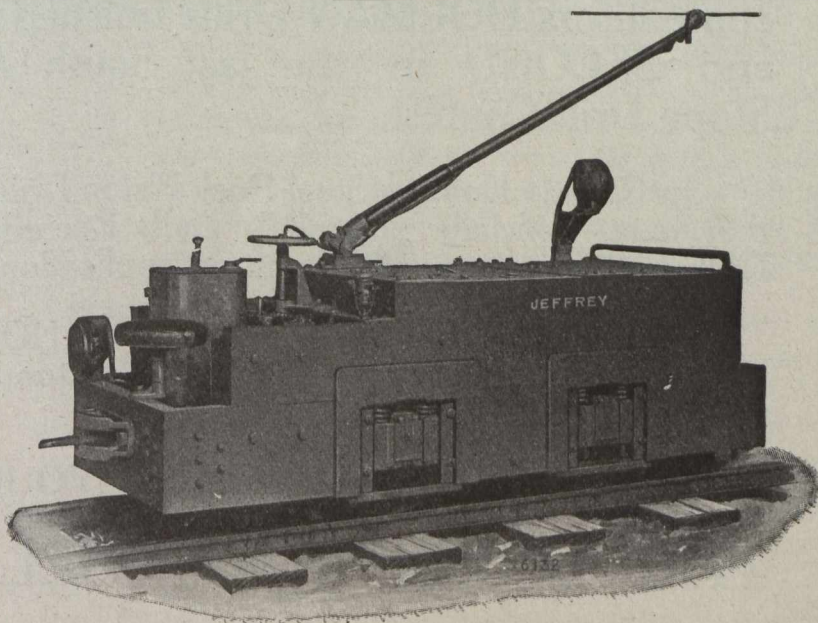
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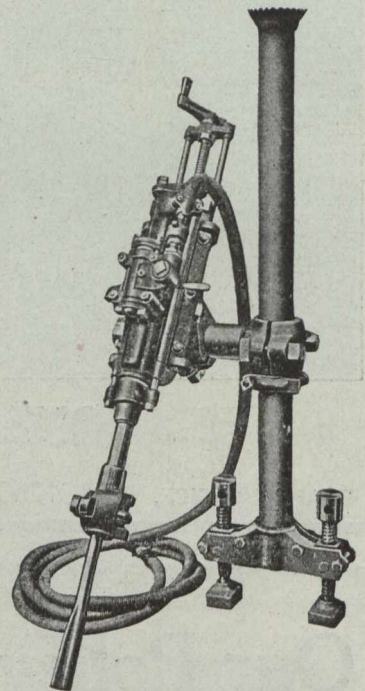
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THE CANADIAN MINING JOURNAL

VOL. XXXVI.

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REGINALD E. HORE

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THE EXPORT OF NICKEL MATTE

The newspapers continue their tirades against the export of nickel matte, without making it clear what advantage is to be gained by such a policy. Since our last issue Mr. Monell, president of the International Nickel Co., has issued a statement that his company has not since the war began sold nickel directly or indirectly to Germany, and that no European steel makers own large interests in the company.

During the past few weeks some of the daily newspapers have insinuated that the Krupp firm owns a large share of the stock of the International Nickel Co. No authentic statement to this effect has been made; but there seems to be a desire on the part of some of the newspapers to have the Canadian public believe this to be the case. Why the editors of these papers should be so eager to frighten their readers is not evident.

A rather peculiar feature of the agitation against nickel export is that our contemporaries show utter disregard for our trade with friendly countries in their suggestions as to how Germany may be effectively cut off from the nickel market. It reminds us of the hunted ostrich that buries his head in the sand.

What countries have been most aided by the shipments of nickel matte from Canada since the war began? Our contemporaries seem to wish their readers to believe that Germany and Austria have been the fortunate ones. Nothing could be farther from the truth. What then is the object of spreading such misinformation?

Surely it cannot be attributed to patriotism. No one wishes more sincerely than we do that the enemy be prevented from obtaining war materials. Any movement to this end which seems to have merit will receive our support. But we cannot see that the newspapers have presented any information which calls for such action as they urge.

Mr. Monell's statement is of course a partisan one. As a concise statement of pertinent facts it contrasts very favorably with the newspaper editorials. It is, however, rather too concise. That, however, is a matter for the Government. From Mr. Monell's statement we assume that the Government is fully informed.

Since the above paragraphs were written the Dominion Government has issued the following memorandum:

"Various criticisms have appeared in the press with regard to the export of nickel matte from Canada to the United States.

"The whole subject has been under careful consideration and investigation by the Government of Canada since the commencement of the war, and they have been in frequent communication with the British Government as to the precautions which should be taken to prevent export to Germany.

"The books of the company in New York are inspected at short intervals by a thoroughly trained and experienced accountant, who goes into all exports most thoroughly and reports to the Canadian Government.

"In addition to this, by an arrangement between the company and his Majesty's Government, certain control is exercised in London through the company's British representatives. The company is not under German control, but is controlled altogether in the United States, where the vast majority of its stock is held. There may be a few German shareholders, but the proportion is insignificant, and there are no German directors.

"The steps taken by the Government of Canada have the entire approval and sanction of the British Government, who express themselves as entirely satisfied with the precautions that have been taken.

"It must be borne in mind that nickel exported from Canada to the United States is used in a large number of industries in that country, and prohibition of the export, except for the most urgent reasons, would be undesirable, as it would produce great business disturbance in a country whose sympathies are very strongly with the cause of the Allies.

"Moreover, the Government is informed that there is an output of nickel in Norway controlled by German interests which could furnish a sufficient supply for German requirements during the present war."

We are thus assured that the British Government is satisfied with the precautions taken by the Dominion Government. We are pleased to have this official assurance. Taken together with Mr. Monell's statement, it confirms our belief that the advocates of prohibition of export of nickel matte are barking up the wrong tree.

We also beg to tender to the Dominion Government our congratulations for the action taken in the matter. Several thousand people in Northern Ontario depend directly or indirectly for their livelihood on the nickel industry. The Government has found it possible to guard the Empire's interests without running the industry by adopting such measures as our contemporaries advocate.

MINE INSPECTION

It is very often asserted that mines in Ontario are not inspected by Government officials frequently enough. It is claimed that every mine should be inspected at least once a week, and that at present there are lapses of months at some mines.

There can be no gainsaying these statements. It is generally recognized that no mine can be examined too

frequently. Where mining is being actively carried on, conditions are changed by every blast. Obviously, however, the Government official cannot be expected to examine the mine after each shot is fired.

In the opinion of many the official inspection is chiefly useful in preventing those in charge from becoming careless through familiarity with danger, and in offering suggestions concerning safety devices and rules. The question then arises, how often should visits be made in order to keep the mining captains and shift bosses alert to the danger. To the miner, examination of the working places is a part of the daily routine. The mine captain in his rounds has a watchful eye for defects in shafts, haulage ways, etc. He finds here a gate left open and there a loose block in the roof. In characteristic language he reprimands those to blame—if he can place the blame. But the mine captain's chief business is getting out the ore. Having many things to think about he may neglect to enforce safety rules, even when the breaking of them does not escape his attention. At such times the visit of a Government inspector is liable to rouse him to his duties. No mining captain likes to have his mine inspected when it is in bad shape. Hence there is something to be said in favor of visits at irregular intervals, provided the intervals be not too long.

Such inspection cannot, however, be considered to take the place of the daily inspection, which should be made by an employee of the company. In the case of large mines an inspector should be attached to the staff. The case of small companies is not so easily dealt with. The inspector must have other duties in order to earn his salary. Managers of small mines therefore would welcome some provision for inspection at very frequent intervals by an inspector delegated by the Government to a small group of mines.

CANADIAN MINING INSTITUTE ANNUAL MEETING

The seventeenth annual meeting of the Canadian Mining Institute will be held in Toronto in March, 1915. Preliminary arrangements indicate that the meeting will be a successful one in spite of the fact that many members are in Europe serving the Empire, and others are forced by a sense of economy to deny themselves the pleasure of attending the meeting this year.

Under the circumstances it is not unlikely that plans for entertainment will be less pretentious than usual, and that a little more time will be given to business. The character of the meeting will naturally depend very largely on the progress made by the Allies in the next few months.

It is expected that the business session will prove unusually interesting, on account of an important suggested change in the by-laws. It is held by members in some provinces that they have not a fair representation on the council. Certainly the list of members does

not indicate a fair distribution. Look over your list.

Secretary Mortimer-Lamb advises us that several papers have been promised and that they afford good topics for discussion. It is to be hoped that more opportunity than usual will be given for discussion. The printing of papers some time before the meeting should enable members to present their views at the meeting. Criticism of papers presented is helpful and should be freely participated in.

THE WORKMEN'S COMPENSATION ACT

The Workmen's Compensation Act goes into effect Jan. 1, 1915. Circulars sent out by the Commission convey the information that the rate for mining companies will be three per cent. of the pay roll. Surface and underground workers are rated alike.

It is not expected that all directors of mining companies will be greatly pleased at this new tax on their income. Some, however, probably most of those in charge of large companies, will welcome the Act, as it helps to systematize the business.

Criticism as to the provisions of the Act may be expected to follow its enforcement. It is not unlikely that weak parts will soon be found and remedied. Until it has been in operation for some time, however, it will be difficult to weigh the merits of some of the objections which are being raised.

One feature which is not very pleasing to those who are making unusual efforts to avoid accidents in mines, is the lack of encouragement to be found in the provisions of the Act. Companies providing safety appliances and enforcing safety rules pay at the same rate as those conducting operations carelessly.

BRITISH COLUMBIA IN 1914

As the year draws to its close it is possible to make a rough estimate of the value of the mineral production of British Columbia during 1914. With only very incomplete information as a guide, it seems probable that a total value of between \$25,000,000 and \$26,000,000 may be estimated. It may be the latter amount will be slightly exceeded, but at this writing it seems better to place the total at somewhere about \$25,900,000. Of this amount, approximate proportions are: Metalliferous minerals \$15,100,000, coal and coke \$7,800,000, and miscellaneous products \$3,000,000. There seems to have been small increases in gold and zinc, but silver, lead, copper, coal and coke, and building stone and other structural materials included under the head of "miscellaneous" appear to show lower totals than those for 1913. As the total for the latter year was \$30,296,398, a decrease of approximately \$4,354,000 is estimated. Possibly the position will be somewhat better when the revised returns come in; meanwhile the foregoing statement may be taken as giving in a general way a fair idea of the total value of the year's mineral production.—E. J.

REFINING NICKEL IN CANADA

In this issue we publish a letter from Mr. R. W. Leonard, president of the Coniagas Reduction Co., on the subject of refining nickel in Canada. Mr. Leonard seems to be of the opinion, after careful study of the matter and consultation with his technical staff, that a nickel refinery could be economically established in Canada. He intimates, however, that the two companies now operating would have to sacrifice a few million dollars now invested in the United States and Wales.

The establishment of a nickel refinery in Canada is, as we have asserted before, greatly to be desired. We are pleased to have Mr. Leonard's opinion that the project is a feasible one, if we neglect consideration of present investments in plants abroad. Possibly the plants now in operation could in time be put to other uses and not become a total loss if Canadian plants were established.

CORRESPONDENCE

RE REFINING NICKEL IN CANADA

To the Editor of the Canadian Mining Journal:

Sir,—The editorial on page 790, Canadian Mining Journal Dec. 15 last, answers an article in the Toronto Star re the above subject, which was one of a number of articles recently appearing in the public press in Canada in favor of and against export of nickel from Canada, refining of nickel in Canada, etc.

Your editorial states that an experienced company might erect a plant for refining nickel in Canada in a few months. You are right. You cannot guess how long it would take to "establish" such a plant, and suppose that what the Toronto Star means is a plant that can be economically operated.

I have gone into this subject in a general way with our staff, and reach the following conclusions, which, without quoting actual figures, prices, etc., will give a fair idea of this much discussed subject.

If one of the established companies operating nickel refineries in Wales and New Jersey wanted to, they could "establish" and economically operate such a plant from date of erection plus a short "tuning up" period, provided they shifted skilled superintendents and foremen from existing works.

The Welsh works of the Mond Company use for raw materials: Bessemer matte (made in Canada), coal, coke, sulphuric acid, power (small), labor. Lastly and most important, the Mond refinery has had the wonderful genius and engineering skill of the late Dr. Ludwig Mond, and of his technical staff, of which Dr. Carl Langer was most instrumental in perfecting the nickel process.

The relative prices of coal, coke and acid in Clydach and certain points on the great lakes can be ascertained. Surely the freight differences on matte would offset considerable differences in fuel costs.

The labor question has never prevented a company from building and "establishing" works for all sorts of purposes where natural resources invite exploitation. It is premised that the technical skill is supplied from existing establishments.

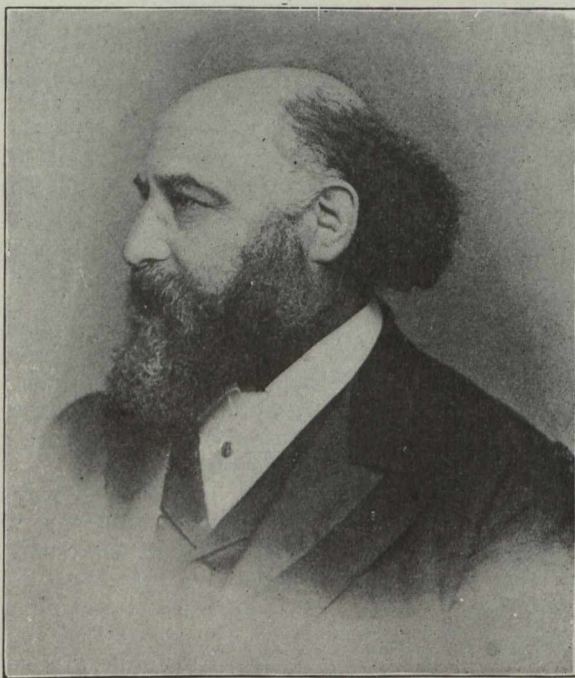
The Orford Company's works in New Jersey use:—Bessemer matte (made in Canada), coal, coke, salteake, nitreake, muriatic acid (trifling), sulphuric acid (small), firebricks.

It is doubtful if this company would have to pay more for salteake at a Canadian point on Lake Erie than it does now.

Comparisons of coal, coke and firebrick can easily be had for Constable Hook and any Canadian point. If for any reason saltcake could not be bought cheaply at lake ports, the raw materials salt and pyrites are abundant in Ontario, and a big Hargreaves saltcake and hydrochloric acid works would neither cost very much to build nor require too much technical skill to operate. A good use for the hydrochloric acid could be found in connection with the nickel industry.

The works at Kristianssand, Norway, use a process, the use of which in Canada has been acquired by a company operating in the Sudbury District. Their raw materials are: Bessemer matte (from Evje), coal, coke, power (large), sulphuric acid.

This works is a shining example of what may be done in a country blessed with nickel ores and a determination to work them up at home. They import their coal and coke at a cost that would make Ontario price-



THE LATE LUDWIG MOND

look cheap, and from ores much poorer than those of Sudbury ore are turning out about 1,000 tons annually of electrolytic nickel of most excellent quality.

Factors which were of controlling importance in 1889, 1890 and 1895, have been eliminated since. Other factors which now appear to interfere, are all of a character which may be cancelled if the powers that be shall so will.

Nickel if refined in Canada can be sold to steel works or any other purchaser in Canada or elsewhere. Because we make lots of flour in Canada, it is not necessary that we make it all into buns in this fair land. There is no special plant required outside of what may be found at Sydney, Hamilton or the Soo for making nickel steel. If these works had a demand for bridge stuff, rails or bars of nickel steel there are no technical reasons why they could not make them now.

In the matter of technical skill it is to be noted that the Orford Copper Company which developed the process used by the International Nickel Company at their works at Constable Hook, New Jersey, originated at Orford Mountain Mine in the Eastern Townships, Province of Quebec, and it was long recognized around those New Jersey works that one had to talk Canad-

ian to get on with the majority of the technical staff.

A great majority of the superintendents, managers, etc., of the great copper mines and smelters of the United States, which country produces 60 per cent. of the world's copper, are Canadians.

There absolutely is no present reason why any of the existing nickel refiners could not "establish" their works in Canada if they are prepared to sacrifice the few million dollars invested in Wales and New Jersey, and move their technical men to Canada. It is doubtful if the difference in operating costs would be perceptible in the selling price of their products.

Yours, etc.,

R. W. LEONARD.

St. Catharines, Dec. 28, 1914.

B. C. MINERAL PRODUCTION IN 1914

To the Editor of the Canadian Mining Journal:

Sir,—From the "president's address," included in the annual report of the Bank of Montreal, printed in western Canadian newspapers, I make the following excerpt from the information given under the sub-head "Province of British Columbia": It is estimated that the total mineral production for 1914 will be 75 per cent. of last year. Consequent upon the inactivity of the smelters, the collieries also are not doing so well, and the output of coal has been greatly diminished."

May I venture the opinion that the president was not fully informed or, perhaps, that it was necessary for bank officials to make an estimate too early to allow of the information now obtainable being available. As a result of my own enquiries and calculations, in connection with the preparation of my annual review of mining in British Columbia, I have reached the conclusion, of course with the production of the last two months of the year largely estimated, that the total value of the mineral production of British Columbia for 1914 will be fully \$25,700,000. As the total given in the Provincial official records for last year was \$30,296,398, it follows that the amount I have estimated for the year now closing is approximately 85 per cent. of that on record as the value of the mineral production in 1913.

E. JACOBS.

Victoria, B.C., Dec. 15, 1914.

THE COPPER PRODUCERS' ASSOCIATION.

Officially, nothing has been done toward dissolving the Copper Producers' Association. Individually, some of the copper producers would prefer that the activities of the association cease, particularly as concerns the monthly statements of stocks in refiners' hands. None of these figures have been compiled since those issued in July covering June operations. In fact, members have not even been called upon to submit their individual statistics. Their monthly assessment for expenses has continued, however.

No salaries are paid except to the secretary, L. C. Graton, who quit the United States Geological Survey for this \$6,000 position. His time of late has not been given entirely to the association, for he has held a professor's chair at Harvard for the past two years, leaving the office routine in charge of an assistant.

WHO'S WHO IN MINING AND METALLURGY.

The 1915 edition of Mr. George Safford's book "Who's Who in Mining and Metallurgy," is now in preparation. Mining engineers and metallurgists are urged to send in their records as soon as possible to Mr. Safford at 18 Eldon St., London, E.C.

THE BUSINESS ETHICS OF THE ENGINEER*

By G. G. S. Lindsey.

Addressing many who have adorned and honored the profession of Engineering, I would be unwilling to formulate my opinions on the nature of the moral agent as an intelligent and free being possessed of a conscience, were I not sure that many of my younger hearers are glad to be told what are the points of the compass by which those whose course they are anxious to follow, steer; a course always true.

"True as the needle to the pole,
Or as the dial to the sun."

I am not a student of the science of resolving cases of doubtful propriety, but I have had many opportunities of observing the practices of Mining Engineers, and, though not a qualified technical engineer myself, know fairly well what are the ideals of the best of them.

Professional Ethics differ in no respect from some of those promulgated on Mount Sinai. No human rules have as yet been laid down which are binding and which have been accepted as the test to which all mining engineers must subscribe as the standards of their profession. And because there is no law, the greater is the moral obligation on the Engineer to fix high standards and voluntarily to live up to them on all occasions. That legal sanctions will come, perhaps soon, prescribing what is right in some matters now left to conscience, I have no doubt. Among the first of them will be those which provide that whenever the public is asked to subscribe for mining stock it must bear the hall-mark of a qualified engineer.

The constituency of the Mining Engineer is the mining community, and while his endeavor is always in the direction of elevating the industry he serves to as high a commercial plane as is possible, yet it is true that the constituency to which he devotes his life's work is one in which the speculator largely predominates, and necessarily so. That the public will speculate is no fault of his. The community should welcome the man who, on chance, puts his money into what becomes a fruitful mine.

It has been said that "mining is, was and will be to the end of time a sane speculation or a silly gamble, but never an investment; the element of risk is never eliminated and any statement to that effect, as regards a particular mine, is made by a charlatan or a fool." To part of this statement anyone will subscribe. The most serious objection made to it, was that it was too frank an admission of the truth. But as successful mining is based on the application of Science to that industry the nearer we get to the truth the less danger we run and the closer we come to solution of the mining problem, how to dig ore and make it pay.

Of the two capacities in which the Mining Engineer may be engaged whether as mine valuator, or to advise on development, equipment and operation of mines and metallurgical works, the former alone calls for attention; because in connection with the other what were formerly matters of conscience, such as taking what was called the "customary commission," a percentage paid on the price of machinery and supplies recommended by him, are now penalized by statute.

As a mine valuator, the engineer will find his duties are divisible into two sets, those business methods concerning which a bargain can be reached satisfactory to all concerned, consistent with thorough and honest work;

and those business ethics in which the exercise of his moral faculties is called into play. To the latter only I intend to direct your attention.

When a client selects an engineer, such reputation as the engineer has gained is assumed to have a market value and the price is offered him on that basis. Once engaged, the engineer's fiduciary relation, outside of his duty to himself, is two fold, he is trustee for his employer as well as such of the investing public as may be asked on the strength of his report to invest in the shares of the company for whom it is made. The engineer should therefore never make a report for a contingent fee, a fee in stock, which depends for its value upon his report in creating confidence in the public mind. Such conditions cannot but influence the judgment of the maker of the report.

When outfitting, the question comes up, what part of the engineer's equipment can be charged to the client. The engineer is assumed to be equipped and outfitted for the work pertaining to mine examination. A charge should only be made for such equipment as is either consumed in the work or returned to the employer. If special equipment is needed for the particular task the client must provide it.

On the journey the engineer is entitled to first class passages on trains and boats and to the best accommodation at hotels. But the expense account is not one which admits of personal gain. It is always desirable for him to travel as a gentleman and not appear cheap in any way. But to travel by one class and charge for a higher is petty larceny. Opinions differ as to the spending of money on entertainment for the purpose of obtaining pertinent information, and although the engineer is sent to secure information and trusted to use his discretion, it is better not to do this at the expense of the client unless it is so agreed.

The engineer's examination may indicate that the shares should be worth more than they are selling for on the market and he asks himself, "Is it fair to buy the company's shares before my report is turned in, or, if not, is it right to do so afterwards?" This means buying shares on information gained at the client's expense. To use his broker before advising his client of his conclusions would be unpardonable. The man of capital does not employ the engineer with the idea that a business trust is to be turned into a personal coup. As was said of the contingent fee, personal interest constitutes a bias in the engineer's opinion. An engineer cannot mix up in a stock deal at the time of reporting without directly laying himself open to the imputation of dishonesty.

It is better too for the engineer not to buy shares after his report is in. It may be that his buying or selling of shares would work a distinct injury to his clients as he may not be informed as to the object of his employment. It is better, on the whole, to leave the stock market entirely alone when engaged in confidential work of this nature.

But it may be asked: should an engineer be precluded from buying a good stock because his examination and personal knowledge shows it to be good? Must he always buy stock in something he knows nothing about personally? It is not an excellent way of showing his confidence in his own judgment, to buy the shares?

*A speech delivered at the annual dinner of the Engineering Society, School of Mining, Kingston, Dec. 15, 1914.

