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DR. W. H. DRUMMOND

The death of Dr. Drummond deprives Canada of a singularly gifted son. For the past two or three years Dr. Drummond had been associated with his brothers in the development and operation of the well-known "Drummond" Mine in Cobalt, where, latterly, he spent most of his time. It was here that he died, after a brief illness, on April 6th.

Dr. Drummond's kindly muse was both robust and homely. Many of his "Habitant" poems are already accepted as permanent additions to Canadian literature. His books are looked upon as an essential part of any camp equipment. He wrote of Canadians, for Canadians. His field was his own. As a sympathetic interpreter of French-Canadian rural life he stands unapproached. His untimely death came as grievous shock to the whole nation.

FORESTRY

The Canadian Forestry Association held its eighth annual meeting in the Railway Committee Room of the House of Commons, Ottawa, on the 14th and 15th of March. The growing sentiment in favor of a more conservative and far-sighted policy in regard to our forests has been strongly in evidence at recent meetings of this association, as also in discussions of the subject in the press, and in the efforts which have been made in recent years to found forestry schools in Canada. The subject is of far-reaching importance in engineering. Wood is now and always will be cheap, strong, and easily worked structural material. For many purposes we can hardly hope to replace it. For example, it is doubtful if it can be advantageously replaced for railway ties or for mine timbers. Civil engineers are in this and in other ways intimately concerned in the question as to how we in Canada can best conserve our forest resources, and how best provide a growth of timber in those parts of the Dominion where the supply is insufficient for local demands. For in the long run it will surely be cheaper to grow the timber reasonably near the place where it is to be used than to transport it over great distances. Our great railway companies, particularly those which control extensive tracts of land, might consider whether it will not be better to set aside lands to grow tie timber for the future, rather than to sell it for a few dollars an acre.

The question is also one of deep concern for mining engineers. A constant supply of mine timber is needed, not to speak of lumber for buildings. But a more serious problem for many mines is the one of fuel. The waste in this respect is painful to contemplate. Many mines are so far from cheap transportation that coal is almost out of the question for fuel. And when the wood within reach has been used up, it often happens that the manager has nothing but a barren prospect of hopeless old brule to contemplate when he looks around for fresh supplies. The last report of the Ontario Bureau of Mines mentions a case in which a mine was closed down owing to scarcity of fuel.

Metallurgists are also interested in this subject. Charcoal is a pure fuel for reducing purposes. At Radnor

Forges, in Quebec, and at Deseronto, Ontario, high grade iron has, for many years, been made in charcoal furnaces; but the increasing difficulty of getting a supply of wood for charcoal has become a very serious problem. The charcoal retorts have been living on capital, and as a natural consequence the supply of wood is getting farther and farther away. If the rocky portions of the country, unfit for farming purposes, were kept permanently covered with forest growth, the annual increase would give a perpetual supply of wood for the manufacture of charcoal, railway ties and mine timber, not to speak of the more general uses, such as for domestic fuel, furniture, farm implements, and buildings.

It is not necessary for Canada to pass through the stages of waste and lack of foresight which have cost some of the European countries so dearly. It is possible for us to take as our object lesson the dreary wastes of bare hillsides in some parts of France and Italy, where millions are now being spent in the effort to restore the forest covering. We might even get our warning nearer home. Wisconsin has eight million acres of worthless lands, once covered with a fine growth of timber. Michigan can also show her warning scars. Both States, with many others, must now consider, if they have not already begun to solve, the slow and very expensive process of reforestation. Why should not Canada omit this stage? She can do so by selecting now the lands which are to remain under forest because unfit for farming, or because the forest is needed to conserve and regulate the flow of water from watersheds. This means wise foresight, a far-seeing view of national interests—in a word, statesmanship.

THE LORD'S DAY ACT

On March 1st the Lord's Day Act became operative in British Columbia. Its rigid enforcement will, beyond all shadow of doubt, militate against the mining and smelting industries, more particularly against the latter. In itself the Lord's Day Act may be an admirable thing. In its general operation it may conduce to the good of the whole Province. But its promoters should take care to inform themselves thoroughly as to its certain effect upon the mining and smelting interests.

There are several metallurgical processes, the whole value of which depends upon their continuity. For example, no iron smelter could survive a regular stoppage of work on Sundays. At nearly all mines a certain amount of labor must be performed on the Sabbath, else work would be suspended on Monday.