The confidential relation of engineer and client does not end with turning in the report, and a conscientious man will therefore neither buy nor sell shares. If it be done with the knowledge and consent of the employer, there is less objection. But the unwisdom of taking shares even under these conditions is well illustrated by what has actually happened. The shares go up, can the engineer sell when he thinks they have gone high enough without affecting his employer's position?

In the case of Yukon Gold, while the owner was making a market price for the shares, the engineer who had made the report was selling. The engineer's information on which he sold belonged to his client, and his being a seller must affect the market. Whatever the propriety of the owner's course, the engineer was using information he had been paid to give his client to the client's disadvantage.

In any case such shares are dangerous to the young engineer who has not learned that stock manipulation is one thing and the value of stock based on the merits of the mine is another thing and not necessarily in accord. The stimulus of a share gamble is the most insidious lure he faces in the early stages of his career. A good authority has said "it has spoilt many fine fellows, it has ruined twenty times as many good engineers as it has enriched."

Being in a district, it is not legitimate for the engineer to take advantage of his presence there to examine and perhaps option mining properties for himself, or to examine and report on properties for others. Even though no time is lost that properly belongs to his employer?

It certainly is not legitimate to take advantage of his presence in a district to report on properties for other parties in the absence of specific agreement to that effect. Apart from such questions as possible competition, he is there on his client's money. It is proper and advisable to see as much of a district as possible but not to use the information for personal gain; if the engineer's examination shows that the properties in the district are of value the information belongs first to his client.

The acquisition of property or options over property on his own behalf would be liable to severe criticism, and place the engineer in a very false position, even if acting in perfect good faith. An engineer returning from the Portland Canal where he has made an examination, finds himself at Prince Rupert and no boat due for a week. He takes a trip to a nearby district, examines and options a prospect, paying all expenses himself and returns in time for the boat. His clients have lost nothing, but as they have paid the expense of his trip to Prince Rupert they should have the opportunity to take the prospect.

If after full disclosure and report the client consents to his keeping any part of what he has got then it is quite proper to do so.

When the engineer has returned home he is concerned to know if he may properly publish in technical periodicals a description of the district visited, giving general information of the conditions obtaining there, the topographical and geological features and conclusions concerning the possibilities of successful mining. This is a question for his client, not for himself. It is in all cases proper to ask permission to publish articles, the material for which is gathered at the expense of another. All general information on any district has an important bearing on any investment in that district. This information is the exclusive property of the client until such time as it no longer concerns his interests. When he permits it, is soon enough to give it to the public.

The answer the engineer is to make to the questions submitted to him necessarily depends on the form of the questions. The man who desires a report wants to know whether the information obtainable justifies his putting up the money that is asked. The demand is for something more than a judgment which hedges. The responsibility should be faced if a judgment is required on the commercial question involved.

If an opinion can be expressed in one word, he should use it, but if he can't he should say so. He is entitled to say he does "not know," when the conditions are such as to leave the matter in doubt. He may condemn a substantially good mine being unable to get sufficient information to warrant a favorable report, and will be right in doing so. The positive answer should be given only when all the conditions justify it. If there are any reasonable doubts, they should be expressed, leaving the client to take the risk.

Every form of disguised advertising is to be avoided. This is an age of commentary, but many of the reviews of professional work to be found in our literature today on the subject of mining engineering have for their purpose only the aggrandizement of the reviewer. This serves no good purpose and stamps the man. It fails in its object—not a very noble one—to bring the writer into prominence at the expense of the more proficient. An engineer is entitled to just such standing as his merits justify, and he is unworthy who seeks notoriety through the medium of criticism of honest and creditable work.

Adherence to such a code of honor as I have endeavored to outline should bring success to the young engineer. A fine sensitiveness is rarely appreciated at its value by those who employ professional services, and confident assurance often commands respect where modest merit is sometimes distrusted.

You would achieve greatness? We are told.

"That man is great and he alone
Who serves a greatness not his own
For neither praise nor self:
Content to know and be unknown,
Whole in himself."

Yet I would not have you disregard the pursuit of fame, nor indeed of riches. To the professional man "fame is the shade of immortality." I would rather have you say with King Hal,

"By jove I am not covetous for gold;
* * * * *

But if it be a sin to covet honor,
I am the most offending soul alive."

Covet honor! Find it and you will be rich. Gold will follow. It is the reputation that commands the fee.

MINE EXPLOSION AT STELLARTON.

New Glasgow, N.S., Dec. 20.—Deputy Inspector of Mines for the Province of Nova Scotia Thomas Blackwood, and James Brown, Superintendent of the Acadia Co. mine (the Allan Shaft at Stellarton), both lost their lives this morning in that mine.

About 9.30 a miniature explosion occurred there and later these two officials, accompanied by Neil McLean, overman, descended into the mine to discover the cause of the explosion.

On their failure to return a rescue party went down and found all three helpless, having encountered a quantity of gas, and lost their way.

McLean responded to the efforts to resuscitate him but both Blackwood and Brown were found to be dead. Deputy Inspector Blackwood is a well-known figure in Nova Scotia mining circles, and has held the position for several years.

THE STAKING OUT OF WORKING PERMITS IN ONTARIO

By J. A. McDonald.

It is important to know that before a patent for a mineral claim is issued by the Department at Toronto, the surveyor has to file triplicate plans of the claim, that it may be laid down in the general office plans. Before the patent issues for a mining claim, the Minister must be satisfied that the claim is recorded and certificates of the full performance of the working conditions filed. Placer claims are treated, in Ontario, just the same as ordinary mining claims.

An Ontario land surveyor must do the work of surveying the claim. A Dominion land surveyor cannot, legally, perform the work, while an Ontario land surveyor cannot, legally, survey mining claims in the western provinces nor in the Yukon, not but one surveyor can do the work as well as another, yet, owing to the lack of reciprocity among surveyors, each group is restricted to a limited field.

To meet cases where a discovery of valuable mineral cannot readily be made upon the lands, provision is made for obtaining what are called working permits. By fulfilling certain provisions of the Ontario Mining Act any person may obtain a working permit for the purpose of prospecting for minerals, the exclusive possession of an area of land open to prospecting and staking out. The chief duty to be performed by the licensee is staking the corners and marking the boundaries of such area, and placing numbers and particulars upon the posts in the same manner, so far as possible, as required respecting mining claims, omitting "discovery post," etc., but the words "working permit applied for" shall be written on No. 1 post, and each post must be notched with three rings of notches not less than one-quarter in. deep and not less than 2 in. apart, beginning about 2 in. from the top of the post.

It is further required that within 15 days after the staking, an application, in duplicate, accompanied by an affidavit stating the name of the licensee on whose behalf the application is made, locality of the area, and such other information as will enable the recorder to lay down the area in his office map, and the time when the area was staked out. Where, however, the area is more than 10 miles from the Recorder's, an additional day is allowed for each ten additional miles.

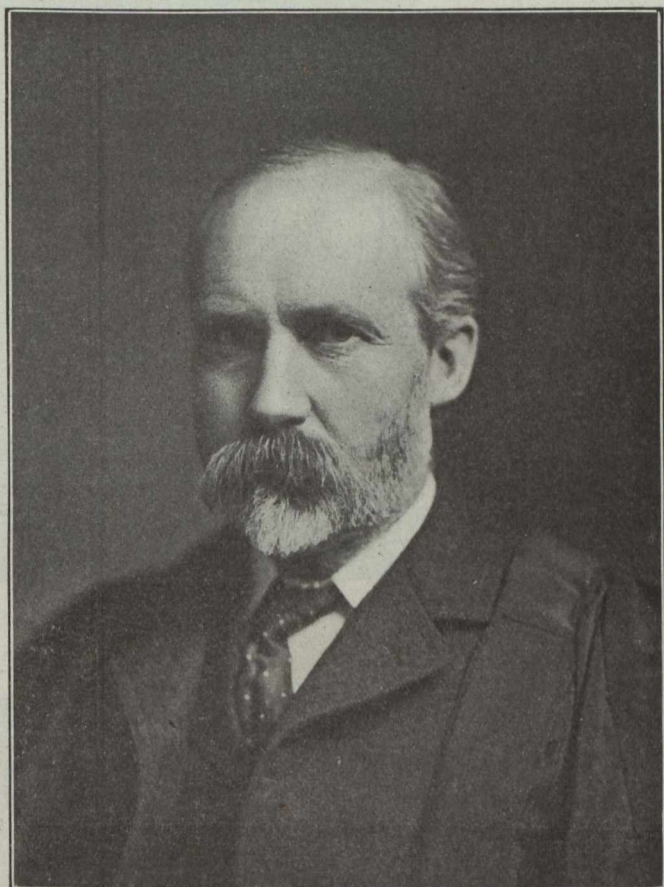
The Recorder will then issue a certificate, which certificate is securely affixed to post No. 1, within three days from the granting thereof. In cases where the surface rights have been previously granted, leased or sold, compensation for damages arising from such prospecting must be made. Upon compliance with these necessary requirements and the payment of the prescribed fee the applicant can, after sixty days, and within seventy, of the staking out of the area, procure from the recorder a working permit, which shall be good for six months from the date of issue.

Until a working permit has been granted and a notice affixed to No. 1 post, the area included in the application is subject to prospecting and staking out as a mining claim by any licensee, but thereafter during the continuance of the working permit, or its renewal, the holder has the exclusive right to prospect and stake out on that area.

The holder of such a claim must begin working within two weeks of the granting of the permit, and perform upon the area such work as searching for minerals by the sinking of shafts or pits, digging trenches, mak-

ing crosscuts, boring or operations of like kind to the extent of five days of eight hours per day in each week," provided the work can be performed in less than six months. But no work is required to be done between Nov. 16 and April 15, a renewal for six months can be obtained. If the holder of a working permit makes a discovery of valuable mineral in a place upon the area of land included therein, he may stake out and record a mining claim thereon in the ordinary way.

The fee for issuing a working permit is \$5, and for a renewal \$1.



A. P. COLEMAN, Ph.D.

Professor of Geology, University of Toronto, who has been elected President of the Geological Society of America

CANADIAN WESTERN NATURAL GAS CO.

Gross earnings of Canadian Western Natural Gas, Light, Heat & Power for the fiscal year ended September 30, 1914, were \$951,288, an increase of \$327,005, or more than 52 per cent. over the preceding year.

Canadian Western Natural Gas supplies gas through a number of subsidiary corporations to many communities in western Canada. The large gains were made in the early months of the fiscal year. October, 1913, reported an increase of \$52,000 over October, 1912, and February, 1914, an increase of \$67,000 over February, 1913. In May, 1914, the gain dropped to \$4,700 and July showed a decrease of \$1,972, while August made a decrease of \$3,708. September, the final month of the fiscal year, did better, making a gain of \$2,840.

The large increases made in the earlier months of the year were due to the starting of operations early in 1913 in new distributing territory and not to gains made on old business. It is probable that for the current fiscal period the increase will be much smaller than for last year.

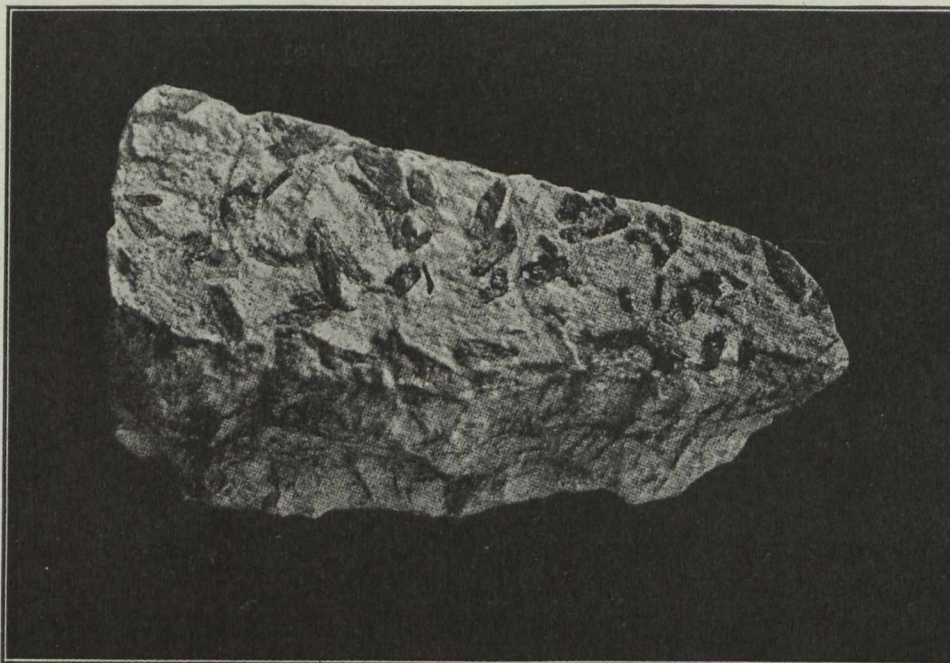
GYPSUM IN CANADA

The Mines Branch has just published an excellent treatise on Gypsum in Canada, its occurrence, exploitation and technology. Mr. L. H. Cole is the author.

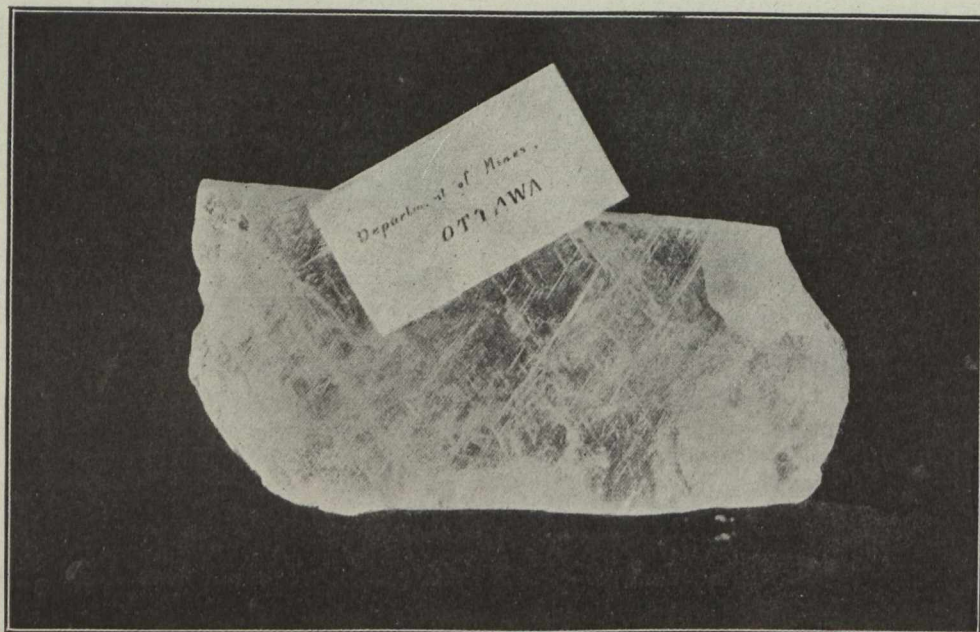
The gypsum industry of Canada is one of the more important non-metallic mineral industries of the country, and one of which very little descriptive literature

field work was carried on during the summers of 1911 and 1912, and visits were paid only to those districts where actual operations are being carried on, or which are near enough to transportation and large markets to give promise of being opened up in the near future.

Special attention has been paid to the mining and quarrying of the material, and its manipulation and manufacture after it reaches the mills. An endeavor



Gypsum with embedded selenite crystals



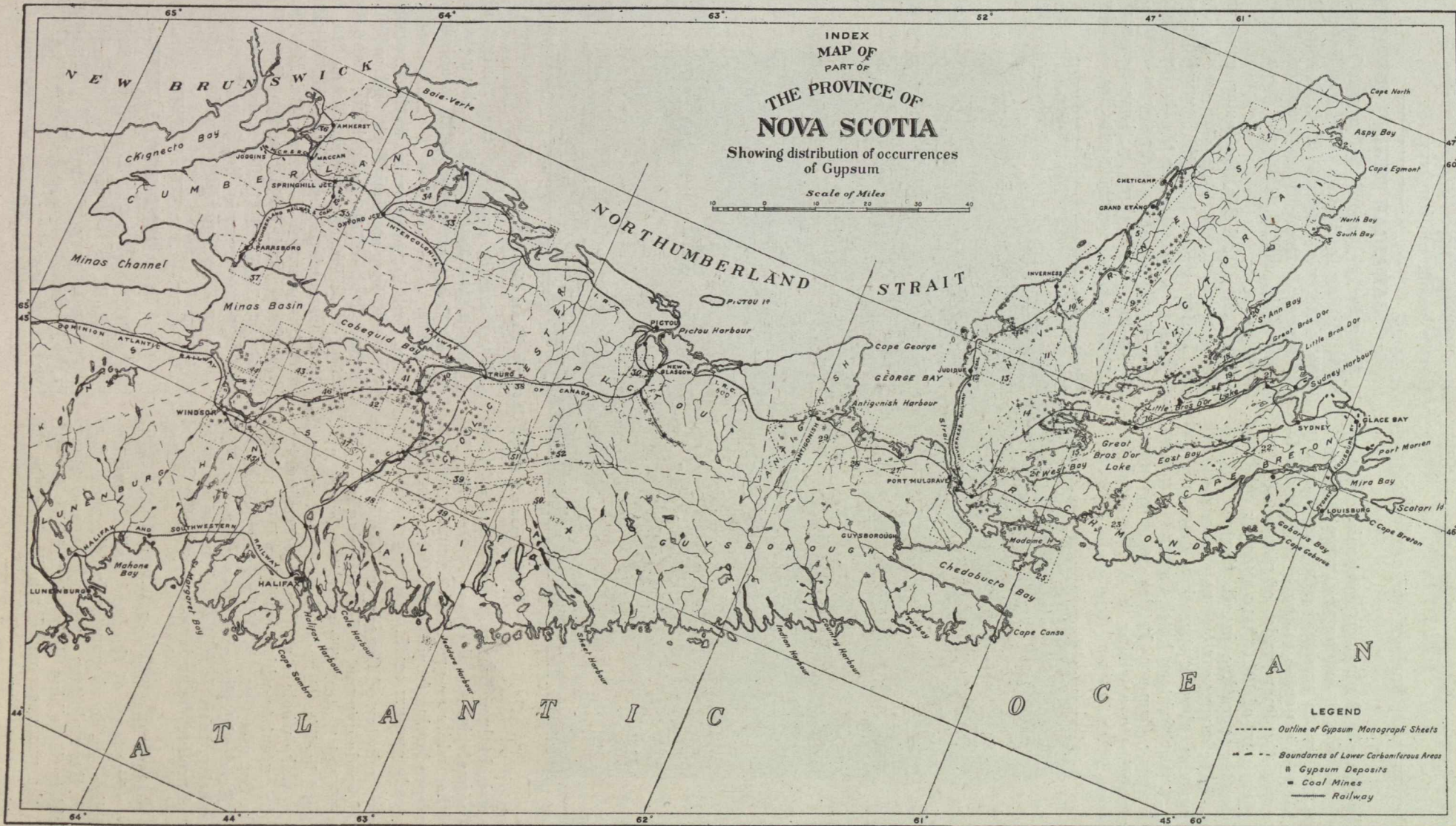
Transparent Selenite

is available. The Mines Branch of the Department of Mines, in 1911, issued a report on the gypsum deposits of the Maritime Provinces. Previous to this, the only descriptions of the gypsums of Canada were to be found as incidental references in the reports of the Geological Survey; the Statistical Division of the Mines Branch, Department of Mines, and the various provincial Bureaus of Mines. The present report deals with the gypsum deposits of the whole of Canada. The

has been made to give some idea of the present condition of the industry, and also of the prospects for future trade.

The report is divided into three parts.

Part 1 deals with general matters relating to gypsum, its properties, theories of origin, and a brief review of the gypsum statistics of Canada, with a few remarks on the trade conditions.



Map showing distribution of occurrences of gypsum in Nova Scotia

NO 646

Part 2 covers the detailed descriptions of the different occurrences in Canada, and of the plants in operation.

Part 3 takes up the technology, and uses of the mineral.

During the year 1912 nineteen companies were engaged in the quarrying or mining of gypsum in Canada. Nine of these companies produced crude gypsum only, most of which was exported to the United States for manufacture into the finer grades of plaster of Paris. During the early part of 1911 there were six calcining plants in Canada, operating, in all, thirteen kettles. At the close of the same year two new plants started, and two companies, already operating, have enlarged their plants, so that eighteen kettles are now running. One plant is using Cummer kettles as preliminary driers, preparatory to calcining in kettles, and two plants are using other types of driers. In three cases

volume of their sales. Concerted effort along this line by all the producers manufacturing in Canada would greatly benefit the industry.

CANADIAN MINING INSTITUTE.

A regular meeting of the Toronto branch of the Canadian Mining Institute was held on Saturday, Dec. 19. Among the guests were O. E. LeRoy and E. Lindeman, of Ottawa; J. Donnelly, of Kingston; E. T. Corkill, of Copper Cliff, and G. Galt, who is on his way to South America.

Mr. LeRoy and Mr. Lindeman gave some account of the work of the committee on the Iron Industry. Mr. LeRoy stated that the committee at present is gathering information for the Government and expects to undertake some investigations in the spring. He asked that the Institute criticize the work of the Department, believing that criticism is helpful.



Cove gypsum quarry, Cheverie, Hants Co., N.S.

the gypsum was obtained from mines and the rest from quarries. The material, in all cases but one, was gypsum rock, either white or grey. The single exception was the small production from British Columbia, which was a high grade gypsum earth.

The gypsum industry of Canada consists, chiefly, in quarrying the crude gypsum, and in shipping it in that state to the United States. There it is calcined, and, in part, shipped back to Canada as a finished product. The industry on the whole is gradually increasing, but, as regards the extent to which calcining is at present carried on in Canada, there is still ample opportunity for growth. Even with the mills already operating at their full capacity, there is still considerable quantity of the finished product being imported from the United States.

It is only recently that any endeavor has been made to place the advantages of the hard wall plasters before the public; yet, by demonstrating the method of application of these plasters, and by means of advertising pamphlets describing their adaptability for different uses, the producers could readily increase the

Mr. Donnelly spoke of the mining activity near Kingston stating that feldspar shipments are large and that there are prospects of the establishment of a pot-ash plant.

Mr. Corkill told of a visit to the Exposition of Safety and Sanitation at New York and called attention to the excellent safety work being done by the New Jersey Zinc Co. He spoke also on the provisions of the Workmen's Compensation Act which goes into force this year. A. J. Young, Col. Hay, Frank Loring, T. F. Sutherland, D. A. Dunlap, E. T. Corkill, W. E. Segsworth, H. E. T. Haultain and James McEvoy, took part in a discussion on the Compensation Act.

The next meeting will be held on Jan. 9, 1915.

DEEP METAL MINE.

The St. John del Rey mine is now 5387 ft. below adit and 5711 ft. in total vertical depth, so that it is the deepest metal mine in the world. The deepest workings in the Tamarack mine in Michigan are about 5430 ft. below the surface.

THE PEACE RIVER COUNTRY

By Martin J. Ravey.

During the past two and a half months I have been through a most remarkable country, full of opportunities awaiting both capital and labor. Eleven years prospecting around the mining camps of Alaska and the Yukon left me with an everlasting impression of the wonderful possibilities offered to those ready to come and settle in the great north-western section of the American continent, but what I saw in those days will not stand comparison with the country I have just returned from. The Peace River country abounds in nature's wonders. Its natural resources are immense. Millions of acres of arable land, intersected with rivers, lakes and streams, which make irrigation totally unnecessary, await settlement. A greater part of this area is practically open and ready for the plow. Peavine, vetches, red top and a variety of other natural grasses grow in the wildest profusion, and the few settlers who have gone in ahead of the railroad speak of the whole country through which I passed as being particularly adaptable for stock raising. One thing which should be particularly advantageous and inducive to rapid settlement is the unlimited supply of game, fish and wild fruits which can be taken with the greatest possible ease.

Throughout the timbered portions of the whole country, moose, deer, bear and antelope roam the woods. They are so numerous and almost tame in certain places that it will not tax the marksmanship of anyone who has learned to handle a rifle to provide all the meat required for the table. The country has almost become overrun with rabbit of a very delicious flavor. The streams abound in wild duck and geese of different varieties, but at frequent intervals I ran into coveys of grouse and prairie chicken.

Fishing is another form of supply for the necessities of life. Whitefish, pike and pickerel of the finest quality, averaging five pounds in weight, can be secured in almost any quantity by using a net in the lakes, while salmon trout, speckled trout, greyling and numerous other varieties of game fish can easily be taken in any of the streams with the use of either fly or bait.

Another very valuable asset is the remarkable quantity of furbearing animals. Many settlers and the native Indians have relied on these as a means of livelihood for many years past. I was very surprised to find such a large number of valuable foxes roving the woods. There were black, silver grey and red specimens. In the Pouce Coupe district a fox ranch has already been established on a profit earning basis. Mink, martin, otter and beaver are also plentiful, and from these trappers also find a most useful source of income. In addition to all these splendid resources awaiting the coming of the settler, capitalists will soon realize that hundreds of profit earning investments are calling for capital, not only to develop the agricultural possibilities, but to open up mineral wealth.

Coal, gas and oil are known to exist. Large areas are underlaid with coal seams. At various points along the banks of the rivers settlers are able to collect large blocks of coal afloat, and all they have to do is to haul it to their cabins for fuel purposes, thus entailing less labor than wood splitting.

Leaving Vancouver the first week in July, I first went into the Albertan oil fields. The rush and excitement that followed the finding of oil in the Dis-

covery well near Okotoks had somewhat fallen off, but some drilling was being done.

After leaving the Albertan fields I spent seven weeks on foot and raft in the vicinity north-west of Edmonton, covering a distance of about fifteen hundred miles going in via Grand Prairie, by way of Edson, through Pouce Coupe, Nose Mountain, Pine River Pass, on to Fort St. John and Peace River Landing, down to Grouard, at the head of Lesser Slave Lake, thence into Edmonton. Throughout the trip I took every opportunity of making detours off the main route. The natural resources in that territory are really surprising. Like many other parts awaiting settlement, the only thing lacking is transportation, but this is practically an assured fact. The lines of no fewer than four companies coming from the east have already been surveyed and partly constructed, while communication with British Columbia is promised as soon as details have been completed in connection with the line which will eventually run from Bella Coola through Pine River Pass, to the heart of the Peace River Country, and out to Hudson Bay. Government surveyors who have reported on the district are agreed that this route will afford the shortest way, with the lowest grade, for all the great north-west products, which in a few years will have to find an outlet to the markets of the world via a Pacific Coast port.

This being practically a virgin country, a traveller naturally has many obstacles to overcome. The Government wagon road, between Edson and Grand Prairie, a distance of roughly 240 miles, is fairly good in places, but has suffered from exceptionally heavy freighting between those points, but the settlers despite these obstacles are all highly pleased with the prospects.

After passing Grand Prairie, I went through an undulating country for about eighty miles to Pouce Coupe. Along this stretch about seventy-five per cent. of the land is open prairie ready for the plow, and the balance made up with scattering bluffs of poplar and spruce.

Several mills are already at work preparing lumber for building purposes, most of the timber being brought in from the heads of the streams in the surrounding district.

On my way I passed trading posts at frequent intervals, but none of them at the present give one the idea of developing into cities of the future, although Grand Prairie commands a position which should make a natural trade centre, capable of looking to the interests of settlers for many years to come, especially in view of the fact that the railroad magnates have already chosen this position as a divisional point.

The settlers who have thus far blazed the trail are chiefly drawn from the Anglo-Saxon race, many of them being either new arrivals from the Old Country or descendants of the United Loyalist stock from the east, both of which include a good percentage of the military type who acquired their land from South African scrip.

Leaving Pouce Coupe I continued my journey through the Nose Mountain country across the Cut Bank River, over the foothills into Pine Pass, through the Rockies, to within a few miles of a point I had reached last summer when making a trip from Bella

Coala over the proposed route of the Hudson Bay and Pacific Railroad. Excellent as the agricultural and mineral possibilities are from the coast inland to this point, I really believe the further one goes into the Peace River country are the indications the more encouraging. In addition to the farming prospects, mineral, oil, coal and gas are found here. Along the stream and river banks outcroppings of lignite and bituminous coal are in evidence, while in the foothills good anthracite has been found. To this end limited coal areas have already been secured by the C.P.R., C.N.R. and other railroad companies operating in the district.

While I was in this district I met an old Klondike friend, who had accompanied a party of Indians to a point near Nose Mountain. These Indians said they had known of the existence of gas there, which although they had never lighted it, they called the "Boiling Spring," on account of the rush and disturbance made by the gas escaping, which swept everything before it. On my way in this flow of gas was ignited and burst into flames, and it was still burning when I passed on my return journey.

I returned to the Coast by way of Peace River Landing. From the Rockies I journeyed over a north-easterly trail to the Peace River and after a very arduous trek arrived at a point near Fort St. John. Finding that the river here was not running at more than four and a half miles an hour, I decided to make the trip to Peace River Landing by a raft, which I knocked together with a few nails and rope. This fragile craft served to carry me by night and day to my destination. With the exception of two slight sand bars, the river along this stretch is quite easy to navigate, in fact, I found the going so good that I was able to sleep on the raft at night, floating down stream with but one interruption, when the raft made a bad bump at a sharp curve and ran into the bank.

At a very small expense the sand bars on the Peace can be removed and make the waterway open for steamboat traffic, while even to-day boats of light draught can easily be taken down stream.

Stopping at Dunvagen I was disappointed to find that the much talked of town is practically at a standstill. None of the settlers nor railroad men there have much confidence of this point developing into an important business centre. They claim that there has been far too large an area subdivided, the outlying districts being many miles from the line of the projected railway.

My next important stop was at the Peace River Landing, where a lively little city is springing up with great activity. Here the ranks of the pioneers have recently been swelled by the coming of hundreds of new settlers in advance of the railroad, which is now being constructed with all possible speed, along the banks of Lesser Slave Lake to this point. As a strategic and commercial centre this town has great possibilities, being surrounded by an extensive territory, naturally adaptable for stock-raising and agricultural pursuits, while its mineral wealth cannot fail to make fortunes for some.

From here going directly south over eighty miles of splendid agricultural country, I came to Grouard, a little town at the head of navigation on the Lesser Slave Lake, which, considering it is several miles off the railroad now being constructed by J. A. McArthur, of Winnipeg, has made tremendous strides since last summer, and the settlers there are confident that before long a second railroad will tap this section of the country and bring the present town of Grouard into direct

communication with Edmonton, thereby giving the town access to all the markets of the Dominion and the States.

My journey from here to Edmonton was made over the Lesser Slave Lake, through Sawridge, a town at present at the head of steel and naturally bustling with enthusiasm. Tourists and prospectors making Edmonton their base should not miss the opportunity of taking a trip over the Lesser Slave—one of the most picturesque stretches of water I came across in all the fifteen hundred miles I travelled on foot.

COBALT SHIPMENTS.

The ore shipments for the week ending Dec. 25, were:

La Rose	85,300
Mining Corporation of Canada—	
Townsite City	172,820
Cobalt Lake	64,600
McKinley-Darragh.	73,610
O'Brien.	62,730
Dominion Red. Co.	84,700
Timiskaming.	83,500

544,960

Bullion shipments for the week ending Dec. 25th, were:

	Bars.	Ounces.	Value.
Nipissing.	208	241,192	\$117,882
*Crown Reserve ..	68	69,000	34,500
Crown Reserve ..	14	15,800	7,500
Dom. Reduction .	41	46,371	23,050
Drum-Fraction. . .	4	4,956	2,478
	335	376,519	\$185,440

*Shipped from Deloro.

The bullion shipments for the year to date are as follows:

	Ounces.	Value.
Nipissing.	4,381,918	\$2,995,984
Buffalo.	791,319	454,249
Crown Reserve	627,072	338,202
O'Brien.	294,552	150,422
Dom. Red. Co.	519,267	281,562
Kerr Lake	54,944	28,133
McKinley-Darragh.	12,176	6,356
Foster Ls. Co.	2,187	1,141
Penn. Canadian	9,237	5,887
Casey Cobalt	2,893	1,484
Trethewey.	2,000	1,200
Timiskaming.	1,951	1,033
Bailey.	1,462	763
Hargraves.	794	414
City of Cobalt	28,724	16,148
Caribou Cobalt	165,608	87,316
La Rose	55,867	29,068
Townsite City	17,163	8,947
Drummond Fraction ..	4,956	2,478
Total.	7,779,556	\$4,245,900

Some copper music dies worth more than \$1,000,000 have been commandeered at Leipzig by German military authorities to be melted to make gun mountings, shells, caps and dies.

Nipissing Mines Co. declared regular quarterly dividends of 5 per cent., payable Jan. 20 to stock of record Dec 31. Books re-open Jan 18.

THE DISTILLATION OF COAL*

By F. C. Lucas.

Coal is a complex mixture of hydrocarbons which practically defies analysis, except as to its ultimate composition, yet from it we get a greater variety of products than from any other known substance, and it is only by destructive distillation that these products may be obtained.

The distillation of coal was first started with the idea of securing gas for illuminating purposes, and coke for metallurgical work, although it did not occur to the pioneers in this work that the two processes might be carried on at one and the same time. In the manufacture of gas, the coke was a by-product, and in the manufacture of coke, the gas was a by-product, and in both cases these by-products were regarded more in the light of necessary evils than as valuable sources of income. Even at this late date, 100 years since coal gas was first made for public use, and about 80 years since coke was made in large quantities for metallurgical use, gas plants in many cases have difficulty in disposing of their residual coke, and many coke plants are letting all their gas go to waste in the air, with all the other valuable by-products which might be recovered.

At present the distillation of coal is carried on for three main purposes, viz., the manufacture of illuminating gas, the manufacture of coke and for the recovery of oil. The latter refers more particularly to the highly bituminous shales. While the aim in each of these processes is to recover a different main product yet there are other products or by-products, which are of such value as may often return the capital cost of the whole plant in a very few years. Until the last few years each of these processes has been carried on separately. The manufacturers of gas did not make coke of such quality as could be used for metallurgical purposes nor did the coke maker, if he saved the gas at all, take care to make it of such quality as to be suitable for illuminating purposes.

In the manufacture of illuminating gas, it has been the general practice to distill, or carbonize, the coal in small lots in sealed retorts, these retorts being heated by burning a portion of the resultant coke. The remainder of the coke has been sold to whoever would take it for fuel purposes. In the early practice, when the retorts and settings had not reached their present highly efficient state, the yield of gas was low; partly because of the low temperature, and partly because of the losses due to the inefficiency of the plant. In order to make the gas saleable it was necessary to take out the tar and ammonia and sulphur, and in the early days of the process all three products were wasted, and almost the same may be said of some of the smaller gas plants of the country to-day.

Beehive Oven—The early history of coke making, and also the present state of a large proportion of it in America, equals, or excels, in wastefulness anything else the country has ever seen. The earliest attempts were made by piling the coal in mounds and covering it with sods wet straw and earth and burning the gas off in the same manner as charcoal has often been made. This process was modified and a brick oven was made practically the same shape as the original mounds, with a hole in the top to let the gas escape.

By this process not only is a portion of the coal burned up to heat the oven, but the gas with all its valuable by-products is allowed to go to waste. Strange as it may seem, more than half the coke in America is still made by this process.

Waste Heat Oven—The next step was to build what is known as a waste heat oven. In this type the ovens are sealed so that there is no loss of coal by burning or direct loss of gas to the air. All the gas escapes into flues in the side walls of the oven and is there provided with the necessary air for combustion, thus supplying the heat necessary to carbonize the charge of coal in the oven. The hot gases on the way to the stack are passed under boilers and so provide steam; truly a great advance over the early Bee-hive oven, but still wasteful in so far that all the by-products in the gases are destroyed.

By-Product Oven—The next step was in the building of an oven providing for the recovery of the gas and all other by-products, viz., Tar, Ammonia, Benzol and Cyanides. If the gas is used for such purposes that it is necessary to extract the sulphur, this may be recovered for the manufacture of sulphuric acid, which is in turn used for the recovery of the ammonia in form of ammonium sulphate.

In the by-product oven the coal is distilled in a sealed chamber, the walls of which contain a number of vertical or horizontal flues similar to those in the waste heat oven; but instead of the gas going directly from the oven into these flues it is drawn off into mains and put through apparatus for the extraction of the tar, ammonia and benzol, and a portion of it varying from 45 to 60 per cent., according to conditions, is returned to the ovens and burned in the oven wall flues to provide the necessary temperature for distillation. The remainder of the gas may be used for any purpose required, such as heating furnaces, steel furnaces, illuminating purposes or steam raising or for use in gas engines. The quantity of gas and other by-products recovered is to a great extent dependent on the per cent. of volatile matter in the coal, but in the principal coals of Nova Scotia the yield is fairly high. Tar about 10 gallons per ton of coal, ammonia 5-6 lbs. or 20-24 lbs. recovered as sulphate, and 11,000 cubic feet of gas of which 5,000-6,000 would be surplus or over and above the quantity required to heat the ovens. When the gas is intended to be used for illuminating purposes it is general to install two collecting mains on the ovens so that the richer portion of the gas, containing the greater part of the illuminants, which comes off from the coal during the earlier hours of distillation, may be kept separate from the leaner gas which comes later. The leaner gas is used for heating the ovens and the rich gas is of such high quality as to be suitable for distribution for illuminating purposes without any further enriching. After the ammonia and tar are recovered, it is passed through oxide of iron purifiers and is then ready for distribution. In this case the benzol would not be recovered as it is one of the principal illuminants in the gas. The lean gas is treated in the same manner as the rich for the extraction of tar and ammonia, but is not purified before being burned in the oven flues.

*A paper presented at the Annual Meeting, Mining Society of Nova Scotia, Sydney, 1914, and published in the Bulletin of the Canadian Mining Institute.

If the gas is to be used for any of the other purposes mentioned, it may not be necessary to extract the sulphur. For gas engine practice, it used to be considered necessary to have the sulphur content reduced to a minimum, but I believe that there are engines on the market now that do not demand such purification. If the ultimate aim is the generation of power, it is beyond doubt more economical to use gas directly in internal combustion engines rather than burn it under boilers. Considering the fuel value of the gas and the power obtained by burning it under boilers and using the steam in the most economical engines 12 per cent. efficiency would be high even if the gas was burned in the latest type of flameless combustion boilers the makers of which guarantee over 90 per cent. thermal efficiency but in the internal combustion engines 30 per cent. efficiency is possible. In certain localities or under certain conditions it may be desired to reserve the total gas obtained from the distillation of the coal for use other than on the ovens. In such cases gas producers are provided and coke breeze or low grade non-coking coal is used to generate gas for heating the ovens. The gas producers may also be equipped with apparatus for recovery of ammonia. As a matter of fact the quantity of ammonia recovered per ton of coal is far greater in gas producer practice than in ordinary gas or coke practice because in the latter a large proportion of the nitrogen in the coal is retained by the coke and part of that which is liberated and unites with hydrogen to form ammonia is afterward broken up by the high temperature in the oven.

With regard to the other coal by-products viz. tar, ammonia, and benzol, there are a great many different types of plant for their recovery, but it is not my purpose to enter into a detailed description of these plants, or discuss their respective merits.

Tar Products—Tar is of itself such a complex substance and has so many by-products which may be obtained by further distillation, that it would be almost impossible to enumerate them, but the most commonly known of these products may be mentioned, viz., pitch, which is the hard residue after the volatile constituents have been distilled off and creosote and other oils. I do not know that there is any unalterable standard or analysis to which creosote oil must conform, but the different oils extracted from the tar are many, and from these in turn may be distilled other products down to drugs and perfumes. The value of creosote oil as a wood preservative is so well known that I need not dwell at length on it except to say that since the price of lumber for railroad ties, pit props, bridge timber, etc., has practically doubled in the past fifteen years and that creosoted timber will last many times longer than the ordinary timber, it seems as if it would be profitable to have a more general use of preserved timber in such work.

The lighter oils derived from the distillation of tar are used as solvents for rubber, and fuel for internal combustion engines as well as providing the base for many of the finer products before mentioned.

The main use for the pitch at present manufactured is as a binder for coal briquettes. The briquetting industry has grown to very large proportions in Europe, and in recent years has received a good start in this country; several plants having recently been constructed in Cape Breton alone. There is no doubt that this industry will grow quite as fast as the market can supply it with pitch, for the advantage of burning briquettes instead of fine coal has been so conclusively

proven that it is likely to be only a question of time until the demand will be such that colliery owners will be forced to briquette the fine coal which may not be used for coking. Pitch is also used in considerable quantities for roofing as well as a substitute for asphalt in road making. It is also used as the base of paints, particularly for covering iron work.

The undistilled tar may also be used for various purposes, although it is better to have it heated long enough to expel all water. A large quantity is used in the preparation of paper and felt roofing. It has also been proven that tar may be used in the Diesel engine with very great success. It is also used as fuel under boilers and in various kinds of heating furnaces. One purpose for which tar is often used, and it might be well if such use was more extended, is coating roads. After the road has been built and properly shaped up it is sprayed with tar. A clay road well rounded and ditched and sprayed with tar is not only dustless in dry weather but mudless in wet weather and the cost of applying the tar is very small when compared with the improved state of the roads so treated.

Ammonia may be recovered from the gas in several forms, such as concentrated liquor for refrigeration purposes, ammonium chloride and ammonium sulphate, but in general practice the bulk of it is recovered in the latter form; the ammonia gases being either directly absorbed by a dilute sulphuric acid bath or first absorbed by water, which is in turn distilled to give off the ammonia for absorption by the acid. The principal use for ammonia sulphate is as a fertilizer and the market for sulphate of ammonia for this purpose is like that for all artificial fertilizers, widening each year.

Benzol—The recovery of benzol from the gas is becoming more imperative each year as the number of internal combustion engines increases. The bulk of the world's production at present is used in automobile engines. Benzol is not only a substitute for, but it is better than gasoline. Repeated tests have proven that a given quantity gives from 15-20 per cent. greater mileage than gasoline. A considerable quantity of benzol is also used by retort gas plants for enriching their gas and bringing it up to the required standard of candle power. More of it with zylol and toluol recovered at the same time, is used by manufacturers of rubber as a solvent. Most of the coke oven plants of Europe recover the benzol from the gas and I do not think it will be long before every coke oven plant will recover this product; except in such cases where the gas is used for illuminating purposes and a high candle power standard has to be maintained.

The Cyanides may also be recovered by a fairly simple process, but hitherto the market for cyanide compounds has not warranted the installation of many plants for their recovery. However, there is a further process now being tested with every prospect of success, which aims to recover the cyanides and then convert their nitrogen into ammonia, which will then be recovered in the usual form as sulphate.

Sulphur.—If it is necessary to purify the gas from its sulphur content before using it, the sulphur may be saved as a further by-product and used for making the sulphuric acid necessary for the recovery of the ammonia as sulphate. In this process the gas is passed through boxes containing layers of bog ore which retains the sulphur. The ore layers are changed from time to time, the foul ore lying exposed to the air for a time, and it can then be used over again. This may be kept up until the ore will contain up to 45-50 per

cent. of metallic sulphur; making a very valuable as well as a very easily worked sulphur ore.

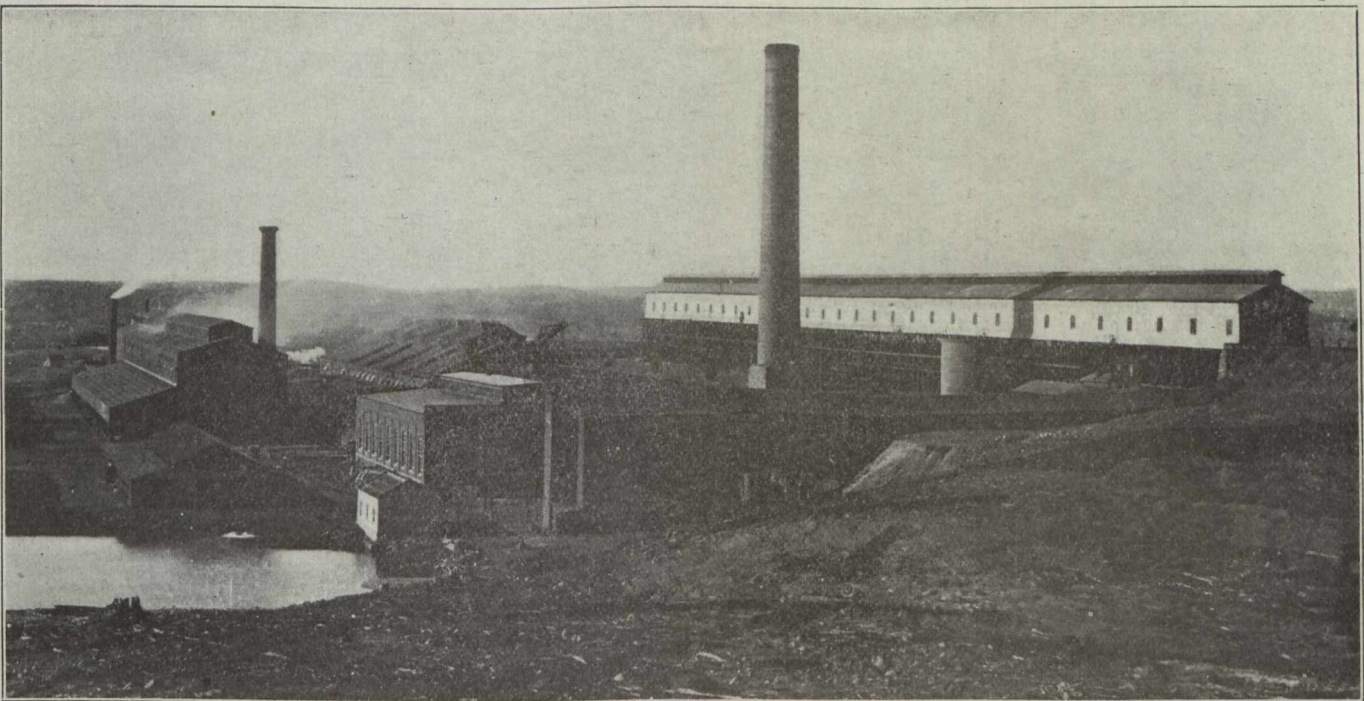
Advantages—The whole question of the most economical consumption of coal, which I believe, must begin with destructive distillation, is far too large to be dealt with at all fully in a single paper, and I can only call attention to some of the facts as they exist, and make mention of some of the things that would seem to be possible if all the coal consumed in Nova Scotia was used with the greatest degree of economy.