We know of a case in our own experience, where the over-zealous apostle of Sabbath observance wrought havoc with a struggling enterprise. Should British Columbia be made to suffer from the intemperance of religious enthusiasts, the whole question of Sabbath observance will receive a serious setback.

MONTREAL RIVER

After such examination as the weather conditions of early spring would permit, Professor Miller reported favorably upon the new silver district lying between Lady Evelyn Lake and Elk Lake. Even tentative official approval will cause a tremendous rush to these areas. As one possible effect of this movement, it is to be hoped that the tropical growth of Larder Lake capitalizations will be checked as by the expulsive power of a new affection.

In his earliest report on Cobalt, Professor Miller asserted that there was every likelihood of recurrences, to the west, of deposits similar to those at Cobalt. This is one addition more to the debt that the Province and the mining fraternity owe to the sagacity and perspicuity of Ontario's Provincial Geologist.

THE PROMOTER

The professional promoter has many sins for which to answer. When the high gods look over his accounts they will notice upon the debit side the scalps of investors innumerable.

The mine promoter, having staked out a claim near the Sinful Sucker, asseverates that since his own property answers to the name of Shameful Swindle, and since both names have an equally sibilant sound, therefore he is justified in expecting seven hundred ounces of gold per ton.

These statements, after due wrapping in the tinsel of high-sounding technical phrases, are served to the public through the daily press. The advertising artist spares no pains. He leaps from hyperbole to extravagance, from extravagance to nonsense. Beside his pyrotechnics, the cold and truthful estimate of a mining engineer looks appallingly flat. How long the public will continue to swallow the misstatements of the promoter we do not know. But we do know that the co-operation of every *bona fide* mining engineer, of all genuine mine operators, and of our technical educationists, is needed to educate the investors of Canada up to a point where they can distinguish the meretricious from the legitimate mining proposition.

EAST AND WEST

Could we acquire perspective by projecting ourselves into the future, and were we then to look back upon the past half decade, we would realize the tremendous import of our country's recent development. An added significance would then be given to the discovery of coal in the Western Provinces. The movement of population to the West, the re-population of the East by wisely controlled immigration, and the consequent readjustment of relations could be traced.

That the West will fulfil its rich promise of to-day, we do not doubt; but we believe, also, that the Maritime East will rehabilitate itself. Already it possesses every essential of natural prosperity. It suffers by contrast with the alluring West. But, all in all, the East is as rich in opportunity as is the West.

THE CHEMIST AND HIS OPPORTUNITIES

To-day the miner protects himself and cudgels operator and public with that most effective weapon, the strike. Elaborate and comprehensive labor organizations give the strike its efficacy.

No such weapon is in the hands of the technical chemist. After four college years—and three intervening summers of unremunerative toil—the chemist becomes an underpaid, overworked assistant in the laboratory of a metallurgical or mining plant. Here the deadening routine stultifies him, robs him of initiative. Conscientious and accurate work is expected of him. A mistake of his may cost his employers hundreds of dollars and him his position. He knows that many of the foremen on the plant get twice his pay and shoulder not a tithe of his responsibility. Also he is aware that cheap chemists are replaced with ease. All of which does not bring inspiration.

The disabilities under which the chemist labors are due in small part to himself. He accepts wages that, in these days of constantly increasing cost of living, hardly suffice to feed and clothe him, and he is backed by no organization of his fellows. But upon the employer rests the larger share of blame. He looks upon the chemist as a superfluity. In engaging him he conforms to a certain growing custom, and that is all. It remains for him to extract from the chemist a maximum of work for a minimum of pay.

If the chemist proves to be a man of undoubted ability he is translated from the laboratory to some sphere of "practical" usefulness. But the chemist, *per se*, is a subordinate and humble official, who performs certain suspicious-looking operations and supplies figures for "practical" men to use.

As with all other abuses, this false conception of the chemist's functions can be corrected only by education. We talk largely and wisely of technical education for our rising generation. Our most startling need is technical and business education for our employers.

EDITORIAL NOTES

The JOURNAL extends its sympathy to McGill University in the very serious loss sustained by the burning of the Engineering Building. We note with pleasure that the Mining Engineering Department was not seriously damaged.

We wish to announce to our readers and the public generally that, in response to a very large number of enquiries, we are about to publish an authentic and up-to-date map of the Cobalt district. This map will have the merit of being both complete and accurate.