It would seem to me to be quite within the range of possibility that coal might be subjected to destructive distillation at the various mines or in the larger centres of population, that all cities and larger towns could have gas supply for cooking, heating or lighting at a price not exceeding half of that charged by any gas plant in Canada to-day. The gas may be conveyed for a hundred miles or more in pipes if the market conditions warranted.

NICKEL EXPORT.

That the International Nickel Company, the chief source of the world's supply of nickel obtained from Canadian ores, has no European "entangling alliances" and never had any; that it has been and is working in accord with the Imperial and Dominion Government suggestions, and will continue in this harmonious operating relationship; that it has complied with every official requirement designed to keep nickel from reaching the enemies of the allies, and even from neutral nations since the Imperial and Dominion Governments at the beginning of the war intimated their wishes, has been asserted by the issuance of the following:—

"To the Canadian Public.—In view of the widespread comment in the Canadian daily and technical press as to the destination of shipments of nickel made and being made by the International Nickel Company and obtained from material of Canadian origin, as well as the references to a European controlling influence in its affairs,



Canadian Copper Company's smelter at Copper Cliff, Ont.

That every city and town and also most of the rural districts could be supplied with electric power practically as cheap as that supplied throughout the Niagara Peninsula of Ontario by the Hydro-Electric Company.

That the roads of Nova Scotia might be as good as any in the world if they were properly prepared and treated with tar from the distillation of coal.

That practically all smoky stacks could be got rid of by using, where solid fuel is necessary, coke and briquettes made from the fine coke dust and low grade coals unfitted for distillation.

That, in view of the fact of the coal deposits of Nova Scotia being so large and so widely distributed, there is no good reason why, if something was done along the lines suggested, Nova Scotia should not be one of the richest and at the same time the greatest manufacturing province of the Dominion.

According to a North Bay despatch an important mineral discovery has been made at Rutherglen, 20 miles from North Bay.

the company begs to submit to the Canadian public the following statement of facts:

"1. There is absolutely no influence exerted in the conduct of the affairs of the company or of any of its subsidiaries, by any European steel manufacturing or similar industry, nor by any individual connected with them, nor by anyone in European financial circles.

"2. Full information as to the destination of shipments of nickel made by the company has been in the possession of the Dominion authorities since the outbreak of the European war, and they are currently kept cognizant of all exports of nickel, as well as of all local shipments made by the company.

"3. While recognizing that refining at the point of production, i.e., the mines, is the ideal condition, economic conditions, seriously affecting cost of production, have dictated the present location of nickel refining, and with the present state of the art, any material change in such economic conditions would react in a manner most detrimental to the Canadian nickel industry.

"The International Nickel Co.,

"A. MONELL, President."

CONIAGAS MINES, ANNUAL REPORT

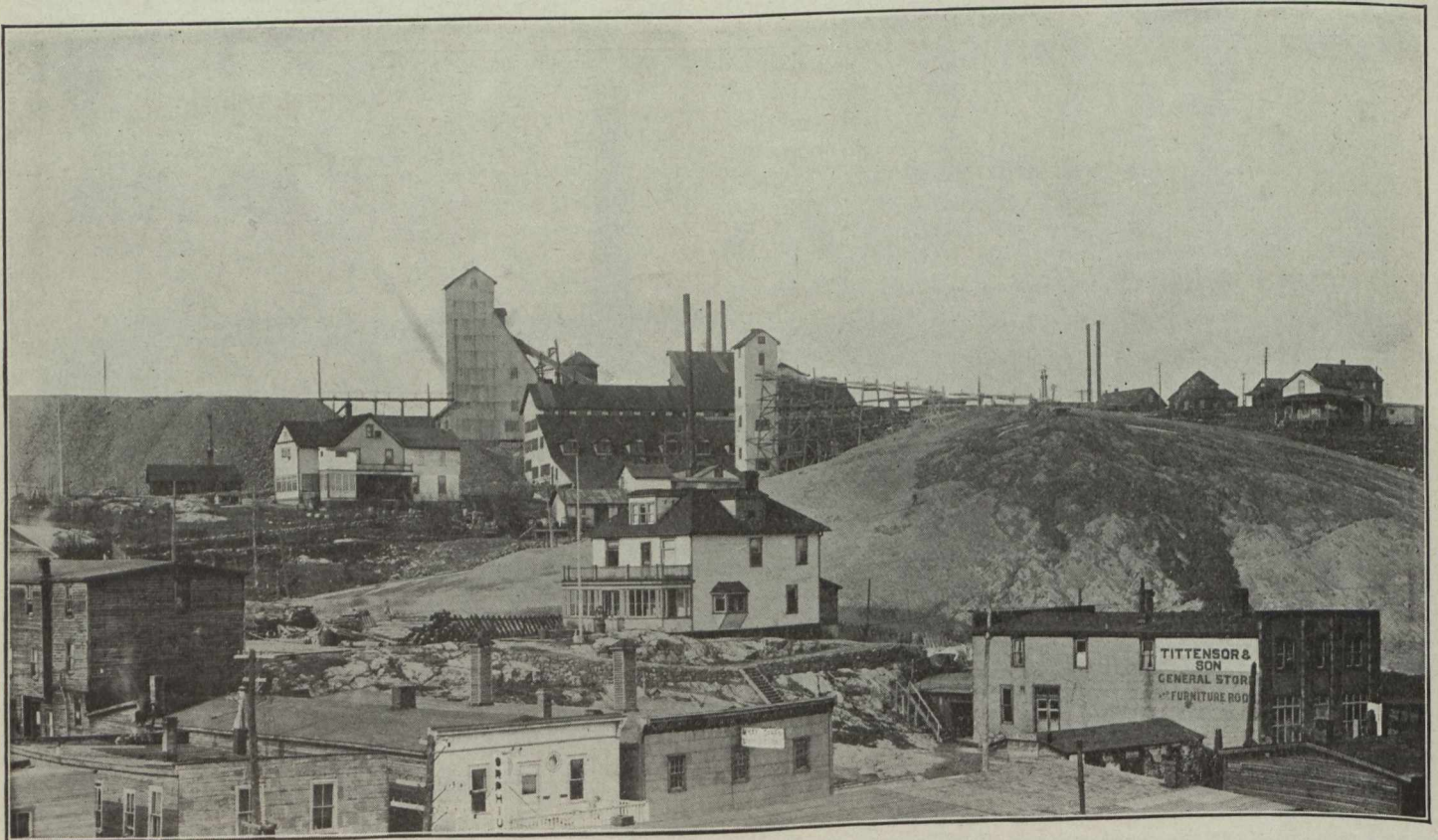
The report of the Coniagas Mines, Limited, for the year ending Oct. 31, 1914, has been issued. President R. W. Leonard says:

Operations for the year ending October 31st last have not been so prosperous for the company as the preceding three years, owing to the low price of silver, the dislocation of business caused by the war, and largely to the diminishing output of high grade ore sacked in the mine, making the silver shipped more dependent on the capacity of our concentrating plant than in previous years.

The year's operations must be considered as satisfactory under the outlined conditions. No reduction in force or rates of wages has been made.

The total shipments of silver from this property aggregate over 20,000,000 ozs. The estimates of additional reserves of ore in sight are about 1,325,000 ozs. less than the shipments for the year. No valuable discoveries have been made during the year on outside claims staked by the company.

The Coniagas Reduction Company, owned by the Coniagas Mines, Ltd., has treated all the ore from the mine, and some customs ore, and is in excellent physical condition, running constantly, employing an average of 166 men; but the low price of silver and the restricted market for by-products has necessitated heavy banking accommodation, which has been taken care of by the mine.



GENERAL VIEW OF SHAFT HOUSE AND MILL, LOOKING WEST

In the future we may hope for better prices for our silver, for a better demand for the by-products of our smelter, and must trust to the results of further development underground showing up high grade ore in ground as yet undeveloped, though promising.

During the year, in addition to the dividend and bonus paid on November 1, 1913, of \$560,000, the mine paid the following:

February 1st, 1914	\$360,000
May 1st, 1914	360,000
August 1st, 1914	360,000

and declared a quarterly dividend payable November 1st, 1914, of 6 per cent., which amounted to \$240,000.

The dividends paid to October 31st, 1914, make a total return to the shareholders since incorporation in November, 1906, of \$7,000,000, and the ore reserves as estimated by Mr. Rogers amount to 11,904,000 ozs.

The total silver shipments from the mine during the year amounted to 2,497,394.88 ozs., which was contained in 484.88 tons of mine ore, and 688.44 tons of concentrates (dry weight). This ore was mined and concentrated at the mine at a net cost of 12.444c. per oz., as compared with 8.776c. per oz. for the previous year. This cost includes all overhead expenses, royalties, and all other expenses exclusive of shipping, smelting, refining and marketing charges, which amounted to 3.585c. per oz. of silver, as compared with 4.321c. for previous year.

The average price received per ounce of silver was 56.75c. as compared with 60.55c. for previous year.

Mr. R. P. Rogers, assistant to the President, reports in part as follows:

The total tonnage of ore milled was 54,522 or an average of 2.93 tons per stamp for 24 hours, as compared with 54,890 tons, averaging 2.95 tons per stamp, for the

previous year. There were 496.4 tons of high grade concentrates shipped, and 251.8 tons of low grade slime, the former averaging 2,030 ozs. per ton, and the latter 151 oz. per ton, mill heads averaging 24 oz. per ton, as compared with 28.3 for the previous year.

The sand tailings from the mill averaged 3.18 oz. per ton, and the slime tailings 6.66 oz. per ton. The average of general tailings was 4.21 oz.

There was a total of 493 tons of mine ore shipped, which averaged 2,944 oz. per ton. Development work during the year has been confined mostly to following up small veins in older portions of the mine, continuing T. crosscut on third level, southerly to connect with No. 4 shaft and sinking No. 4 shaft to our fourth level.

All work in stopes and drifts, also broken rock on stulls in mine, is shown on accompanying plans and sections. The broken rock on stulls has been increased by 43,000 tons during the year.

	Mine Ore	Concentrates	Total Ozs. Silver Shipped	Total Ozs. Silver paid for
1st Quarter. . . .	361,625.92	205,849.48	567,475.40	538,865.53
2nd Quarter. . . .	360,234.01	224,891.74	585,125.75	555,543.87
3rd Quarter. . . .	369,671.26	291,117.14	660,788.40	628,281.65
4th Quarter. . . .	359,991.08	324,014.05	684,005.13	650,818.07
	1,451,522.27	1,045,872.41	2,497,394.68	2,373,509.12

Year, Nov. 1 to Oct. 31	Total Shipments From the Mine.					
	Mine Ore		Concentrates		Total	
	Tons	Ozs.	Tons	Ozs.	Tons	Ozs.
1905-06 . . .	289	657,513	.....	.....	289	657,513
1906-07 . . .	2,655	1,341,372	.....	.....	2,655	1,341,372
1907-08 . . .	Mine Ore and Concentrates				627.5	1,457,240
1908-09 . . .	350	807,253	426	599,975	776	1,407,288
1909-10 . . .	330.1	979,630	645.5	949,901	975.6	1,929,531
1910-11 . . .	619.1	2,142,961.71	1,418.4	1,646,312.20	2,037.5	3,789,273.91
1911-12 . . .	650	1,944,212.80	1,287.5	1,564,164.47	1,937.5	3,508,377.27
1912-13 . . .	735.8	2,249,394.32	1,034.30	1,323,004.56	1,770.10	3,572,398.88
1913-14 . . .	492.9	1,451,522.27	748.2	1,045,872.41	1,241.1	2,497,394.68
	6,121.9	11,573,859.10	5,559.9	7,129,229.64	12,309.3	20,160,388.74



THE CONIAGAS REDUCTION COMPANY, LIMITED
Smelter and Refineries at Thorold, Ontario

Development of new ore bodies during the year is estimated at 1,072,000 oz., shipments being 2,497,000 oz.

Ore reserves to October 31st, 1914, are estimated as follows:

2,461 tons high grade ore at 3,000 ounces	7,383,000
605 tons high grade ore at 2,000 ounces	1,210,000
151,250 tons mill rock (in place) at 20 ounces	3,025,000
52,125 tons broken ore on stulls in mine at 40 ounces	2,085,000
43,100 tons broken ore on stulls in mine at 20 ounces	862,000
10,500 tons mill rock on surface dumps, at 30 ounces	315,000
Total	14,880,000

Allowing 20 per cent. for possible over-estimation would leave an ore reserve on the 31st of October, 1914, of 11,904,000 oz., which I consider a conservative basis on which to estimate for the ensuing year. The estimates are based on careful surveys made by R. E. K. Neelands.

The following was the quarterly output of the mine for the fiscal year in ounces of silver, all of which was shipped to the Coniagas Reduction Company, Ltd., at Thorold:

Work done to date and work done during the year ending October 31st, 1914:

	Total to Oct. 31st, 1914	Total to Oct. 31st, 1913	Work done during 1913-14
Ounces			
Shaft sinking, feet	802	610	192
Drifting, feet	15,982	14,939	1,043
Crosscutting, feet	6,805	5,899	906
Winzes, feet	519	441	78
Raises, feet	895	819	76
	25,003	22,708	2,295
	Tons removed since beginning of operations to Oct. 31st, 1914		Tons removed during 1913 and 1914
Cross Cutting and waste	35,293	27,914	7,379 Barren Rock
Drifting	52,846	49,271	3,575 Pay Rock
Stoping	249,395	198,592	50,803 Pay Rock
Open Cutting	4,780	4,780	..... Pay Rock
Shaft Sinking	2,554	2,265	289 Barren Rock
Winzes and Raises	4,151	3,602	549 Pay Rock
	349,019	286,424	62,595

Ore Milled in Tons to October 31st, 1914.

Total to Oct. 31st, 1914	Total to Oct. 31st, 1913	Milled during 1913-14
282,127	227,605	54,522

Surface Dumps.			
Remaining Oct. 31st, 1914	Remaining Oct. 31st, 1913	Removed during 1913-1914	
10,500	10,500	.....
Milling Ore and Rock Hoisted, Tons.			
	Total to Oct. 31st, 1914	Total to Oct. 31st, 1913	During 1913-1914
Milling Ore	282,127	227,605	54,522
Waste Rock	39,701	32,121	7,580

During the year we have started operations at our No. 4 shaft. The shaft house and hoist house have been erected, and shaft about completed to our fourth level. This shaft is located in the Town of Cobalt, and the necessary mining operations will necessitate the removal of many buildings which have been erected by those who purchased surface rights. I would recommend that most of our prospecting for the coming year be carried on through this shaft. I consider prospects very favorable for discovering valuable ore bodies in this vicinity during the coming year. From the estimate of ore reserves it will be seen that there is a considerable increase of mill rock in place, this is mostly accounted for by many of the stopes being wider than estimated on in my last report. The broken rock on stulls in mine and mill rock on surface dumps is sufficient to keep concentrating mill running at its present capacity for about two years without breaking any new ore.

We now have a total of 42 houses on the property which are owned by the company and rented only to employees. The total rent for those houses amounts to about \$330 per month and rents are so adjusted that the capital invested with interest will be returned to the company.

The sleep camps and dining room have accommodated an average of 54 men, charge for such accommodation being 60c. per day per man, though the cost to the company has been 75c.

On January 27th the majority of underground employees went on strike without giving the management due notice. Operations underground were affected for two days when full force were put on, but 30 of the former employees were not taken back. With the exception of this slight interruption, there has been no serious delay.

In conclusion I might say that the output of the mine for the coming year should be about equal to the year covered by this report.

GREAT NORTHERN ORE.

That after January 1 M. A. Hanna & Co. will handle the output of practically all Great Northern Ore properties, means that the cancellation of the Steel Corporation lease will cause little delay in marketing Hill ores.

Great Northern starts its career as an independent seller of ore in competition with other Lake Superior ores at a poor time. The steel industry is at present operating around 35 per cent. of capacity, iron ore prices are very low and the prospects for 1915 are not encouraging by any means.

It is estimated that the Steel Corporation shipped 6,000,000 tons, minimum requirement, and 440,463 tons additional from the Hill mines in 1914, equivalent to over 30 per cent. of combined shipments by United States Steel of approximately 17,000,000 tons. Great Northern Ore trust cannot ship a large tonnage of ore in 1915, and margin of profit per ton on what it can sell will be narrow in comparison with the profit derived from sales to United States Steel.

The 1914 sales of 6,440,000 tons of iron ore would be sufficient to supply total normal requirements for four of the country's largest independent steel companies, namely, Republic, Lackawanna, Bethlehem and Cambria. On present curtailed output of steel, the annual requirements of these four companies would be not much over 3,500,000 tons. From this it is evident that sales of Hill ore will be greatly restricted unless there is a substantial improvement in the steel industry.

DOME.

Dome Mines' November production was slightly under the October figures, which constituted a monthly record. However, the value of the gold produced was higher, and indeed was only exceeded in value by the production of three other months in 1914, or six other months in 17 months.

The record of the Dome for the past seventeen months is as follows:—

	Tons Milled.	Value Gold Produced.	Value Per Ton.
1913.			
July.	11,150	\$75,958	\$6.81
August.	10,728	67,660	6.31
September.	10,790	70,135	6.50
October.	12,370	118,000	9.53
November.	13,820	121,150	8.76
December.	13,740	106,904	7.93
1914.			
January.	13,900	111,500	8.02
February.	12,010	69,000	5.74
March.	14,979	87,657	5.85
April.	14,770	97,454	6.59
May.	16,180	62,109	3.83
June.	18,250	83,421	4.51
July.	19,780	82,984	4.19
August.	20,170	90,893	4.50
September.	21,940	99,301	4.52
October.	22,500	95,880	4.70
November.	22,040	96,770	4.39

SPELTER.

According to the Boston News Bureau the present advance in spelter is not difficult to understand when it is realized that Germany, Austria and Belgium, whose mines and smelters ordinarily produce 50 per cent. of the world's output, are now either shut down or have seriously curtailed operations. The result is that the United States, the largest individual producer, has had its surplus stocks licked up by an insistent foreign demand which shows no sign of abating. Fortunately the domestic demand is comparatively quiet owing to the depression in the steel business.

Great Britain, which consumes a very large amount of spelter, but produces little, is hardest hit, as ordinarily she depends on continental Europe for a large portion of her supply. For example, in 1913 Great Britain consumed 215,000 tons of spelter and produced but 65,000 tons.

The following table shows production and consumption of spelter by countries in 1913 (tons):

Country.	Production.	Consumption.
United States	347,000	295,000
Germany and Austria	330,000	300,000
Belgium.	218,000	84,000
France and Spain	78,000	96,000
Great Britain	65,000	215,000
Russia. . . . .	.....	37,000
Miscellaneous.	52,000	40,000
Total.	1,090,000	1,067,000

CONSOLIDATED MINING AND SMELTING CO., OF CANADA, ANNUAL REPORT

The report of the Consolidated Mining and Smelting Company of Canada, Limited, for the year ending September 30th, 1914, has just been issued. President Matthews says:

The net profit, after writing off \$193,149.69 for depreciation, amounts to \$474,012.24, out of which four dividends (a total of 8 per cent.), amounting to \$464,376, have been paid, leaving a balance of \$9,636.24, which, added to the balance at the credit of the profit and loss account as shown last year, makes a total of \$1,727,286.73 at the credit of that account. The property account has been increased during the year by the sum of \$283,422.31, which includes the cost of claims adjoining the Rossland properties and the Sullivan group, and stock in the Silver King Mines, Limited, together with a portion of the amount expended on the development of the Sullivan, Silver King and other properties which had not commenced shipments, or which only shipped ore to a limited extent. The bank overdraft has materially increased, the reasons for which are given in the General Manager's report. It can, however, be reduced very substantially when the conditions of the metal markets warrant the Company in disposing of the large stock of refined metals on hand. The development work at the Rossland mines and also at the Sullivan group is very encouraging, and the various other properties are looking well, while the alterations and improvements at the smelter make for efficiency and economy.

General Manager R. H. Stewart reports in part:

Total tonnage smelted at Trail was 374,771 tons, having a gross value of \$6,000,662, showing an increase in the average monthly tonnage smelted over last fiscal year (15 months) of about 4,090 tons. Production details follow:

Consolidated Mining and Smelting Co. of Canada, Production Oct. 1, 1913, to Sept. 30, 1914.

Mines.	Weight in Tons	Gold in Ounces	Silver in Ounces	Lead in Pounds	Copper in Pounds	Gross Value
Centre Star, ore	172,379	.....	.....	.....	.....	.....
Centre Star, concentrates .	9	90,762	63,131	.....	1,804,191	\$2,139,522
Le Roi, ore	80,499	.....	.....	.....	.....	.....
Le Roi, concentrates	137	31,030	39,064	.....	1,817,004	894,892
Sullivan, ore	30,919	.....	431,746	21,390,103	.....	879,829
St. Eugene, ore	1,217	.....	26,119	992,385	.....	45,782
Molly Gibson, ore	572	7	29,964	137,278	.....	22,701
Number One, ore	5,790	76	185,230	121,382	.....	112,908
Highland, ore	1,346	.....	.....	.....	.....	.....
Highland, concentrates ...	2,520	.....	64,579	3,929,856	.....	203,388
Maestro, ore	262	.....	4,421	241,491	.....	10,403
Richmond-Eureka, ore ...	541	.....	23,698	162,960	.....	20,269
Lucky Thought, ore	36	.....	4,295	33,279	.....	3,871
Ottawa, ore	342	.....	50,900	.....	.....	29,070
Silver King, ore	(16,031)	(266)	(123,549)	.....	(589,286)	(157,581)
Smelted, Trail Smelter ...	374,771	129,083	2,568,301	34,617,318	3,645,997	6,000,662

The company's mines in Rossland continue to show an increase in the amount of ore available, the greater part of the increase being due to tonnage developed in the Le Roi mine, where development work has yielded very satisfactory results.

The crosscut from the Centre Star shaft, mentioned in the last annual statement as being driven to connect with veins developed on and above the War Eagle 14th level, and 300 ft. below that level, reached the ore about

the first of January, and although the ore bodies so far opened up on this 16th level have not been as large as on the 14th level, the prospects are that a large tonnage will be obtained between these levels.

The Centre Star shaft below this level is now being repaired, with a view to driving another crosscut, below this 16th level, to tap the vein at three hundred ft. greater depth.

The satisfactory results of development in the lower levels of the War Eagle strongly indicate the favorable possibilities of still deeper development.

At Kimberley development of the Sullivan group has demonstrated a very large amount of complex zinc-lead ore, of which a considerable portion can be shipped under present conditions and smelted for lead; while there remains a very large tonnage, which is comparatively high in zinc, and is, as yet, not available for shipment, although its gross value is upwards of \$20 per ton.

Other properties owned by the company, most of which are under development, have been closed down owing to the situation imposed by the war, mainly on account of the facts that the prices of metals are low, most of the metals difficult to market, and many of the properties require considerable money for development.

There have been no new developments in the St. Eugene mine, which was operated in a small way during part of the year.

The Molly Gibson was operated for a short time, but was closed down at the commencement of the war, little development having been done; but such as has been done has shown the vein in the bottom level to be as promising as in the levels above.

Nothing new has been developed in the Richmond-Eureka group.