THE CANADIAN MINING JOURNAL will welcome letters from its subscribers on any subject pertaining to mining. Any requests for information of a technical nature will receive prompt attention. But it is undesirable that the JOURNAL should attempt to give information to individual enquirers about isolated mining camps; neither is it well that we should try to advise in matters pertaining to the stock market. There are many capable mining engineers and brokers whose business it is to advise in these matters.

A company has been organized in London, England, for the purpose of manufacturing "coalite," a smokeless fuel. The process of manufacture is yet a secret, but several plausible guesses have been offered. It is supposed that bituminous coal is subjected to treatment with superheated steam. The resultant "coalite" carries about 10 per cent. volatile matter and is perfectly smokeless. Petrol, for which the demand is increasing out of all proportion to the visible supply, is to be secured as a by-product. The process, it is claimed, will serve the double purpose of abating smoke nuisance and of relieving the petrol market. The project sounds somewhat too good to be true.

Annual Meeting of the Mining Society of Nova Scotia

The fifteenth annual meeting of the Nova Scotia Mining Society was opened in the Board of Trade rooms, Halifax, on Wednesday morning, March 27th, 1907. President Hayward's opening address, which is given below, was encouragingly optimistic.

After the opening address, Secretary Wylde's report was read, new members were elected, and the reports of various committees received.

On Wednesday evening the annual banquet was held at the Halifax Hotel. The banquet was attended by about 200 guests, and was a most unquestioned success. Indeed, the smoothness with which every feature of the dinner was carried out deserves more than passing mention. A military band provided most acceptable music. A paper by Mr. Robert Reford on "Transportation," and an address on "Municipal Ownership," by the Rev. Dr. Magill, were listened to after the dinner. On Thursday afternoon, March 28th, the annual session was concluded.

During the sessions the following papers were read and discussed:—

"Mine Pumping with Direct Connected Turbine Pumps," by P. H. Moore, M.E.

"Sinking and Timbering of the Allen Shaft," by H. E. Call, M.E.

"History of the Mining Society of Nova Scotia," by G. W. Stuart, M.E.

"Notes on the Property of the Seal Harbor Mining Company," by T. G. MacKenzie.

"Classification of Coal," by A. L. MacCallum, B.Sc.

"Coal Shipping Piers," by Hiram Donkin.

"Geological conditions of the Iron Ores of Nova Scotia," by Prof. Woodman.

"Coal Sampling," by Prof. Woodman.

"Londonderry Furnace Practice," by H. S. Badger.

"Sibley Mine, North Brookfield," by E. Percy Brown.

PRESIDENT—MR. C. J. COLL, STELLARTON, N.S.

The new officers elected are:—President, C. J. Coll, general manager Acadia Coal Company, Stellarton; 1st Vice-President, Dr. J. E. Woodman, Dalhousie College, Halifax; 2nd Vice-President, T. J. Brown, general manager Nova Scotia Steel & Coal Company, Sydney Mines; Secretary-treasurer, H. M. Wylde, Halifax. Council—Ald. J. A. Johnson, Dr. H. S. Poole, Prof. F. H. Sexton, G. W. Stuart, R. H. Brown, Hon. B. F. Pearson.

ADDRESS OF THE RETIRING PRESIDENT, A. A. HAYWARD.

Mr. Vice-President and Gentlemen:

This being the fifteenth anniversary of the Mining Society of Nova Scotia, as well as its fifteenth annual meeting, it is but natural that we should seriously consider the affairs of the Society by glancing back to the days of our first meetings, to the days of anticipations, to-day but partially realized.

To-day we ask ourselves: Are we fully satisfied with the results that have been obtained through organization? Have we, as members, given to the Society our individual and loyal support? Can we claim any individual improvement in ourselves because of our having helped to create and support the Mining Society of Nova Scotia? Has the Society been all you could desire, and has it accomplished sufficient to warrant its existence, and entitle it to respect and public recognition?

If anyone were to cast a stone into a body of water, of more or less extent, its influence would be recorded on shores far from the central point of disturbance. And just so can we liken the individual efforts of the gentlemen who compose this Society. Their individual efforts and experiences recorded in the transactions of the Society, and the discussions that have naturally followed, must have in some degree influenced and moulded public opinions.