The Lucky Thought mine, at Silverton, mentioned last year as being under bond to the company, has been developed to a small extent, with the exposure of some small shoots of high-grade ore, but nothing of importance has so far showed up.

At Slocan City the Ottawa mine has showed up some small shoots of high grade ore.

At Ainsworth developments in the Highland and No. One mines have only been fairly satisfactory. Both mines have produced considerable ore during the year, but the reserves of ore have not been increased. The same applies to other properties at Ainsworth.

New Properties.

The charge to property account includes purchase of the Mabel mineral claim, adjoining the Centre Star properties in Rossland; the purchase of a one-fifth interest in the Pilgrim mineral claim, in Rossland, adjoining the War Eagle mine; the purchase of the Paul Boy and Eddie J. in Rossland; the Annie E. and the property of the Canadian Goldfields Syndicate in Rossland; purchase of some stock of the Silver King Mines, Limited; and some small expenditures on claims adjoining the Sullivan.

There is also included in this charge a portion of the amount expended on development of the Sullivan, Silver King, Ainsworth and Slocan properties, which, owing to conditions imposed by rebuilding at the smelter, were unable to ship to full capacity during the year, or had not reached the shipping stage.

dations, floors and retaining walls, all of which have been replaced with concrete; rebuilding of the fire protection system was also necessary during the year.

Small expenditures were made on tracks; on tunnels for recovering ore from storage, and on extra locomotives for charging the furnaces.

The objects of these alterations and improvements have been to increase the capacity of the plant, to increase recoveries and to decrease costs of operation.

The lead plant formerly handled a considerable tonnage of high-grade clean concentrates, comparatively low in sulphur and free from zinc, which was supplied mainly from the St. Eugene mine. With the working out of the St. Eugene mine, it has been necessary to replace the tonnage, to a large extent, with ore of lower grade and of a much more refractory nature, largely from the Sullivan mine, and carrying more sulphur and requiring more capacity for roasting and furnacing in order to produce an equal tonnage of lead.

In the roasting plant, particularly, the seven Godfrey roasters with which the smelter was previously



Outcrop of Vein at Centre Star Mine, Rossland, B. C.

Improvements.

Expenditure on plant account during the year has been \$571,207.01. Of this amount \$482,134.44 has been spent in improvements to the smelter. This has been expended mainly as follows: On re-building the lead plant, including two Wedge roasters, having a capacity each of from 85 to 95 tons per day; conveyors and automatic scales for handling the ore from storage to the roasters, and for handling the pre-roasted product from roasters to sintering pots; three new lead blast furnaces and extensions to building, with crane for handling receivers and by-products, such as matte; a Cottrell plant for clearing the blast furnace gases of lead fume; flues connecting the blast furnaces with the Cottrell plant; new charge cars and some small equipment for the lead sampling mill.

Alterations to the copper plant, include re-building of three of the five blast furnaces and increasing the dimensions of two of them; building of a new smoke stack; repairs to the flues; installation of a crane in the copper furnace building, and rebuilding of the launders leading to the slag dump.

Improvements in the blower-room, include installation of an additional blower, having a capacity of 40,000 ft. of air per minute; extensive repairs to the blower-room on account of the rotting of timber foun-

equipped had a capacity of only 25 tons per day each of Sullivan ore; the two Wedge roasters, just installed, have a capacity each of from 85 to 95 tons per day, and are costing at present about 50 cents per ton less to operate, the saving being mainly in fuel and firing.

The installation of conveyors handling the ore to and from the roasters will still further reduce costs of operation of the roasters, by substituting mechanical equipment for manual labor.

The costs of operating the Heberlein pot plant have already been materially reduced by the substitution of mechanical appliances for hand labor, which alterations were made last year.

The building of new lead furnaces was made necessary by the condition of the old ones, which had been in operation for a long time, and it was considered advisable in rebuilding them to place them further from the copper plant, in order to allow for any necessary extensions to the copper plant; also to allow for better arrangements for charging and handling the products.

The installation of the Cottrell plant was very necessary on account of large losses in fume from the blast furnaces. The flues and Cottrell plant are now saving in the neighborhood of eight tons per day of material high in lead, a considerable portion of which was previously lost.

Improvements to the copper plant were made necessary by the wearing out of jackets on the old furnaces. In rebuilding, two of them have been increased in size from 300 in. to 420 in. in length, and from 42 in. to 50 in. in width at the tuyeres. The enlarged furnaces so far show an increase in smelting capacity of from 60 per cent. to 80 per cent. over the older ones. This increase in capacity will result in a proportionate decrease in cost of labor and, probably, in a decrease in cost of coke per ton of ore smelted.

Generally speaking, we believe that the changes made in the smelter during the past two years will result in sufficient saving in costs of operations and recoveries to pay for themselves within the next two or three years' operation.

At the Number One and Highland mines a hydraulic power system was installed which will save its cost in less than a year's operation. Other expenditures at Ainsworth have been, mainly, equipment of the properties with air drills and hoists, with a few small additions to the Highland sampling mill.

At the Sullivan mine a boiler plant was installed to operate the compressor during the season of low water—the boilers being transferred from the St. Eugene plant.

At the Centre Star it was found necessary to rebuild the shipping bins.

General Conditions.

The increase in amounts due the banks is attributable to the following:

Expenditure on plant account at the smelter and mines. Increase in metals on hand at the smelter, due, partly, to inability to smelt the ores received during the heavy repairs, and, partly, to increased metals carried at the refinery on account of increase in the number of lead tanks in operation. Development of new properties, from which returns have not yet been received in the shape of ore shipments. This amount would have been very materially reduced at the time of writing had the metal markets been normal. Owing to the present situation, however, heavy accumulations of refined metals have taken place, which may have to be held for a time, or until the markets resume more normal conditions. The unexpected and sudden drop in the value of metals has made a very considerable difference in the estimated value of stocks on hand—the drop in silver at September 30th amounting to about 8 cents per oz.; while copper sold as low as 11.1 cents per lb. as compared to 16 cents in the previous year.

Conditions at the mines, generally speaking, have been satisfactory, with a prospect for increased tonnage had it not been for the closing down of a number of mines owing to the unsettled condition of metal markets.

Management.

The properties and departments of the company have been in charge of the following gentlemen: Mr. S. G. Blaylock, Assistant General Manager; T. W. Binay, Comptroller; James Buchanan, Superintendent of Smelter; M. H. Sullivan, Assistant Superintendent of Smelter; J. F. Miller, Superintendent of Refinery; M. E. Purcell, Superintendent Centre Star Group of Mines; E. G. Montgomery, Assistant Superintendent; F. S. Peters, Superintendent Le Roi Mine; C. H. McDougall, St. Eugene and Sullivan Mines; K. B. Carruthers, Molly Gibson Mine; W. A. Cameron, Slocan Lake properties; W. M. Archibald, J. M. Turnbull and A. W. Davis, Mining Engineers.

MOND NICKEL.

It is stated that the Mond Nickel Co. will proceed at once with all the enlargements and improvements contemplated at the smelter at Coniston. These improvements and enlargements were intended to be scattered over a period of years, but now owing to the urgent need of nickel in the British and Allied navies the plant will be rushed to completion at once.

It is incidentally learned that recently there has been an insistent demand for a very large tonnage of nickel matte from Russia.

The enlargements at the Mond plant will, when they are completed, almost double the capacity.

It is improbable that much if any of the nickel matte produced by the Mond Company found its way to Germany because the orders from the British Government were always much larger than the English company could supply; but it is quite certain that none is going now.

AUSTRALIAN MINING.

The value of the output of minerals in Australia last year was £26,279,000, or £215,300 above the figures for 1912. The total is very satisfactory, for while there was a fairly high range of prices for tin and lead during the year, the price of spelter was on a lower level, and there was a decline in the price of copper. The gold total, which amounted to £9,363,300, showed little variation from the figures of 1912. The coal output amounted to £4,627,500, silver-lead to £5,253,900 and copper to £3,266,100. New South Wales was the greatest producer of minerals among the States of the Commonwealth, its total being £12,095,100. Next came Western Australia with £6,036,200. The Broken Hill field remained as the great dividend-producing centre of Australia.—London Financier.

According to Mr. A. C. Dennis, superintendent for the contractors a new world's record for tunnel boring was established in November in connection with the work being done in the Roger's Pass for the C. P. R. by the contractors, Messrs. Foley Bros., Welch and Stewart.

Mr. Dennis reports that last month 817 ft. of the "pioneer" heading—the preliminary shaft running parallel to the main passage, from which operations are directed at several points—was excavated. The American record for a month's tunnel boring was 810 ft. in 31 days.

As a result of the rapid progress now being made with the tunnelling operations, the contractors are now confident that they will put the Rogers Pass tunnel through several months earlier than their contract with the Canadian Pacific calls for. The five-mile, double-tracked passage through the base of Mount Macdonald is to be ready according to the terms of the firm's agreement, by the end of 1916. At the present rate of projection it is estimated that the tunnel will be completed in the summer of 1916.

There remains 16,000 ft. of the "pioneer" shaft yet to be driven, 10,640 ft. having already been bored. At the west end of construction, 817 ft. of the preliminary shaft, and 640 ft. of the main passage was excavated last month, and from the eastern portal 527 ft. of the former and 588 ft. of the latter. Although the work has been well advanced, the hardest part of the actual boring has yet to be done.

PERSISTENCE OF ORE IN DEPTH

At the second general meeting of the twenty-fourth session of the Institution of Mining and Metallurgy, held in London, on Dec. 17, 1914, there was a discussion of a paper entitled "Persistence of Ore in Depth," presented by T. A. Rickard.

Mr. T. A. Rickard said in part:

Twenty-eight years ago—nearly 29 years ago—I was temporarily in charge of a mine in Colorado. A letter came from London notifying me that one of the directors would pay a visit to the property, which was owned by an English company. At once I realized the importance of the occasion. I assumed, of course, being ignorant of joint stock finance, that a director must be a man of unusual sagacity, with special knowledge of mining. Else wherefore was he selected as a director? When he arrived, I found him to be a wise old Scot, with some knowledge of sugar plantations, but innocent as regards mining. However, I was very careful of my p's and q's, desiring to create a favorable impression. The day after his arrival we went to see one of the mines. As we proceeded leisurely on quiet horses up Virginia canyon, from Idaho Springs towards Central City, he noticed the prospect holes on the adjoining hillside. "What are those?" he asked. I told him that they were excavations made by miners in the search for ore. "Why did they stop work?" he queried. "Because the ore did not last," I replied. "Could the ore in our mines come to an end in depth?" "Certainly," said I. Whereupon he relapsed into silence. This was his first contact with a basic fact in mining. And to tell the truth, his question had also made me aware how thin was the smooth ice of optimism on which our enterprise was skating. Later, while we enjoyed an excellent pasty provided by the Cornish superintendent, he questioned me concerning the origin of ore. Having discovered that the old gentleman was at my mercy, I proceeded to tell him the whole story from the geological dawn to that sunny noon on the Rocky Mountains. Not being hampered by too many facts, I was well able to discourse on this fascinating subject. That was long ago; if any canny Scot were to ask me now to tell him how ore is formed, I should answer with the hesitation that comes to us when we have learned to realize the limits of ascertainable fact.

The subject of ore persistence is vital. As the whole philosophy of life is colored by a recognition of our physical mortality, so the operations of the miner must be conditioned on some definite notion concerning the continuance of his orebody. I submit to you that for a mining engineer to undertake the appraisal or equipment of a mine without a clear idea concerning the probable persistence of ore in mines generally is as unwise as it would be for an actuary to prepare a policy of life-insurance without a definite notion concerning the average longevity of human beings. The problem of ore persistence must be faced frankly and fearlessly. We must face it in the light of facts—the bright glare of realities not the rosy twilight of agreeable hypothesis or the dense fog of flamboyant expectations.

The enrichment of ore in depth has been consigned to the limbo of discarded fallacies; the generalization that ore persists indefinitely in depth must join it. Geologists may prove to their satisfaction that the deepest mine workings are relatively shallow and that the question of depth in itself is rendered supererogatory by the miles of erosion to which the ore bearing rocks have been subjected. But such academic arguments are only confusing.

I can imagine that a clever physiologist might bring forward an argument to prove that if the human body were carefully conserved, if shocks and excesses were avoided, if food and climate were carefully chosen, and if every organ were given adequate and regular exercise, a human being would be capable of living to 250 years. It would be interesting; but I should take my academic friend to the nearest cemetery and point to the dates of arrival and departure upon the truthful tombstone; I should quote the psalmist's dictum concerning "three score years and ten," and I should introduce my learned theorist to an actuary, who would tell him that as a matter of insurance business the average expectation of life is only 45 years, and the maximum one century. I should treat his brilliant argument as an intellectual feat and offer him the sedative of a cigar.

To assert the indefinite persistence of ore is to assume the inexhaustibility of ore deposits. Is history to be disregarded? Greece obtained her silver from Laurium as long ago as the Peloponnesian war; Hannibal drew money for his campaigns from the gold mines of Iberia; the Roman emperors took tribute from the gold mines of Dacia; the ancient world derived its copper from the Sinai peninsula, and so forth. Of these mines, in most cases, only the memory remains.

Is that an unpractical test? Then I turn to the share list of mines quoted on the London Stock Exchange at the date when my first article on this subject was published, namely, January 21, 1893, nearly 22 years ago. In the Financial Times of that day I find a list of the mines that were then the subject of joint stock speculation. Out of 250 companies then quoted, only a quarter have survived. Out of 22 British mines, only seven have been continuously operated, and each one of these has gone through phases of reconstruction and recapitalization; 15 are dead as mutton. Out of the 76 South African mines, 30 have succumbed, chiefly diamond ventures and gold enterprises on the outskirts of the Rand. As the Rand is practically one lode, the discontinuance of an individual mine is inconclusive. On the miscellaneous list there were 160, of which number only 23 are now doing business, and of those five have suffered reconstruction. Among the casualties are half a dozen Mysore "pups," for in 1893 Indian mining was enjoying a boom. The list also includes a number of mines once famous; for example, El Callao, Richmond Consolidated, Emma, Montana, Elkhorn, Guston, Yankee Girl, Old Lout, Poorman, Maid of Erin, Mammoth Gold, Amador Gold, Sierra Buttes, Linares, Alamillos, Victory, Darien, Copiapo, Tetuan, Mesquital del Oro and Kapanga. I give the names just to remind some of you of the vanished dreams of a bygone day. To talk about persistence in depth in such a context is like asseverating physical immortality to the compiler of a biographical dictionary. Not that biographical dictionaries are necessarily depressing; in their stories of great achievement and high endeavor they stimulate and encourage a later generation. Of the mines mentioned, the majority yielded fortunes to their happy owners, and the minority that entailed loss on their shareholders did so chiefly through such unjustifiable exaggeration of their productivity as was due to an erroneous assumption of inexhaustibility based on the idea of indefinite persistence of ore in depth. Fortunately we forget our fozzles in mining as in golf. Jas. D. Hague, one of the wisest of mining men, said long ago that mines are like saints, "for many are called and few are chosen." The chosen wear a halo.

It will be said by some worthy people that the insistence upon unpleasant realities is hurtful to mining speculation and of no particular advantage to the industry. Leaving the proud platform of the scientific man, scorning all intellectual dishonesty, let me reply on the sandy floor of workaday commercialism, by insisting that the capital available for mining is limited, and that the more of it that is squandered over wild goose chases or will-of-the-wisps, the less of it will there be for intelligent enterprise. When money is furnished for foolish ventures, the industry suffers by disgusting or disappointing those who would otherwise participate in reasonable projects. An example of recent date may be quoted.

In January of this year a description of the Kirkland Lake district was published in the daily press, in advance of the prospectus of a company, the shares of which were subsequently the sport of excited gambling. In that description it was stated in pseudo-scientific language that "the volcanic activities which resulted in the mineralization of Ontario took place subsequent to the denudation of the Laurentian mountains by glaciers," and that "the volcanic material, which contains the minerals, has everywhere been forced upward through the sedimentary and glacial deposits." Then comes the inference: "This indicates with certainty that the mineral bearing veins will be found to persist to great depths." And "great depths" is further defined as "only limited by physical obstacles to economic working." Here is the old fallacy, decked more decorously than of yore, but unchanged in its insidious mendacity. In sheer bravado the scribe, hired by a company promoter, asserts that "this would appear to be especially true of the silver deposits at Cobalt and the gold bearing veins of Kirkland Lake and Porcupine."

As the deepest ore disclosed at Kirkland Lake was only 300 ft. deep and the deepest at Porcupine only 450 ft. from surface at the time this was published, the prophecy, for it is only that, may wait for proof or disproof, save on general grounds as something contrary to experience; but of Cobalt it can be stated that the economic geology of that rich silver district is sufficiently known to warrant a categorical denial of persistence to "great depths." Facts disclosed by mining and inferences made by experienced geologists unite in proving that the veins of Cobalt extend into the Huronian conglomerate for a limited vertical distance above and below a sill of diabase where that diabase is relatively near the present surface. (These statements are not true to-day.—Ed.)

When the ore bearing veins pass out of the conglomerate or the diabase into the underlying Keewatin schist, they become unproductive, regardless of depth. Moreover, these are not the only mining localities in that part of the world. The Rainy Lake, Wabigoon and Lake of the Woods districts have had their day, and it was as short as the persistence of their ore was brief. Cobalt has done well, despite relative non-persistence in depth, and affords ample opportunity yet for productive exploitation within known vertical limits. Porcupine and Kirkland Lake, we may hope, will become important goldfields, but it remains to be proved, in one way only, by actual mining, how deeply the ore persists.

Meanwhile, no scientific fact warrants and no experience justifies the confident assertion of a persistence to depths that will test the mechanical ingenuity of the miner. Of course, such ignorant assertions as above quoted have nothing to do with economic geology, but

they have a great deal to do with methods for debauching our profession, for exciting the greed of the unwary, and transferring the earnings of the many to the pockets of the few.

The subject is one that must come home to all of you. Each of you must have some opinion upon it, according to your observation and experience. It is well that you should contribute out of your store of personal knowledge, so that we may arrive at a settlement of this vexed problem.

You need not fear that the truth will hurt legitimate mining. On facts science is built and on the application of science mining is based. No legitimate industry can prosper on make-believe; no profession can command confidence so long as its reckless optimism is flouted by the realities of experience. If the mining industry is to flourish and to receive public support it is for us—for you and me—to enlighten those who furnish the capital; to divert such capital from unproductive channels to those likely to be productive; to render the employment of money safer and more profitable.

To discard make-believe is not to become pessimistic. That the miner never is, so long as he remains a miner. But sane hopefulness must not degenerate into crazy optimism. In mining, as in life, to accomplish anything we require the cheerful forward glance; but in mining, as in life, credulity leads only to disaster.

The discipline of facts must control the constructive imagination of the engineer, so that mining as an art, regulated by science, may become the safe basis of beneficent industry.

It is high time that an unsubstantial generalization should cease to provide material for flamboyant prospectuses and irresponsible promoters. It is high time that mining engineers should dissociate themselves from pseudo-scientific fallacies masquerading as scientific truths. That is why I have taken the pains to collect data and to marshal arguments in the hope of disproving once and for all that the indefinite persistence of ore in depth is neither a fact nor a theory in economic geology.

The president, **Dr. F. H. Hatch**, said that the subject of Mr. Rickard's paper was of the greatest importance, seeing that the life of most mines was chiefly determined by the downward limitation of the orebodies to the exploration and exploitation of which the mining man directed his energies. Strange as it might appear, it was not always easy to ascertain from the published returns of a mine whether the average metallic content of an orebody was diminishing or not as depth was attained.

Improvements in the methods of mining, of handling and of treating the ore were continually effecting a reduction in the working cost of a given mine; consequently, ore of lower and lower grade could be treated profitably. Thus it came about that rock which at an earlier period of the operations was rejected as "waste" was at a later stage a valuable material for treatment. In consequence, a lower average yield did not necessarily mean a falling off in grade due to increased depth.

It was true that by systematic sampling and recording of results on a suitably devised assay plan, variations in the metallic content of an orebody from level to level were disclosed; and it was by those means that the cardinal fact as to whether there was or was not an impoverishment with increasing depth could always

be established, provided of course that it really was desired to ascertain the true conditions, whether they proved palatable or not.

Mr. W. H. Trewartha-James expressed his very great pleasure to congratulate alike the president, the Institution and the author upon the brilliant presentation of the paper, which was remarkable from two or three different points of view; the great ability and the great width of research shown in marshalling and collecting the facts; the rugged and outspoken honesty of purpose, which was self-obvious; and although the author pointed out that the question of the impoverishment of orebodies in depth had previously been lightly discussed, this was the first occasion on which a definite theory had been presented in such a form. Undoubtedly most of them had long been aware of this great truth, and had realized it in different degrees as the result of their experience, yet none of them had ever dared to put forward on such a strong basis the material fact which must now be accepted by the profession for the future.

The title of the paper itself was a model of terseness, but it did not disclose the positive conclusion which the author intended to formulate, though the subject-matter left no doubt thereon. He could have wished, however, that the author had stated in the paper, as no doubt he would state in reply, exactly what his positive attitude was, because upon the terms of that statement depended very materially the final acceptance of the theory.

He thought that the facts, that had been arrayed so logically, showed that in the great majority of cases the metalliferous "ores" in lodes and veins do not and cannot be expected to persist to absolutely indefinite depths. But the word "depth" was, as the author had pointed out, such a relative term that the speaker clearly saw a danger in placing a wrong interpretation on this word, and in the acceptance of the theory of ultimate impoverishment at depth without reservation, for the word "depth," which was the gist of the paper, entirely begged the question of precise definition.

He understood the author contended that depth, and depth alone, was the material consideration which had to be taken into account, whilst the speaker held that structural geology must form the basis for consideration.

With regard to the "forlorn hope" of which the author spoke, he could give a remarkable instance from his personal experience, the case of the Britannia mines in Howe Sound, British Columbia.

The company had been exploiting those mines for a number of years, and had spent something like \$3,000,000 without any profit to themselves; the material which they were mining was not ore, but a mineral aggregate. A very clever man, whom no doubt the author knew, Mr. Schley, of New York, from long study of the subject in all its details as they affected the Britannia mines, had arrived at the conclusion that before he abandoned the mine he would put in two or three adit levels at considerable depth beneath the great orebodies which they had not been able to work profitably above, and of which large quantities of available tonnage remained.

He desired to pay one of the highest tributes that could be paid to the engineer in charge of these mines, as he declined to be responsible for driving these deep tunnels, and resigned his post because he saw no prospect of attaining a useful object thereby.

The result of that exploitation at depth he thought they probably all knew. The Britannia mine to-day

was one of the most remarkable mines on the West Coast, one of the great profitable producers of copper, and that "forlorn hope" had become of the utmost importance, not only to that company, not only to that district, but to the whole science and art of mining on the Pacific Coast.

He trusted he had made it perfectly clear that he accepted the author's main contention that metalliferous ores in lodes and veins do not continue or persist to indefinite depth, or, as defined in his earlier writing, that ores do not as a rule persist in depth, much less grow richer, and on the facts as stated it appears that mining engineers as a community must do the same.

With regard, however, to the various inferences, generalizations and corollaries deducible from the main contention, there was room for considerable modification.