Where are they, within, or, without, the circle of this Society that can truthfully say, the experience recorded in the form of papers by its members, during the years that have past, have not gone out from this humble centre and been far-reaching in their effects, and perhaps been instrumental in assisting some hesitating chap up the hill of uncertainty, and perhaps brought success where before failure seemed imminent? On the other hand, the recording of our experience may have been instrumental in preventing others from undertakings costly both in time and money, and possibly may have prevented disaster.

I venture to say there are none present, who review the days of the old four-stamp mill, with all its defects in construction and operation, but will admit the improved conditions in the stamp mills of to-day (at least in this Province) are not largely due to the recording of experiences of many of the men, who early in the history of this Society occupied prominent positions on its council. How many are there who recall the primitive mining, pumping and hoisting plants that dotted this Province from one end to the other, who do not feel the greatly improved conditions in these mechanical appliances are also in a large measure due to interchange of ideas and experience of members of this Society?

One might multiply at length, and still the result would be the same, and in the end we would conclude that apart from the social side of our corporate existence we have after all been some individual benefit to each other; and that perhaps some tiny wavelet of our experience, though enfeebled by its journey, may have reached some distant shore, and while not entirely adapted to its new environments may find lodgement in some sympathetic surroundings and bring forth abundant fruit in due season.

ROOM.

On behalf of the Room Committee, I have much pleasure in welcoming you to the new home of the Society, which, through your indulgence and generosity, has been secured and furnished at the expense of the Society, and the committee sincerely trust that their efforts will meet with your approval.

There surely should be a feeling of satisfaction and rest when we realize, after all our wanderings, that we are at last and for the first time in our history established in quarters befitting the dignity of a Society whose members represent the largest and most important portion of the industrial activity of the Province of Nova Scotia, the royalties from which largely defray the expenses of our political Government.

During the year the books belonging to the Society, which were stored at the Science Library, have been housed in cases in our new quarters, and one hundred and thirty-four new books added to the library. I consider the acquiring of a library most important, but in doing so it would be well not to duplicate books already in the Science Library.

BUILDING.

I would strongly recommend that the Society keep in mind the desirability, if not the necessity, of owning a suitable building in which to make a permanent home. I might say that I do not think it beyond the range of possibility that sufficient money might be donated for such a purpose, providing proper steps were taken to secure it. This work could best be done by the appointment of a committee, which I would strongly recommend.

AMALGAMATION.

I am also of the opinion that an amalgamation of the Engineering Society with that of the Mining Society of Nova Scotia would result beneficially to both, as the addition of their numbers would greatly increase the effectiveness of this Society, while both would receive largely increased benefits, and the operating expenses per member would be reduced.

It must be apparent that there is not sufficient room in this small field for two societies working along similar lines if they are to accomplish results.

By-Law.

By-law VII., regulating the election of officers, is ambiguous and should be repealed and another substituted. And again, the preparing of a slate by the council does not give satisfaction, conveying as it does the impression that the Society is run by a clique, which impression should not be allowed to continue if good government and harmony is desired.

Nominations should be made by members only. Nine members should compose the council, instead of six. This would give better representation to the country at large.

been satisfactory to the operator, and that the same degree of satisfaction has been enjoyed by the consumer. But this is purely a trade question, and cannot wisely be taken up in a Society representing the technical side of commercial life.

Gold Mining.

This industry, according to the official returns, was still on the decline during the year 1906, the total yield of gold being about 14,000 ounces, and which is about 1,000 ounces below the yield of 1905.

Several causes are by as many different people assigned as a

PAST PRESIDENTS AND SECRETARY OF NOVA SCOTIA MINING SOCIETY

reason for the falling off in the yearly production, all having a certain amount of merit.

That there will ever be any material improvement in the general conditions of metalliferous mining in this Province, until the Department of Mines is divorced from the Department of Public Works, and a man placed at the head of the Mines Department who is not responsible to party politics, but is dependant upon his own ability, is a question this Society would do well to consider. And if the Society would adopt, as one of the things to be accomplished during the year 1907, the investigating of the decline in gold mining, I am confident the results would be found sufficiently encouraging to entitle us to bring the matter more forcibly before the Government.

Publications.

It has been proposed by the secretary of the Canadian Mining Society that your transactions be published in connection with those of the Institute, and that the Institute would be willing to do this at a cost not to exceed the present cost of the publication to this Society.

There should be considerable advantage by such an arrangement, but if any future plans for amalgamation with the Engineering Society are to be considered, it would be unwise to tie the Society up by considering such offer too hastily.

Coal Output.

The output of coal during the year 1906 was, roughly, 5,850,000 tons. The returns from this important industry, we trust, have

IRON MINING.

This industry is receiving more recognition than in former years. There seems to be an increased demand for native ore. This is no doubt largely due to the increased bounty on iron made from native ore.

It was to be hoped that at least a part of the bounty now paid to the iron master would have been paid to the producer of native ores. Such a policy would encourage prospecting and stimulate the development of many encouraging locations.

TECHNICAL EDUCATION.

This most important subject has during the year occupied much time and thought, but not more than the subject deserved or required.

And after many trials and changes of position, the establishment of a school of technology in this Province, and by the Local Government, seems to be quite well assured.

To accomplish this, it was necessary to secure the co-operation of all existing educational institutions, who, by their moral support, made the situation possible, at the same time securing harmony. And as the gentlemen from the various institutions who by invitation met in these rooms last April, for the purpose of more fully considering the entire project, most earnestly supported the plan proposed by your committee, and by their support opened the way for the Government to safely and seriously consider the project, they naturally expected that when a final decision was reached, and before any bill was drafted and presented, all the contracting and interested parties would be called together again for consultation, and that a bill would not be constructed on the advice alone of gentlemen from any one of the institutions, and especially from the one which would, under the provisions of the bill, receive the larger amount of benefit. But such are the regrettable facts. The Society, however, has nothing to regret, as their actions have been open and above board. And now that their efforts are apparently to be crowned with success, the credit, if any is to be enjoyed, belongs to Mr. Alex. McNeil, the gentleman who first called to the attention of this Society the necessity of higher technical education for the young men of this, his native Province.

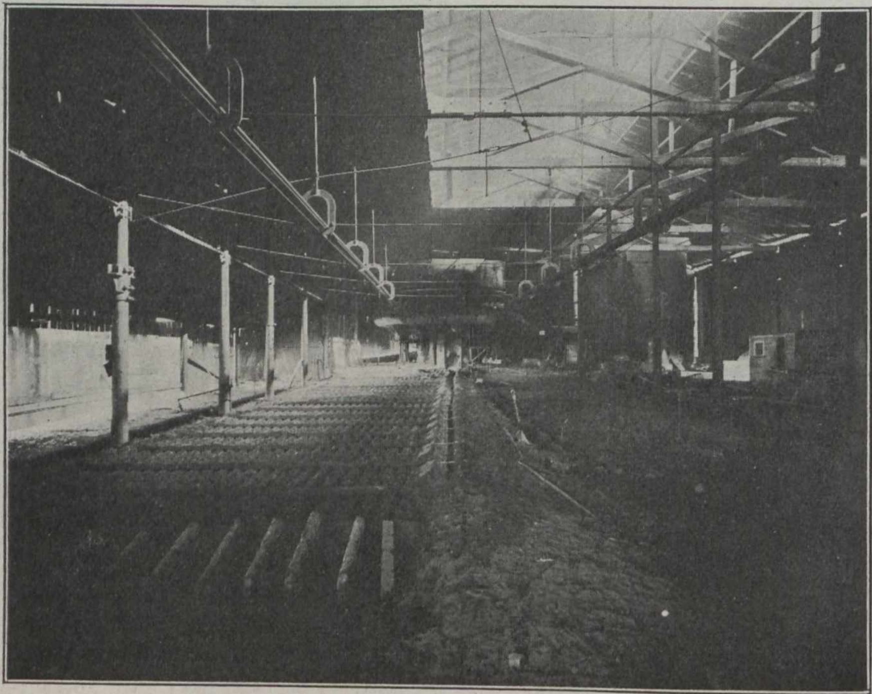
MEMBERS.

During the past year, while the membership of the Society has not largely increased, there has been no falling off, either in its members or their loyalty to the Society. There has not, however, been given that individual and collective support that was anticipated, and without which no Society can expect to accomplish high attainments. Yet, judging from past experience, had serious conditions arisen demanding united action and enthusiastic support, I am confident the opportunity to demonstrate the fervent loyalty of its members would not have been neglected.

Nevertheless, passive submission and willingness to allow things to drift when no clouds darken the horizon, are not conducive to good government; nor can the Society under such conditions be reasonably expected to ripen or mature the soundest and best fruits of progress and edvelopment.

I therefore earnestly recommend that each and every member give to the incoming administration such support as he himself would expect were he similarly situated. And if this is done there need be no apprehension as to the results that will be accomplished by the Society.