Professor Wm. Frecheville said he would like to commence by complimenting the author on his very interesting and stimulating paper. It was a most important subject and probably many of the members would agree in the main with the author's conclusions. Also, he thought the public—and by the public he meant the people who invested in mining ventures—largely knew that mines were uncertain, and that they were what accountants call a "wasting asset." The only people who did not acknowledge it were the Income Tax authorities, who would insist on charging the full rate on mining dividends.

In the main he thought many of the members would agree with the author, but at the same time he could not help thinking that in his keenness to prove his point the author had at times given a rather one-sided view. For instance, he quoted the Village Deep as an instance of a mine where the ground in depth was poorer than the ground immediately above it. That was quite true, but the author omitted to mention a neighboring mine, the City Deep, where the exact opposite was the case.

Then again, the author gave a diagram of the underground workings of a number of mines on the Kolar goldfield, and amongst them the Champion reef. Turning to that it would be seen that in the case of the Champion reef the lode at the 2,000 ft. level had been more productive than it was at the 1,000 ft. level; more ore had evidently been stoped out. If that improvement in depth could take place at 2,000 ft., why not at 3,000 ft., or 4,000 ft.? Why should they select an arbitrary point and say there might be improvements from 1,000 ft. to 2,000 ft., but not from 2,000 ft. to 3,000 ft.

Again, the author mentioned the North Star mine, and insisted that the mine had become poorer, although he acknowledged that the production per square foot had increased with depth.

The task of comparing ore ground in depth with ore ground close to the surface was a very difficult one, because they all knew that ore deposits were patchy. Even the ore deposits on the Rand were patchy, and they were much more so in ordinary lodes. The prospector, to start with, walked over the surface of a mine and found a payable orebody. He did not go to much expense; he made a few trenches and found it, and it gave him a clue to follow in depth, and he followed it. But what was his position when he got down to a considerable depth and those orebodies began to fail, as they knew orebodies always would fail? If the prospector wanted to prospect he had to work laboriously and slowly in the dark and at great expense; he was seriously handicapped. They knew there were

blind shoots, that is, shoots coming in in depth which did not go to the surface, and the inference was justified that in many mines there were other orebodies, other patches, which were never brought to light.

Most people would probably agree with the author that too little lateral prospecting was done as a rule. In ground which was highly mineralized the chances of finding other parallel deposits, or other deposits on the extension, were probably not always sufficiently realized.

In conclusion, in spite of what the author had brought forward, he thought that miners would continue, when they had encouragement, to sink, in the hope that they might find a recurrence of good values, or other orebodies, such as those to which the author had drawn attention in the North Star and other mines.

Mr. E. T. McCarthy regarded the subject as of the highest importance, although one that was open to a great deal of criticism, because the factors concerned in it were so various, so complex, so overlapping and so interwoven with each other, that it was difficult to draw any certain deductions from them. Yet the author had made out a very strong case in support of his contention by the facts he had marshalled in favor of the question of persistence of ore in depth.

As the author stated, the question was a comparative one. He believed that the depths of veins, or of a series of lens-like fissures, had some relation to the length, strength and structure found along their strike, or lateral extension at or near surface. For example, if he found the outcrop of a vein continuing all round the globe, only then would he expect it to go down indefinitely in depth, or until it ended at the centre of gravity.

Again, there was the question of veins now being worked at depths that must originally have been great. For example, let them take a series of lens-like orebodies becoming enriched as they approached an underlying contact rock, as in the Porcupine district of Canada; there they found orebodies existing which in all probability had been formed long before the Glacial Epoch had swept away their upper portions, and at a far greater depth than would be workable at present had the original surface been maintained. In Siberia the Russian geologists considered that some of the present known ore deposits were formed at a time when many thousands of feet existed above their present level, which had since been denuded until the great Steppe Plains, in which they were found, were now reduced to a comparatively almost dead level.

If those were right assumptions, it would go to prove that ore fissures of one sort and another might exist at almost any horizon below the present surface of the earth, and that depth in itself had nothing to do with their persistence, but had rather to do with some relation between the lateral extent, strength and structure of the fissuring, and was relative to that and not to the present ground surface. But when one came to the persistence of the ore itself in depth, relative to any particular fissure, after the upper or enrichment zone had been passed through (which latter, so far as they knew, occurred only in those veins which had been subject to decomposition where they had reached the surface), one was met with much more complex problems. Where, on the other hand, great homogeneity of the country rock could be determined, through which the fissure passed, a greater continuity of mineralization in depth might be expected than where the reverse occurred.

Mr. H. W. Turner said with regard to ore giving out in depth, the author could recollect that in the early history of Kennedy mine, on the Mother Lode in California, on about two levels there was no profit. The mine was then closed down for some little time, and that would have been the end of it if no one had had any belief in deep mining. As those interested in that part of the country were aware, it was taken up again, and they had now gone down about 4,000 ft. vertically, and had found excellent ore in the bottom.

The Empire mine, in Grass Valley, was another example. This property being in private hands, there were no public reports, but he was credibly informed that about the time the present chief owner, Mr. W. B. Bourn, took hold of the property, a level was run that was nearly barren, and this was perhaps the thirteenth level on which the vein split up into branches. Nevertheless, below the ore came in again, and it is now one of the really good mines in the Grass Valley district, and said to be about 4,000 ft. deep on the incline.

Mr. W. McDermott said that what they had heard already had been so highly interesting that upon the main subject of the paper he had nothing to add, because he thought all those who had much experience would agree that there were a painful number of instances of mines which rapidly got no better with depth. However, he thought the author's general conclusions might make some people a little more despondent than there was any necessity for; because even within the profitable depths which had been attained, of the good margin from 150 ft. to 5,000 ft.—there were plenty of opportunities for the mining engineer.

It must be a great consolation also to consider what a merciful dispensation of Providence it was that the poor ends of mines were not stuck up in the air. It seemed to have been specially arranged the other way for the benefit of the profession of the mining engineer, giving an encouragement to start from the surface; and also hopefulness, so that capital was obtainable to back up hope as to persistence in depth in that particular case in which each man was personally interested.

CROWN RESERVE.

Crown Reserve's next dividend will be at the monthly rate of 2 per cent., and will be payable on January 15. It is expected that early in the month the directors will come to their decision with regard to the reduction in the dividend rate, and that the next announcement will be at the new rate, presumably 1 per cent. It is said that Col. Carson, president of the company, who has been in England superintending the movement of the Canadian contingent, will return to Montreal for the annual meeting.

HEDLEY GOLD MINING CO.

Hedley Gold Mining Co. has declared a quarterly dividend of three per cent. and an additional dividend of seven per cent. on the outstanding capital of the company, payable Thursday, December 31, 1914, to stockholders of record December 26, 1914. The earnings for this year will be somewhat less than last year, although sufficient to maintain last year's dividend rate of 30 per cent. In view of the heavy outlay for the new power plant and the increased inventory of supplies from abroad, provided to protect us from interruption by the war, the directors deem it wise to reduce the total dividend for 1914 to 25 per cent.

THE ALBERTA OIL FIELDS*

By E. H. Cunningham Craig.

In spite of the amount of actual drilling that has been done in the last few months, it cannot yet be said that the Calgary field is proved.

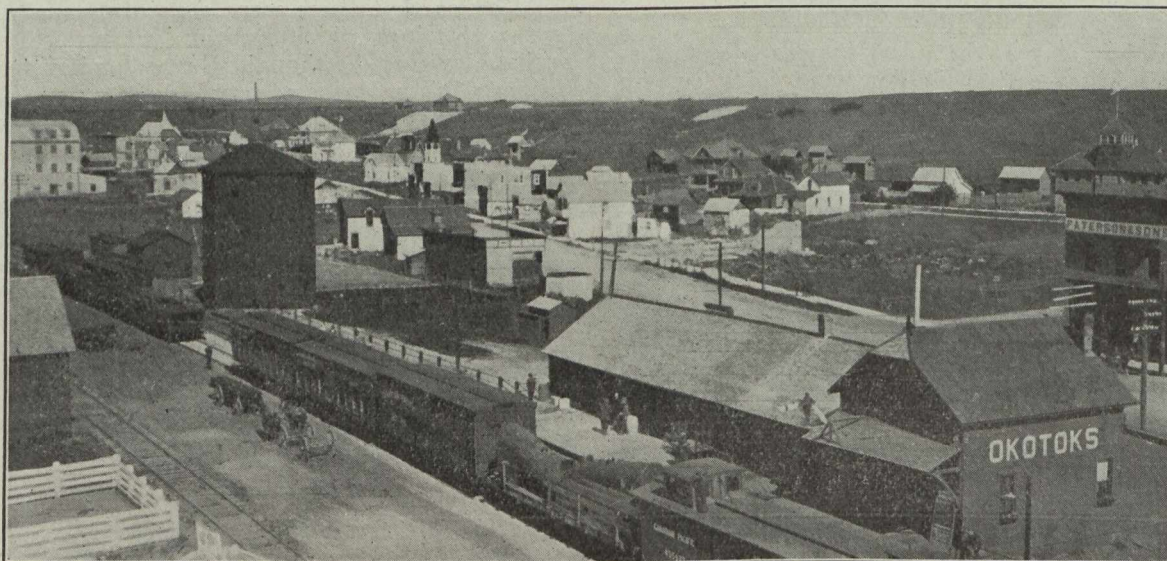
The first well of the Calgary Petroleum Products Company (the "Discovery Well") continues to produce the same very light oil, but not in the large quantity of which optimists claimed it was capable. The gas pressure remains very strong, however, and the company's second well has progressed steadily and is yielding gas under very high pressure. Its prospects of proving to be an oil well are distinctly good.

Several other companies working in the immediate neighborhood have also struck gas.

Between thirty and forty wells are now drilling, and a very wide area is being tested—from the Athabaska River north of Fort McKay to the International Boundary—while many other companies intend to begin active work shortly.

Benton Shales (not the Bearpaw) and has reached and found oil in the Kootanie. This theory necessitates the presence of a great unmapped fault eastward of the well, and it is difficult to reconcile such an idea with the stratigraphical work done by the Geological Survey and other observers. Yet it cannot be said that it is beyond the bounds of possibility, and should it be finally proved it will assuredly enhance the prospects of those wells drilled on western flexures to reach the Kootanie rocks.

Confidence in the prospects of the field is yet unabated, though inflated prices of stocks are now a thing of the past, most of the shares of companies being quoted at what are approximately their intrinsic values. There is reason for this confidence, however: every company that has drilled into the Dakota formation has had signs or slight shows of oil and gas, and these from strata so calcareous and close-grained that they are incapable of



OKOTOKS, CALGARY OIL FIELD, ALBERTA

This activity, though saying much for the enterprise of the various companies, is to be deprecated, since a dozen wells carefully located might be quite sufficient to test all the different areas and different conditions in the Province.

Many, indeed most, of the wells are predoomed to failure on account of the absence of favorable geological structure, and some even quite near the Discovery Wells are situated too far to east or west of the crest of the anticline to have any great hope of proving productive.

The depth to be drilled in most cases has proved greater than was anticipated, noticeably in the case of the United Oils of Alberta and the British Alberta Oil Company, which are testing anticlines lying to the westward of that on which the Discovery Well is situated. The principal cause of this is unprecedented thickening-out of the Dakota Formation. No well has yet reached the Kootanie strata under really favorable geological conditions.

A theory based upon fossil evidence, which may or may not be adequate, has recently been put forward to the effect that the Discovery Well really begins in the

containing more than minute quantities of hydrocarbons. In one or two cases these shows have continued for hundreds of feet, now increasing slightly, and again decreasing.

The Calgary Alberta Oil Company, drilling in a western anticline, where the Dakota rocks come very near the surface, have had a show of oil in Dakota strata at little over 200 ft., and as the flexure in this case lies on a more westerly line of strike than is being tested by any other company, the show is certainly significant.

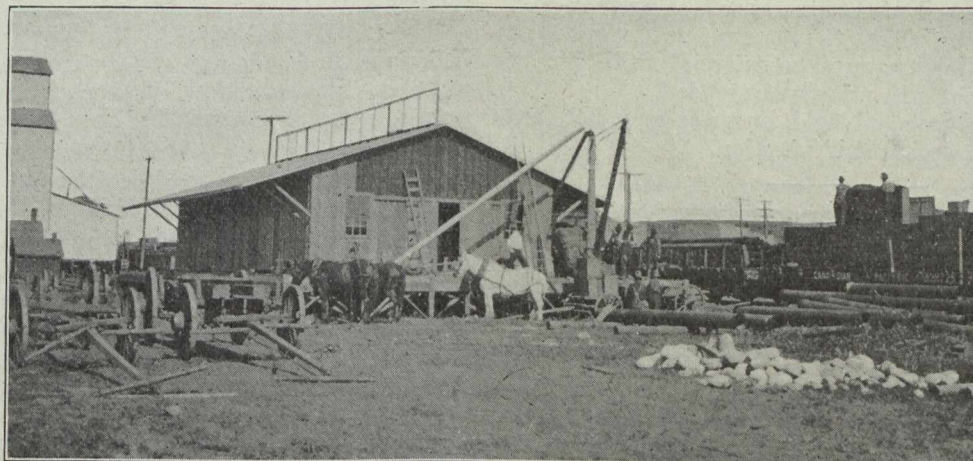
A good show of dark-brown oil of 45 (Beaume) gravity has lately been announced by the Southern Alberta Oil Co. at a depth of 2,200 ft. The company's well is about a mile to the northward of the Dingman or Discovery Well, and it seems possible that this may indicate the quality of oil that may be expected when the source of the filtered oil struck in the Discovery Well is reached.

The only important point to be noted in connection with all these occurrences is that the oil-bearing stage has been reached in strata above those in which the actual production is looked for. This in itself is suffi-

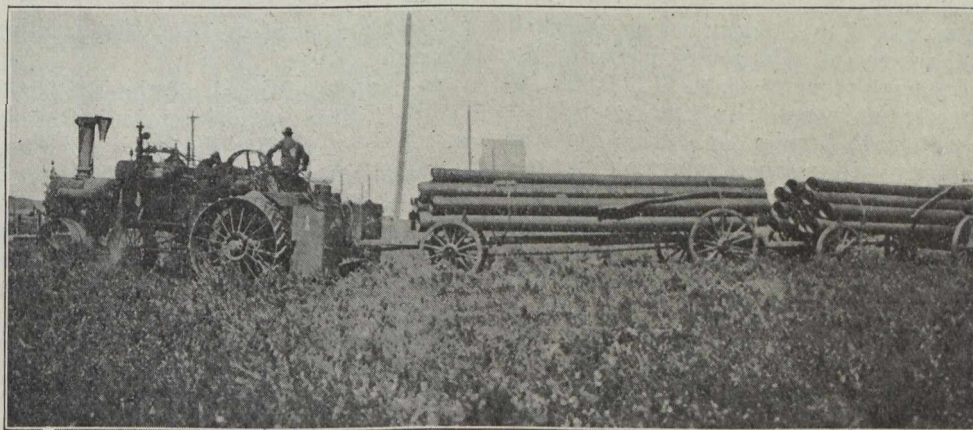
cient to justify much of the development work that is being done, and to suggest that there may be excellent results when the Kootanie horizon is reached.

Of other companies testing strata higher in the Cretaceous series there is little to tell. The Monarch Oil Company has drilled to some 3,500 ft. and has had shows of both gas and oil at several horizons, beginning in the Edmonton formation. The Dome Oil Company is also credited with having encountered gas among the higher horizons, but as yet there is no definite and reliable evidence from the Alberta field that commercial production can be obtained from any strata above the Claggett shales.

Further westward and northward more than one prospecting party has been making exploration. In all these cases, however, it is to be feared that the fields are somewhat shallow, and that the best oils obtained are merely filtered residues which exude slowly from strata older than the oil-bearing series, but which have been impregnated from it. Such anticlines as have been delineated seem to be too broad and gentle to have had great effects in concentrating heavy petroleum to a sufficient extent. A vast field still remains for prospecting guided by scientific methods, and when transport facilities are better than at present it is possible that these northern and north-western fields may be able to show suffi-



Unloading oil well Supplies at Okotoks, Alberta



Transporting oil well supplies in Alberta

Oil-shows and gas-shows both at outcrop and in wells from younger strata are numerous, and it may be necessary to collect and deal with such evidence at no distant date, but for the present the fact remains that no production on a commercial scale can be brought forward as proof that geological structures are sufficiently favorable to warrant extreme prospecting by the drill in these younger formations.

In Northern areas, e.g., the Athabaska, Peace, and Mackenzie rivers, prospecting work has been active during the summer, and samples of very good oil have been brought from many widely separated localities.

Athabaska Oils, Ltd., under new management, has continued the work of prospecting the "tar-sand" area north of Fort McKay, and thick heavy oil, yielding however a large percentage of light oils on distillation, has been obtained in small quantities.

cient inducements to attract capital for their development.

The Sweet-grass country on the International boundary has attracted considerable attention, and several wells are now being drilled. The old Lineham well has been re-opened and samples of excellent brown oil of approximately 40 (Beaume) gravity from it have been on exhibition, but no statement as to what production can be counted upon has been made.

In the course of the summer many experts and quasi-experts both from the United States and Great Britain have visited the various fields and have spent days or even weeks in examination of the geological conditions and of the drilling wells.

Some have unhesitatingly condemned the fields; though whether upon sufficient grounds or not it has been difficult to discover. Some have been merely

"Boosters" upon grounds equally obscure. Some, and it is noteworthy that the best known experts from the United States come under this category, have come, seen, said little or nothing, and departed.

Generally speaking, it may be said that the definiteness of the pronouncement in each case has been in inverse ratio to the geological knowledge of the expert.

Still, as mentioned above, the tone in Calgary of those most deeply interested is one of quiet and cautious confidence. Dealing specially with the fields within sixty miles of Calgary, it cannot be said that any undoubted proof of the presence of an oil field can be claimed. A certain measure of success is indicated by the Discovery Well, but much has yet to be proved. The oil-bearing stage has been reached in the strata, as was predicted on theoretical grounds. That is certain, but whether a production of petroleum on a commercial scale can be counted upon or not still remains unsettled.

There may be a great oil field, or there may not, but only the drill can decide this question.

AMALGAMATED COPPER.

In an interview at Great Falls, Mont., last week John D. Ryan, president of the Amalgamated Copper Co., and B. B. Thayer, president of the Anaconda Copper Mining Co. who are on a tour of inspection in the West, had the following to say:—

"There has been some report that it is the intention of the Anaconda Copper Mining Co. to abandon Great Falls and practically close the Boston & Montana smelter. You may say as strongly as you can that there is no foundation for that rumor. We propose rather to enlarge the investment here materially, and the payroll at Great Falls, when the plans have been developed, will be very much increased. The refinery which we shall build in the general scheme of enlarged activities of the Amalgamated will represent more than \$1,000,000 investment. The investment caused by the general expansion and preparation to handle the business of the future by our company will mean a material increase in the copper industry of Montana. Great Falls can have no fear about the Amalgamated withdrawing from this city. There is no ground for such rumors.

"We are studying the question as it applies to our entire interest, but are unable to say at this moment in what particulars this development will be effected. We will visit all of the properties in the state, and after fully sizing up the situation expect to adopt a policy of enlargement upon which work will be started just as soon as the proper time is deemed to have arrived.

"Among the propositions we have in mind and which we hope to carry into effect, will be the elevating of the Black Eagle dam at the Boston & Montana smelter for the production of an increased power. We also expect to make substantial improvements to the refinery department at the Boston & Montana smelter, together with other minor improvements to the plant which will bring it up to a high standard. It has been determined to do this construction and improvement work during the time the plant shall remain idle, as it can then be effected at a great saving under the cost during the plant's operation.

"Money conditions have greatly improved, and the matter of financing this proposed work will be far less troublesome than it would have been a few weeks or months ago. However, until we have visited the other plants in the state and have gone into the details fully we will not be able to announce our plans definitely, preferring to act upon the matter as a whole."

PERSONAL AND GENERAL

Mr. W. P. Alderson, formerly of the Hollinger Co.'s staff, Porcupine, but now general manager for the Motherlode Sheep Creek Mining Co., operating a gold mine and stamp mill in Sheep Creek camp, Nelson mining division of British Columbia, left Nelson on December 13 on a visit to Toronto.

Mr. Clifford E. Smith, Toronto, has been elected a governor of the School of Mining, Queen's University, succeeding Hon. Wm. Harty who retires after many years of service on the Board.

Mr. Gerald Galt has joined the staff of the Braden Copper Co.

Messrs. E. LeRoy, G. C. MacKenzie, John McLeish and E. Lindeman of Ottawa, spent a week in Toronto during December, gathering information on the iron industry in Ontario for the Department of Mines.

A meeting of the Toronto branch of the Canadian Mining Institute was held on Dec. 19, 1914. The next meeting will be on Jan 9, 1915.

Mr. C. J. Seymour Baker, long engaged in making investigations and tests in connection with the occurrence of gold-quartz ores in Cariboo district of British Columbia, recently spent a few days in Rossland camp.

Mr. J. C. Drewry, for years officially connected with the mining company, formerly owning part of what is now the St. Eugene group of claims at Moyie, East Kootenay, and other mining properties in British Columbia, has been seriously ill at his home at Cowley, Southwest Alberta.

Mr. F. Chas. Merry, superintendent for the Ferguson Mines, Ltd., operating in the Lardeau district of British Columbia, is retiring from that position and leaving the district.

Mr. Dudley Michel, of the British Columbia Department of Mines, who is organizer of classes for instruction in "first aid to the injured" among men employed at metalliferous mines in the province, recently organized a class at Anyox, Observatory Inlet, in the neighborhood of which place is situated the Granby Co.'s Hidden Creek copper mine and the company's new smelting works. He went thence to the Silver Standard mine near Hazelton, Skeena district. He will shortly visit the Britannia Co.'s property, near Howe sound, Vancouver mining division, with the object of interesting miners there in first aid instruction.

Mr. R. S. Ord, of Spokane, Washington, is now general manager for the Corbin Coal and Coke Co., which operates coal mines in the Crows Nest district, Southeast Kootenay, B.C. For some years Mr. E. Roberts, also of Spokane, managed this company's office affairs, but other duties as superintendent of the Corbin railway out of Spokane to British Columbia require all his time, hence his retirement from the coal mining company.

Mr. Frank A. Ross, who was general manager of the Nickel Plate mine and stamp mill at Hedley, B.C., for the executors of the estate of the late Marcus Daly to the time of the sale of that gold producing property to the men who organized the Hedley Gold Mining Co., has been elected president of the Columbia Local Section of the American Institute of Mining Engineers, with headquarters in Spokane, Washington.

Mr. R. H. Stewart, of Trail, B.C., general manager for the Consolidated Mining and Smelting Company of Canada, Ltd., has been in Toronto in connection with the company's annual meeting of shareholders.

SPECIAL CORRESPONDENCE

COBALT, GOWGANDA, SOUTH LORRAIN

Buffalo.—Normal conditions have been resumed at the Buffalo mines after being closed down or running with a greatly reduced force since the beginning of the year.

The Buffalo has always ranked as one of the largest mines in the camp, and the resumption of operations has greatly increased confidence that the crisis in the silver market is over. In the second or third week in August the Buffalo closed down underground operations, and some weeks later the mills. Since then a few men had been put on, until there was a force of about 75 employed. On the decision to resume operations, one hundred men were hired, and the mine and low grade mill are in full swing. It is understood that underground work at the Buffalo during the past six or eight months has been quite satisfactory in adding to the reserves blocked out and indicated a good tonnage of low grade ore. For the present the high grade mill will not be operated, and the concentrates from the low grade mill will be stored.

Nipissing.—The better condition of the silver market is reflected in the fact that the Nipissing has commenced to release a good quantity of its stored bullion. Other companies are following suit, and the shipments during the last two weeks of the year should be high.

McKinley-Darragh-Savage directors decided to pay the regular dividend of 3 per cent. on Jan. 1st. This will be the third dividend without bonus. The McKinley will, on Jan. 1, have paid 196 per cent., or \$4,404,708.

No new ore bodies have been found on the McKinley-Darragh itself within the past three or four months. On the new discovery at the Savage, a drift is now being run at the 200 ft. level, and both faces are still in remarkable ore.

Chambers-Ferland.—There is considerable interest and speculation as to the probable or possible results from the exploration work undertaken by the Chambers-Ferland and the La Rose in their new shafts to the north-west of the Nipissing. This particular area of conglomerate has always been regarded as most probable to yield profitable results from exploration. Nothing definite has been found on either property to date, but there has been much excitement among Chambers-Ferland stockholders, owing to the report that their crosscut was now nearing the point where it should intersect a vein worked almost to the boundary of their property on the Nipissing. The shaft on the La Rose is now down to a depth of 150 ft. and is still in conglomerate. The first station will be cut at 200 ft., but little exploration work will be undertaken until the contact has been reached, as development on the adjoining Nipissing has shown that the best grade of ore is most likely to be found in the conglomerate for a hundred or a hundred and fifty feet above the contact.

November shipments of ore from the Cobalt camp were slightly higher than for the preceding month. Bullion shipments for the same period were very much lower. Thirteen mines shipped 1,366 tons.

The Mining Corporation of Canada, which includes the City of Cobalt, the Cobalt Townsite, and the Cobalt Lake, was easily the heaviest shipper. Their contributions to the ore list have been growing perceptibly during the latter part of the year. All ore is now being

hoisted from the City of Cobalt and the Cobalt Townsite through the new main working shaft and after being picked sent direct to the mill. Upon the mill a wing is now being built for the installation of a plant to cyanide the slimes.

Nipissing.—During November the Nipissing mines shipped nothing, neither ore nor bullion. Nipissing mined ore of an estimated net value of \$189,029. As stated above, the company has resumed bullion shipments to England this month.

Interesting results were obtained in putting down winzes to discover the depth of the contact below the fourth level at shaft 73. The first winze found the contact at 45 ft., another 150 ft. to the east is still in good conglomerate at 28 ft. on a vein 2 in., assaying 2,500 oz. As soon as the information on the exact whereabouts of the Keewatin contact is complete, the fifth level will be started.

At shaft 64 a winze put down on the vein at the 900 ft. level shows no improvement in the silver contents of the lead. During the last month the hydraulic was working on the surface five veins were uncovered. During November a drill was put to work open cutting three of the better of these veins. The most favorable has a width of 2 in., of 2,000 oz. ore, for a length of 40 ft. During the month of November the three open cuts yielded 10,385 oz. in silver.

During the past season 95.6 acres were washed of overburden.

PORCUPINE AND KIRKLAND LAKE

Hollinger.—A contract has just been let for ten additional stamps at the Hollinger mine. These stamps should be ready to drop by the end of March, as work on the excavations has already been commenced. The three big compressors in the new power house on Gillies Lake are now complete and running.

Jupiter.—The McKinley-Darragh-Savage Company of Cobalt has definitely decided to throw up the option on the Jupiter mine. The three months' extension of the option expired on Dec. 17th.

Under this option the McKinley-Darragh was required to pay off the bonds amounting to \$50,000, and to buy control of the stock at a price amounting to 13 cents a share, and to continue development. After a conference at the mine and in Toronto it was definitely decided to throw up the option and the machinery belonging to the McKinley has been taken out of the mine and shipped back to Cobalt.

There is no doubt that the mine has responded to development; but the ore shoots are claimed to be too short on the various levels to allow of a profit commensurate with the risk taken by the company in taking up the option. The ore shoot on the vein at the 475 ft. level as developed showed a very good grade of ore right across the face of the drift.

The Jupiter Company sent its president, Mr. Brigstocke, to examine the mine, with the result that it has been determined to keep it pumped out for the present. It is rumored that the company is endeavoring to arrange for the future development of the mine itself.

Dome.—Very considerable difficulty has been obtained in fulfilling the terms of diamond drill contract at the Dome. It was stipulated in the original agreement that at a depth of 1,000 ft. the drill should be within a radius of a 50 ft. from the vertical. Not much

progress had been made, as the terms of the contract could not be complied with, and a trial was given to another contractor. The attempt was not a success.

Alexo.—Since operations were resumed at the Alexo mine, near Porquis Junction, nine cars of ore have been shipped. The total for the month of November was 622,600 lb. of nickel ore. This is all going to the Mond nickel smelter at Coniston.

Sesikinika.—A find of some importance has been made on the claims of the Canadian Gold and Silver Mines at Sesikinika. It has been traced across the border to the townsite of Sesikinika. The discovery was made in the course of clearing land to comply with settlement duties some ten days ago, and has made a little stir in the community.

The Huronian-Belt syndicate has till the first of January in which to start operations on the Murray Mogridge claims at Wolf Lake, if it wishes to exercise its option on these claims.

Bonus to employees.—Several mines in the camp are continuing their practice of paying a bonus to miners for "loyal service." The Hollinger has long adopted this system, and a certain percentage is set aside every month for this purpose. The Porcupine Crown has now adopted the principle, and at the end of the year will pay all employees who have been on the pay roll for three months a bonus of 5 per cent. of their wages during the year.

Vipond.—Mr. H. C. Poirier, manager of the Vipond Porcupine gold mines, has returned to New York after a stay in the camp of several months. The mill at the Vipond is now running smoothly, and a good extraction is being made. The New York consulting firm, of which Mr. Poirier is a partner, has secured an important contract in Virginia, and after a short stay in New York Mr. Poirier will go to Virginia to supervise the work there. The contract is for shaft sinking on a sulphur property.

Acme.—Some very rich ore is now being mined at one of the shafts of the Acme gold mines. Before the twenty stamps in the Acme mill are ready to drop, there will be no less than sixty faces in ore on the Acme property to work upon. The development of the Acme property is showing very remarkable results.

Porcupine Crown.—Operations at the 500 ft. level of the Porcupine Crown mine have been very reassuring of late. A crosscut has now picked up what appears to be the vein, and although it is not as high grade nor as wide as at the upper levels, it is yet so much better than anything that has been discovered before at this level, that it is very assuring.

BRITISH COLUMBIA

East Kootenay.

There has been an improvement in the situation as it affects the Crow's Nest Pass Coal Co.'s operations in the Crowsnest district, for it has been announced that the Great Northern Railway has increased its order for coal for locomotive use within reasonable distance of this coalfield, and the resumption of operations at the Granby Co.'s smelting works at Grand Forks involves the supply of coke for furnace fuel. A press despatch sent from Fernie to the Nelson Daily News on December 13 follows: "The demand for coke from the Crow's Nest Pass Coal Co. in this district is increasing, and during last week 100 coke ovens were started at the company's Michel colliery. It is expected that more of the Michel ovens will be started in the near future. The coal mines here have also been

working more time, and while they are producing only slightly more than one-third of their capacity the prospect is more favorable than it was a fortnight ago. Last Saturday was the coal company's regular monthly pay day, but the effect of the improvement in working conditions will not be seen until the January pay day."

West Kootenay.

Slocan.—Ore from the Surprise mine is being concentrated at the Ivanhoe concentrator, which has been leased and put in operating order by Mr. J. P. Keane, who intends running it as a custom mill and is negotiating for ore from other mines. The Surprise has contracted to send to the mill about 1,000 tons of lead-zinc ore a month. Arrangements have been made to ship the zinc concentrate to the United States, and it is expected a market will also be found for the lead concentrate.

While the Standard Silver-Lead Mining Co. has suspended ore production and closed its concentrating mill, pending a return to conditions that will leave a higher margin of profit on mine and mill products than has been obtainable during recent months, development work is being continued in the mine. No. 7 adit is now in between 4,000 and 5,000 ft., and has been in ore in places along that distance. No. 8 is also being driven, but this will be of even greater length before it will be under the big bodies of ore that were opened in levels Nos. 5, 6 and 7.

Nelson.—The Granite Poorman property, situated about half a dozen miles west of the town of Nelson, has been leased from the liquidator of the Kootenay Gold Mines, Ltd., by Mr. J. P. Swedborg, of Nelson, who has had a number of men employed getting out ore preparatory to restarting the 20-stamp mill near Granite. Before this property was sold to the above-mentioned company it was worked for years by Messrs. Gough and Guille, who took out a comparatively large quantity of gold ore.

Bad roads, now that a few inches of snow has fallen, prevent the shipment of ore from mines in the neighborhood of Salmo. Before the hauling on wheels had to be stopped for the season, zinc carbonate ore to a total of 350 tons was shipped from the H. B. and adjoining Zincton mines to Depue, Illinois. In addition, lead ore was shipped to Trail. Shipping will be resumed when more snow has fallen and a good winter road for heavy sleighs made. A new lead bearing property has been opened in this district, but it has not yet been developed sufficiently to regularly maintain shipment of ore to the smeltery.

Coast District.

Observatory Inlet.—The following excerpt from the New York special correspondence of Mining and Scientific Press may interest many readers of the Canadian Mining Journal: "Reports from the Anyox property of the Granby Company state that two furnaces are in operation and that during October 1,794,308 lb. of copper was produced, at a cost of 8c. per lb. The smelter is now making a satisfactory showing, and it is probably not generally known that this is due to George A. Guess, who is professor of metallurgy at the University of Toronto. The ore at the Anyox is so high in sulphur that it was expected that the ore could be smelted without other fuel than the sulphur. When the furnaces were blown in, however, they failed to work satisfactorily, and Mr. Guess was called upon to diagnose the trouble and point out the remedy. He found that the design and operation of the furnaces were such that it was hard to get enough air through

them for the proper conduct of operations, and by changing the character of the charge and the design of the furnace slightly, he was able to remedy this difficulty, with the good results that are shown. The incident is worth mention, since the general public belief is that college professors are more likely to get plants into trouble than to be able to remedy the mistakes of operating men." Now, without any intention to in the least detract from the value of the services rendered by Mr. Guess at the Anyox copper smeltery, it may be stated that a story current on the coast is to the effect that the breaking of a part of the ore crusher at the Granby Co.'s Hidden Creek mine (or at the smeltery at Anyox, if that is where the ore is crushed before being passed to the furnace charge bins) necessitated feeding the furnace or furnaces with ore not crushed, but of a size as sent down from the mine, and that out of this necessity came the discovery that the furnace ran more freely when fed with large-sized ore than with crushed ore. The repetition of this story does not necessarily suggest that other changes made did not contribute in important degree to the marked improvement stated to have been made in the operation of the blast furnaces; it simply makes public the fact that there are men who take it for granted that it has been found at the Anyox plant that the Hidden Creek ore smelts better when fed large than when crushed to a smaller size.

Sometimes a newspaper man with a lively imagination "gets in his work." There is published in one of the British Columbia coast cities a newspaper of mature years and so circumspect in its determination to protect the dear guileless public that it every now and again declines to publish "mining news." Some time ago, when half-page and page advertisements of the "get rich quick" order were obtainable, it was not averse to admitting some of them to its advertising columns, but that, of course, is "a horse of another color," for newspapers must live. But to come to the present story—an "esteemed contemporary" printed what on the face of it appeared to be a press despatch from Seattle. Next day the circumspect one improved (?) on that despatch, in these words: "Heralding the resumption of a steady carrying trade between the copper plants of British Columbia and the markets of North America, the steamer Amur, with 550 tons of refined copper, worth approximately \$165,000, aboard, has completed her first trip in many weeks between Granby Bay, B.C., and Seattle. Since the beginning of the war, the great mining and smelting plant of the Granby Consolidated Mining, Power & Smelting Co., at Anyox, has been practically closed down, as when hostilities broke out the bottom fell out of the copper market. This state of affairs resulted in the temporary suspension of shipments South from Northern smelters. The resumption of trade is attributed to the general renewal of confidence in business throughout the North American continent. The big British Columbia smelting plants, situated on the Portland canal, will soon be in full blast again, and the steamer Amur will ply regularly between Granby Bay and Seattle, carrying valuable refined cargoes of metal, and returning North towing barges loaded with coke."

The Canadian Mining Journal published in its issue of November 1 (pp. 709-712) the Granby Co.'s annual report, including a statement made by the president as on October 6. There was little in that report suggesting that the company's works at Anyox had "been practically closed down," as stated in print in Seattle and Victoria toward the middle of December. In fact,

the production in October of 1,794,000 lb. of copper shows that, on the contrary, there must have been much activity, during that month at any rate. Then there is the buncombe about refined (?) copper from smelting plants on Portland canal (?)—but there; irresponsible space fillers cannot be bothered with facts, they only want "news." It is too bad, though, that the circumspect newspaper quoted has to be so particular about its "mining news."

CERRO DE PASCO MINING CO.

Very little creeps into print concerning the Cerro de Pasco Mining Co. It is a close corporation and for this reason shuns publicity. About 40 per cent. of the company's stock is understood to be owned by the estate of the late J. B. Haggin.

There has been an investment to date of fully \$25,000,000 in the enterprise which was started in 1902. The mines are located in Peru, over 14,000 feet above sea level.

History records that silver was discovered at Cerro de Pasco in 1630 and the mines produced to the close of the nineteenth century about 450,000,000 ounces from 40,000,000 tons of silver and copper ore, nearly all extracted by hand work and carried three to six miles on the backs of llamas to primitive smelters, whence the silver bullion was transported by llamas 200 miles to Lima, until 1870. Formerly only the ores of 25 per cent. to 40 per cent. copper were shipped.

The introduction of modern machinery and methods, albeit under many discouraging handicaps, has resulted in the building up of an enterprise capable of producing over 70,000,000 pounds of copper per annum.

An official of the company gives the Boston News Bureau the following figures of output for the past three years, November and December, 1914, being estimated:

1912—45,272,000 pounds fine copper, net refinery returns.

1913—43,856,000 pounds fine copper, net refinery returns.

1914—42,000,000 pounds fine copper, net refinery returns.

The official adds: "The company's smelter has a capacity when running full of at least 6,000,000 pounds per month. Had it not been for the war we had hoped to reach this capacity the last half of this year. At the present time we are shipping at the rate of 2,500,000 pounds per month, or about 40 per cent. capacity."

ALBERTA OIL.

What is claimed to be the most important development in the history of the South Alberta oil fields since the discovery of the light volatile oil in the Dingman well occurred on an isolated hill top under the shadow of the Rocky Mountains last week when nearly a barrel of heavy crude oil, olive green in color, and sparkling with life, was baled from the well of the Moose Mountain Oil Company, Limited, eighteen miles southwest of the town of Cochrane. The following facts about the strike are given in the Calgary Herald: Crude oil struck Friday, November 20, 1914. Depth of well when first real showing was made 1627 feet. Well was spudded in September 28, 1914. Oil contains about 35 per cent. gasoline and is expected to test 45 to 47 baume. Drill has gone through 30 feet of black sands and still in them. The section on which the well is being drilled was located by George W. Harris, a director of the company. The actual well site was selected for the company by E. H. Cunningham Craig.

MARKETS

STANDARD EXCHANGE, TORONTO.

Dec. 28, 1914.

	Sellers.	Buyers.
Cobalt—		
Bailey . . . . .	.01½	.01½
Beaver . . . . .	.23	.21
Buffalo	1.05	.85
Chambers Ferland . . . . .	.15	.14
Coniagas	5.80	5.25
Crown Reserve . . . . .	.70	.63
Foster . . . . .	.05	...
Gifford . . . . .	.03	.01
Gould . . . . .	...	.00½
Great Northern . . . . .	.05¼	.04¾
Hargraves . . . . .	.02	.01½
Hudson Bay	50.00	35.00
Kerr Lake	4.55	4.30
La Rose . . . . .	.80	.75
McKinley-Dar.-Sav. . . . .	.60	.53
Nipissing	6.05	5.75
Peterson Lake . . . . .	.29½	.29
Right of Way . . . . .	.03	.02
Seneca-Superior	2.00	...
Silver Leaf . . . . .	.03	.02½
Silver Queen . . . . .	.03	.01½
Timiskaming . . . . .	.10	.09
Wettlaufer . . . . .	.10	.04
York, Ont. . . . .	...	.06¼
Poreupine—		
Apex . . . . .	.02	.01½
Dome Extension . . . . .	.08½	.08
Dome Lake . . . . .	.37	.35
Dome Mines	7.50	6.75
Foley O'Brien . . . . .	.20	.16½
Gold Reef . . . . .	...	.03
Homestake . . . . .	...	.15½
Hollinger	20.50	19.95
Jupiter . . . . .	.10¼	.10
McIntyre . . . . .	.24¼	.23
Pearl Lake . . . . .	.03½	.03¾
Poreupine Crown . . . . .	...	.67
Poreupine Crown . . . . .	.01	.00½
Poreupine Imperial . . . . .	.01¾	.01¼
Poreupine Pet . . . . .	...	.15½
Poreupine Tisdale . . . . .	...	.00¼
Poreupine Vipond . . . . .	.23½	.22½
Preston East D . . . . .	.01½	.01
Rea Mines . . . . .	...	.19½
Teck-Hughes . . . . .	...	.08

MONTREAL MINING EXCHANGE.

Dec. 23, 1914.

	Bid.	Asked.
Beaver . . . . .	.20½	.23
Chambers Ferland . . . . .	.13	.14½
Crown Reserve . . . . .	.70	.74
Dome Lake . . . . .	.34½	.37
Dome Mines	6.25	7.25
Dome Extension . . . . .	.08	.09
Hollinger	19.75	20.25
Jupiter Mines, Ltd. . . . .	.09	.09½
Kerr Lake	4.50	5.00
La Rose . . . . .	.73	.78
McKinley Darragh . . . . .	.50	.60
Motherlode Sheep Creek . . . . .	.10	.15
Nipissing	5.50	6.00
Peterson Lake . . . . .	.28	.29
Poreupine Crown . . . . .	.70	.78

Rea Consolidated . . . . .	.15	.25
Silver Leaf . . . . .	.01½	.02½
Timiskaming . . . . .	.09	.10½
Poreupine Vipond . . . . .	.22	.24
McIntyre . . . . .	.22	.24

TORONTO MARKETS.

Dec. 28—(Quotations from Canada Metal Co., Toronto)—
 Spelter, 6 cents per lb.
 Lead, 5 cents per lb.
 Tin, 35 cents per lb.
 Antimony, 17 cents per lb.
 Copper, casting, 13½ cents per lb.
 Electrolytic, 13½ cents per lb.
 Ingot brass, yellow, 10c. per lb.; red, 12 c. per lb.

Dec. 28—(Quotations from Elias Rogers Co., Toronto)—
 Coal, anthracite, \$8.00 per ton.
 Coal, bituminous, \$5.25 per ton.

GENERAL MARKETS.

Dec. 24—Connellsville coke (f.o.b. ovens)—
 Furnace coke, \$1.60 per ton.
 Foundry coke, prompt, \$2.10 to \$2.50 per ton.

Dec. 24—Tin, straits, 33.75 cents.
 Copper, Prime Lake, 13.10 to 13.20 cents.
 Electrolytic copper, 12.85 to 12.95 cents.
 Copper wire, 14.50 cents.
 Lead, 3.80 cents.
 Spelter, 5.60 to 5.70 cents.
 Sheet zinc (f.o.b. smelter), 8.75 cents.
 Antimony, Cookson's, 15.00 to 15.50 cents.
 Aluminum, 18.75 to 19.25 cents.
 Nickel, 40.00 to 45.00 cents.
 Platinum, soft, \$44.00 to \$45.00 per ounce.
 Platinum, hard, 10 per cent., \$47.00 to \$49.00 per ounce.
 Bismuth, \$2.75 to \$3.00 per pound.
 Quicksilver, \$50.00 per 75-lb. flask.

SILVER PRICES.

December—	New York cents.	London pence.
12	49⅞	23⅛
14	49⅞	23⅞
15	49¾	23
16	49⅞	22⅞
17	49½	22⅞
18	48⅞	22⅞
19	48½	22½
21	49⅞	23
22	48⅞	22⅞
23	48⅞	22½
24	48¾	22⅞

SILVER BULLION SHIPPED.

Gobalt, Dec. 26.
 Bullion shipments for the week will be higher than usual, and it is altogether probable that the shipments for the month of December will establish a record for the year. This week four mines have shipped silver bars as follows:

Mine.	Bars.	Ounces.	Value.
Nipissing	208	241,192	\$117,882
*Crown Reserve	68	69,000	34,500
Crown Reserve	14	15,000	7,500
Dominion Reduction	41	46,371	23,050
Drummond	4	4,956	2,478
Total	335	376,519	185,440

*Shipped from Deloro.

We have in preparation, and nearly ready for press, a volume devoted to mining in Canada. In this work, which will be well illustrated, we are drawing attention to the mineral resources of the Dominion. It includes a brief resume' of the production of the several metals and non-metals, some general descriptive matter concerning the chief minerals produced in Canada, articles on development and production in the several provinces, and a list of the chief mining companies.

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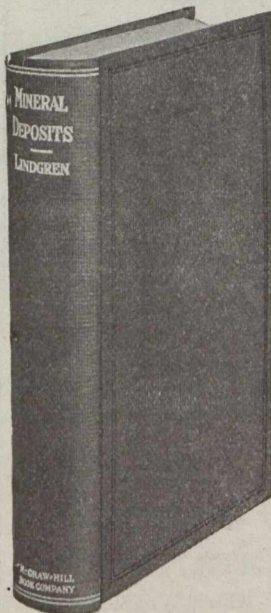
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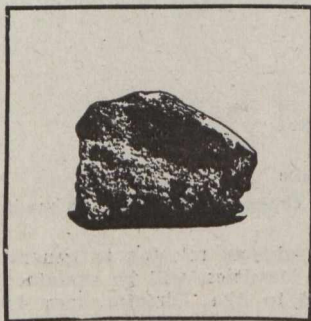
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Summary Report of the Geological Survey for the year 1912.

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Memoir 51. Geology of the Nanaimo Map-Area, by C. H. Clapp.

YUKON AND NORTH-WEST TERRITORIES

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MAPS RECENTLY ISSUED:

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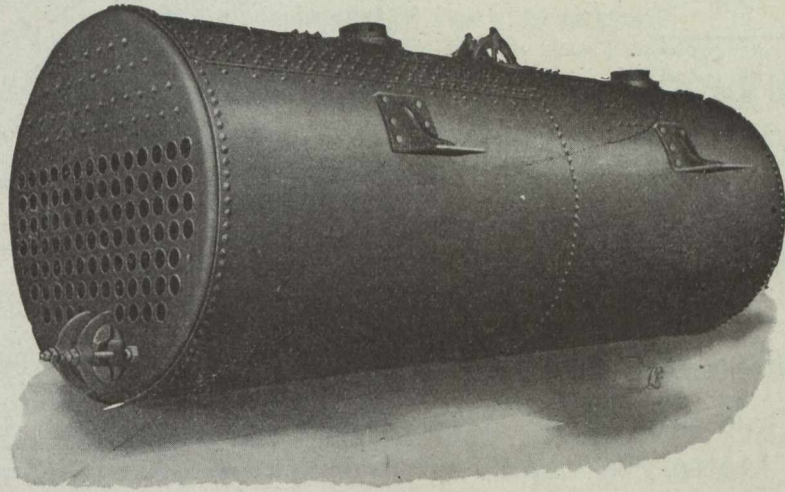
Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

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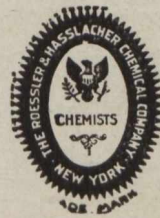
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Peacock Bros.
The John Inglis Co., Ltd.
- Engines—Oil—**
Peacock Bros.
Can. Fairbanks-Morse Co.
- Engines—Steam—**
Fraser & Chalmers of Canada, Limited.
Smart-Turner Machine Co.
S. Flory Mfg. Co.
Peacock Bros.
M. Beatty & Sons.
Mussens, Ltd.
Can. Fairbanks-Morse Co.
The John Inglis Co., Ltd.
- Fans—Ventilating—**
Fraser & Chalmers of Canada, Limited.
Sullivan Machinery Co.
Peacock Bros.
Mussens, Ltd.
- Feeders—Ore—**
Fraser & Chalmers of Canada, Limited.
Mussens, Ltd.
- Flights—**
Hendrick Mfg. Co.
- Friction Hoists—**
The Herbert Morris Crane & Hoist Co., Ltd.
- Forges—**
Mussens, Ltd.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co., Ltd.
- Forging—**
M. Beatty & Sons.
Smart-Turner Machine Co.
Peacock Bros.

Canadian Explosives, Limited

Head Office - - - MONTREAL, P.Q.
 Main Western Office - VICTORIA, B.C.

This stamp



means quality

Get this stamp on your explosives and you get efficiency.

See us before buying elsewhere.

We specialize in explosives for safe coal getting and rock work.

We can give you an explosive which will produce your coal or ore at a minimum cost with a maximum of safety.

We also handle the best of blasting accessories, including Electric Fuses, Electric Time Fuses, Safety Fuse, Blasting Batteries, Tamping Bags, Thawing Cans, Connecting Wire and Leading Wire, in fact everything needed for your work.

Our Stumping Powder has made land clearing cheap and easy for the farmer.

We have offices at the points mentioned below. Look them up and our Managers are sure to interest you. Tell them about your proposition and you will be surprised at the help you will receive.

DISTRICT OFFICES:

NOVA SCOTIA:	-	-	-	-	-	-	Halifax
QUEBEC:	-	-	-	-	-	-	Montreal
ONTARIO:	Toronto,	Cobalt,	South Porcupine,	Port Arthur,	-	-	Kingston
MANITOBA:	-	-	-	-	-	-	Winnipeg
ALBERTA:	-	-	-	-	-	-	Edmonton
BRITISH COLUMBIA:	Vancouver,	Victoria,	Nelson,	-	-	-	Prince Rupert

Factories at

Beloil, P.Q.	Vaudreuil, P.Q.	Windsor Mills, P.Q.
Waverley, N.S.	James Island, B.C.	Nanaimo, B.C.
Northfield, B.C.	Bowen Island, B.C.	Parry Sound, Ont.

Canadian Miner's Buying Directory.—(Continued from page 28.)

Furnaces—Assay—

Lymans, Ltd.
Mussens, Ltd.

Fuse—

Peacock Bros.
Curtis & Harvey (Canada),
Ltd.
Canadian Explosives.
Mussens, Ltd.
Northern Canada Supply Co.
Canadian H. W. Johns-Man-
ville Co., Ltd.

Gears—

Smart-Turner Machine Co.
Northern Canada Supply Co.
The John Inglis Co., Ltd.

Generators—

Northern Electric Co., Ltd.
Peacock Bros.
Can. Fairbanks-Morse Co.

Hangers—Cable—

Northern Electric Co., Ltd.
Standard Underground Cable
Co. of Canada, Ltd.

Hand Hoists—

The Herbert Morris Crane &
Hoist Co., Ltd.
Fraser & Chalmers of Can-
ada, Limited

Heaters—Feed Water—

Mussens, Ltd.
Peacock Bros.

High Speed Steel Twist Drills—

Mussens, Ltd.
Northern Canada Supply Co.

Hoists—Air, Electric and

Steam—
Can. Ingersoll-Rand Co., Ltd
Peacock Bros.
Mussens, Ltd.
S. Flory Mfg. Co.
Jones & Glasco.
M. Beatty & Sons
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Can-
ada, Limited
Northern Canada Supply Co.

Hoists, Chain, Electric and

Pneumatic—
The Herbert Morris Crane &
Hoist Co., Ltd.

Hoisting and Conveying Ma-

chinery—
Jenckes Machine Co., Ltd.

Hoisting Engines—

Peacock Bros.
Mussens, Ltd.
Can. Fairbanks-Morse Co.
Sullivan Machinery Co.
Fraser & Chalmers of Can-
ada, Limited
Can. Ingersoll-Rand Co.
M. Beatty & Sons.

Hoists—Gas and Gasoline—

Mussens, Ltd.

Hose—

Canadian H. W. Johns-Man-
ville Co., Ltd.
Mussens, Ltd.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

Jacks—

Mussens, Ltd.
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd
Northern Canada Supply Co.

Jigs—

Mussens, Ltd.
Roberts & Schaefer Co.

Lamps—Acetylene—

Mussens, Ltd.
Northern Canada Supply Co.

Lamps—Safety—

Mussens, Ltd.
Canadian Explosives.
Peacock Bros.

Link Belt—

Northern Canada Supply Co.
Jones & Glasco.

Locomotives—Electric—

Mussens, Ltd.
Jeffrey Mfg. Co.

Locomotives—Steam—

Mussens, Ltd.

Metal Merchants—

Henry Bath & Son.
Geo. G. Blackwell, Sons &
Co.
Consolidated Mining and
Smelting Co. of Canada.
Canada Metal Co.

Monel Metal—

Orford Copper Co.

Motors—

Mussens, Ltd.
Northern Electric Co., Ltd.
Can. Fairbanks-Morse Co.
Peacock Bros.

Ore Sacks—

Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

Ore Testing Works

Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

Ores and Metals—Buyers and

Sellers of—
Geo. G. Blackwell.
Consolidated Mining and
Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

Perforated Metals—

B. Greening Wire Co., Ltd.
Fraser & Chalmers of Can-
ada, Limited
Northern Canada Supply Co.
Hendrick Mfg. Co.

Pick Machines—

Sullivan Machinery Co.

Picks—Steel—

Mussens, Ltd.
Thos. & Wm. Smith.
Peacock Bros.

Pipes—

Consolidated M. & S. Co.
Peacock Bros.
Can. Fairbanks-Morse Co.
Mussens, Ltd.
Northern Canada Supply Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.
A. M. Byers Co.

Pipe Fittings—

Can. H. W. Johns-Manville
Mussens, Ltd.
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

Pneumatic Chain Blocks—

The Herbert Morris Crane &
Hoist Co., Ltd.

Pneumatic Tools—

Can. Ingersoll-Rand Co., Ltd
Jones & Glasco.

Producer—Gas—

Mussens, Ltd.

Prospecting Mills and Mach-

inery—
Standard Diamond Drill Co.
Mussens, Ltd.
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Can-
ada, Limited

Pulleys, Shafting and Hang-

ings—
Fraser & Chalmers of Can-
ada, Limited
Northern Canada Supply Co.

Pumps—Boiler Feed—

Can. Fairbanks-Morse Co.
Mussens, Ltd.
Northern Canada Supply Co.
Peacock Bros.
Canadian Ingersoll-Rand Co.
Ltd.
Fraser & Chalmers of Can-
ada, Limited

Pumps—Centrifugal—

Mussens, Ltd.
Smart-Turner Machine Co.
Peacock Bros.
Thos. & Wm. Smith.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd
Fraser & Chalmers of Can-
ada, Limited
The John Inglis Co., Ltd.

Pumps—Electric—

Can. Fairbanks-Morse Co.
Mussens, Ltd.
Canadian Ingersoll Rand Co.,
Ltd.
Fraser & Chalmers of Can-
ada, Limited
The John Inglis Co., Ltd.

Pumps—Pneumatic—

Can. Fairbanks-Morse Co.
Mussens, Ltd.
Smart-Turner Machine Co.
Can. Ingersoll-Rand Co., Ltd
Can. Fairbanks-Morse Co.

Pumps—Steam—

Can. Ingersoll-Rand Co., Ltd
Mussens, Ltd.
Thos. & Wm. Smith.
Northern Canada Supply Co.
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
The John Inglis Co., Ltd.

Pumps—Turbine—

Mussens, Ltd.
Canadian Ingersoll-Rand Co.,
Ltd.
Fraser & Chalmers of Can-
ada, Limited
The John Inglis Co., Ltd.

Pumps—Vacuum—

Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.

Quarrying Machinery—

Mussens, Ltd.
Jenckes Machine Co., Ltd.
Can. Cleveland Drill Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

Roasting Plants—

Fraser & Chalmers of Can-
ada, Limited

Rolls—Crushing—

Mussens, Ltd.
Fraser & Chalmers of Can-
ada, Limited

Roofing—

Faterson Mfg. Co.
Dominion Bridge Co.
Mussens, Ltd.
Northern Canada Supply Co.
Can. H. W. Johns-Manville

Rope Blocks—

The Herbert Morris Crane &
Hoist Co., Ltd.
Mussens, Ltd.

Rope—Manilla and Jute—

Jones & Glasco.
Mussens, Ltd.
Peacock Bros.
Northern Canada Supply Co.
Allan, Whyte & Co.
Thos. & Wm. Smith, Ltd.

Rope—Wire—

B. Greening Wire Co.
Allan, Whyte & Co.
Northern Canada Supply Co.
Thos. & Wm. Smith.
Fraser & Chalmers of Can-
ada, Limited
Mussens, Ltd.

Rubber—

Canadian Consolidated Rub-
ber Co., Ltd.

Runways, Hand Operated—

The Herbert Morris Crane &
Hoist Co., Ltd.

Samplers—

Canadian Laboratories.
Ledoux & Co.
Milton Hersey Co.
Thos. Heys & Son.

Screens—

Mussens, Ltd.
Jeffrey Mfg. Co.
Northern Canada Supply Co.
R. Greening Wire Co.
Peacock Bros.
Fraser & Chalmers of Can-
ada, Limited
Jenckes Machine Co., Ltd.

Screens—Cross Patent Flang-

ed Lip—
Hendrick Mfg Co.

Separators—

Smart-Turner Machine Co.
Peacock Bros.
The John Inglis Co., Ltd.

Sheets—Genuine Manganese

Bronze—
Hendrick Mfg. Co.

Shear Legs—

The Herbert Morris Crane &
Hoist Co., Ltd.

Shovels—Steam—

Mussens, Ltd.
M. Beatty & Sons.

Slime Tables—

James Ore Concentrator.

Smelting Machinery—

Mussens, Ltd.
Peacock Bros.
Fraser & Chalmers of Can-
ada, Limited

Stacks—Smoke Stacks—

Canadian H. W. Johns-Man-
ville Co., Ltd.
Hendrick Mfg. Co.

Stamp Mills—

Jenckes Machine Co., Ltd.
Mussens, Ltd.
Can. Fairbanks-Morse Co.
Peacock Bros.
Fraser & Chalmers of Can-
ada, Limited

Steel Drills—

Sullivan Machinery Co.
Mussens, Ltd.
Northern Canada Supply Co.
Can. Ingersoll-Rand Co., Ltd
Peacock Bros.
Swedish Steel & Imp. Co., Ltd

Steel—Tool—

Mussens, Ltd.
Thos. & Wm. Smith.
Can. Fairbanks-Morse Co.
N. S. Steel & Coal Co.
Swedish Steel & Imp. Co. Ltd

Surveying Instruments—

Peacock Bros.
W. F. Stanley.
C. L. Berger.

Switchboards—

Northern Electric Co., Ltd.

Tanks—Cyanide, Etc.—

Mussens, Ltd.
Peacock Bros.
Fraser & Chalmers of Can-
ada, Limited
Jenckes Machine Co.
Hendrick Mfg. Co.

Tramways—

Mussens, Ltd.
B. Greening Wire Co.

Transformers—

Can. Fairbanks-Morse Co.
Northern Electric Co., Ltd.
Peacock Bros.

Transits—

C. L. Berger & Sons.
Peacock Bros.

Tractors—Oil—

Can. Fairbanks-Morse Co.

Tube Mills—

Mussens, Ltd.
Peacock Bros.
Fraser & Chalmers of Can-
ada, Limited

Turbines—

Peacock Bros.
Fraser & Chalmers of Can-
ada, Limited

Winding Engines—

Mussens, Ltd.
Peacock Bros.
Canadian Ingersoll-Rand Co.,
Ltd.

Wire Cloth—

Mussens, Ltd.
Northern Canada Supply Co.
B. Greening Wire Co.

Wire (Bare and Insulated)—

Northern Electric Co., Ltd.
Standard Underground Cable
Co., of Canada, Ltd.

Zinc Dust—

Roessler & Hasslacher.

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$72,704,603; Lode Gold, \$76,486,512; Silver \$35,832,546; Lead, \$29,696,585; Copper, \$80,818,051; Other Metals (Zinc, Iron, etc.), \$1,852,824; Coal and Coke, \$142,068,615; Building Stone, Brick, Cement, etc., \$20,974,184; making its Mineral Production to the end of 1912 show an

Aggregate Value of \$460,433,920

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1888, inclusive, \$69,598,850; for five years, 1889-1893, \$15,079,632; for five years, 1894-1898, \$38,738,844; for five years 1889-1903, \$83,807,166; for five years, 1904-1908, \$116,153,067; for five years, 1909-1913, \$137,056,361.

Production During last ten years, \$253,209,428

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with mining Reports and Maps, may be obtained gratis by addressing

THE HON. THE MINISTER OF MINES
VICTORIA, British Columbia

YOUR Fine Ores, Concentrates and Fluedust

Can be Cheaply and Successfully
Sintered by the

DWIGHT & LLOYD SYSTEM

(Fully Protected by Patents.)

SIMPLE, EFFICIENT, CONTINUOUS
LOW COST OF INSTALLATION

Many plants now in daily operation in U.S., Dominion of Canada, Republic of Mexico, Australia and European Countries. For particulars as to Licenses in Canada, Estimates, etc., address

Dwight & Lloyd Sintering Co., Inc.

(Successor to Dwight & Lloyd Metallurgical Co.)

29 Broadway, New York.

Cable Address: SINTERER, NEW YORK

"For information regarding sintering of iron ores and iron flue dust, consult special licensee."

American Ore Reclamation Co.

71 BROADWAY, N.Y.

"B.C." Mining Drill Steel

The Steel with a Reputation

*Has stood the test in Canada for Twenty
years.*

Manufactured by

B. K. MORTON & COMPANY

SHEFFIELD, England.

Full Stocks carried by

Montreal: The Canadian B. K. Morton Co., Ltd.

Toronto: The Canadian B. K. Morton Co., Ltd.

Cobalt: The Canadian Rand Co., Ltd.

Victoria B.C.: E. G. Prior & Co., Ltd.

The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

Deposits of particularly high grade manganese ore occur at a number of different localities.

Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

High-grade cement-making materials have been discovered in favorable situations for shipping.

Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H. P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to

HON. E. H. ARMSTRONG,
Commissioner of Public Works and Mines,
HALIFAX, N. S.

LANDS OF THE ALGOMA CENTRAL & HUDSON BAY RAILWAY

Opened for Prospecting

Two thousand square miles of railway lands in the Lake Superior region that have been held in reserve during the construction of the A. C. & H. B. Railway are now open for public prospecting.

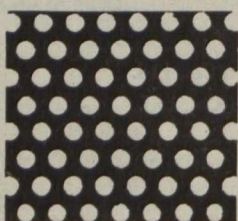
No license is required; staking, recording and assessment work practically as on Government lands. Perpetual mining rights obtainable under renewable leases on easy royalty. The lands are in alternate blocks with intervening areas of Government lands which are also open for prospecting. Two passenger trains daily through the district.

— FOR REGULATIONS, MAPS, ETC., APPLY TO —

JOHN A. DRESSER,

Manager, Lands Dept., A. C. & H. B. Ry.,

Sault Ste. Marie, Canada



PERFORATED METALS *For Every and All Purposes in all Metals*

Elevator Buckets (plain and perforated).
Conveyor Flights and Trough, also
General Sheet Iron Work.

HENDRICK MANUFACTURING CO., Carbondale, Penna., U.S.A.

New York Office: 30 Church St.

THOS. & WM. SMITH, LTD.,

WIRE ROPE MANUFACTURERS,

NEWCASTLE-ON-TYNE, ENGLAND.

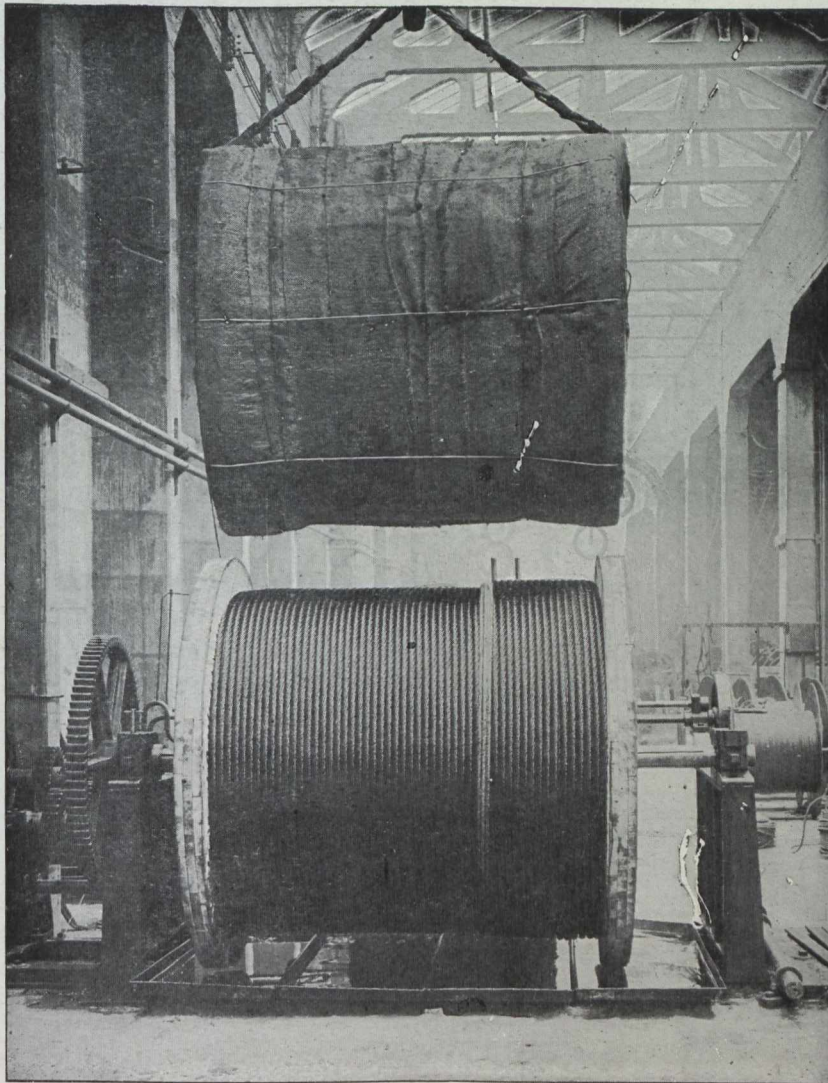
STEEL WIRE ROPES (RED THREAD BRAND.)

For MINING:—

Winding, Hauling, etc.

Also Aerial Cableways,

Cranes, Dredges, etc.



Two Reels of Wire Rope for a Colliery Company in Nova Scotia, each 10,000 feet long, $1\frac{1}{8}$ " diameter, and weighing ten tons each.

MODERN AND UP-TO-DATE APPLIANCES
for dealing rapidly and efficiently with Wire Ropes of any weight.

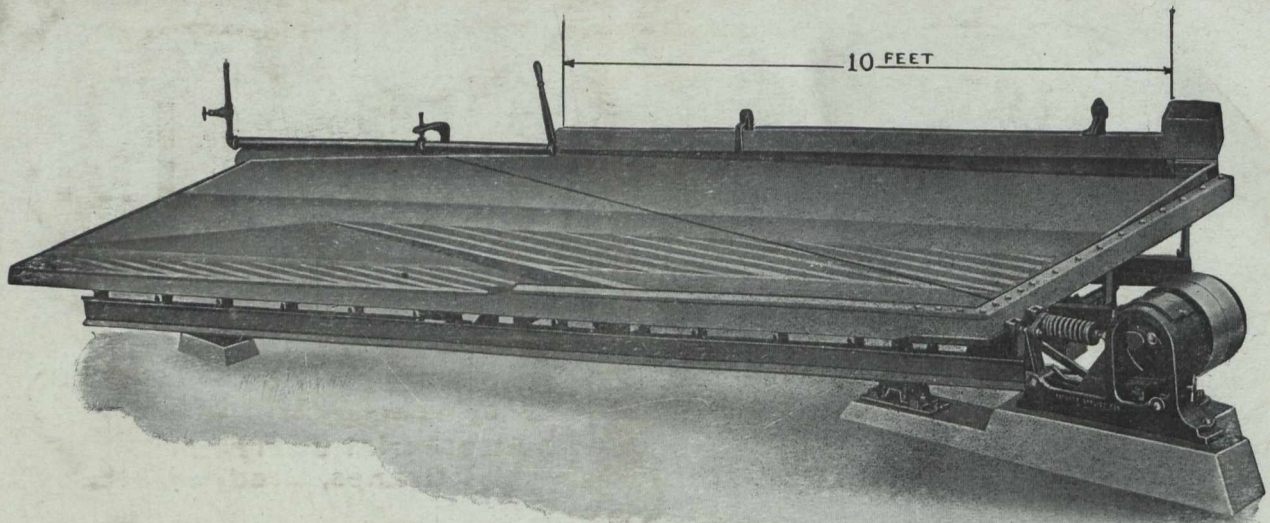
CANADIAN REPRESENTATIVE:

D. W. CLARK, 49 Common Street, Montreal, P.Q., CANADA.

AGENTS.

Evans, Coleman & Evans, Ltd., Vancouver B.C.

CANADIAN B. K. MORTON CO., LTD., TORONTO



The James Diagonal Plane Slimer, Patented

The James Diagonal Plane Slimer Has Proven Its Superiority Over Its Competitors In The Cobalt District. This table is manufactured in New Glasgow, Nova Scotia, for the Canadian Market, and Newark, N.J. for the United States and Mexican Markets.

The following are users of the JAMES TABLES in this district.

Nipissing Reduction Works.	Buffalo Mines.	Temiskaming Mining Co., Ltd.
Hudson Bay Mines, Ltd.	Trethewey Silver	Cobalt Mining Co., Ltd.
Beaver Consolidated Mines, Ltd.		The O'Brien Mines.

James Ore Concentrator Company, 35 Runyon St. NEWARK, N.J.

EXPLOSIVES

For Every Class of Work

CURTIS'S & HARVEY

(CANADA) LIMITED

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Montreal