There are many valuable objects which this Society would do well to interest itself in, and which are closely allied to the more complete development of this Province. It should not be necessary to wait until the opportunity overtakes the Society. But go and meet it half way; and, if necessary, go farther and create the opportunity, and by so doing establish the right of the Society to increased recognition and respect.



INTERIOR OF CAST HOUSE, LONDONDERRY, N.S.

SUBJECTS.

There is set forth, as one of the objects of the Society, the interchange of ideas by meetings, and reading of papers, and it is assumed scientific and practical results were expected to follow the reading of such papers and the discussions that would naturally follow. I would strongly advise a still closer application along such lines, rather than admission and discussing of commercial subjects, which only have tendency to lower the character and tone of your deliberations. Such subjects more rightfully belong to commercial associations and boards of trade. The dignity of the Society can only be sustained and successfully continued by keeping a watchful eye over its transactions and discussions.

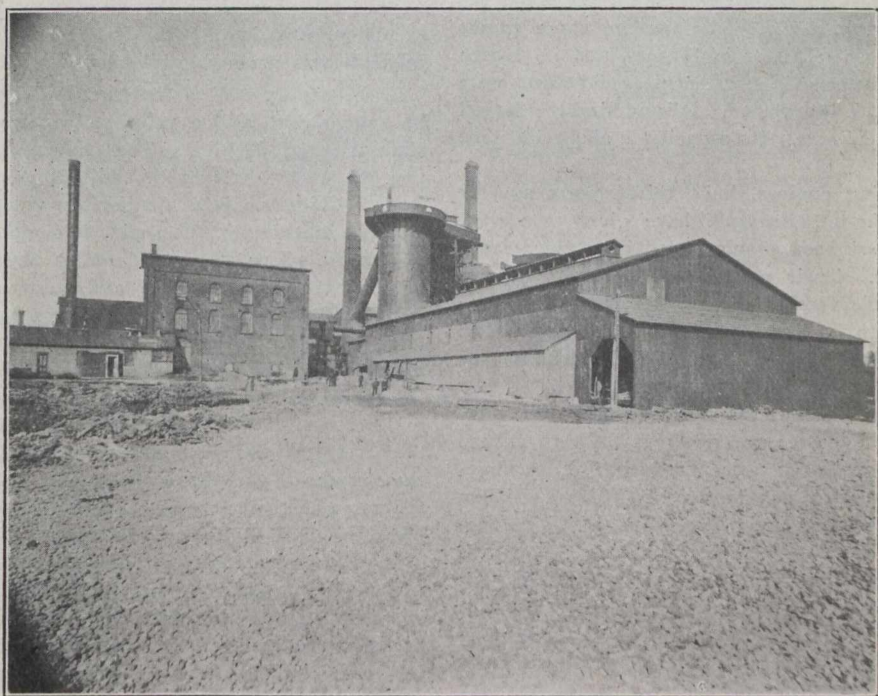
A. A. HAYWARD,
President.

March 27th, 1907.

LONDONDERRY IRON AND MINING COMPANY

Snugly ensconsed at the foot of the Cobequid Hills, two miles off the main line of the Intercolonial Railway, lies the town of Londonderry. The town owes its being to two enterprises which are carried on within its limits—the blast furnace of the Londonderry Iron & Mining Company, and the pipe foundry of the Canada Iron Foundry Company. A brief description of the former industry is the object of this paper.

The history of iron-making in Londonderry would make a long and interesting narrative in itself. It may, perhaps, be the subject of a later article. For our present purpose it suffices to say that, after suffering many vicissitudes, the old Londonderry Iron Company shut down their works in 1896. Six years later—1902—a group of Montreal gentlemen, prominent among whom were Messrs. T. J., George E. and J. J. Drummond, and Mr. Edgar MacDougall, decided to take over the plant, mines and lands of the old company and start iron-making once more. As a result of negotiations, the plant, iron mines, and about 33,000 acres of land, carrying much excellent timber and cordwood, became the property of the new Londonderry Iron & Mining Company.



BLAST FURNACE, CAST HOUSE AND ENGINE ROOM, LONDONDERRY, N.S.

The work of renewing the whole plant, of opening the mines, of remodelling and relining the furnace, and of repairing the old coke ovens, was begun in September, 1902. Adverse conditions of labor, weather and transportation made this an arduous task, and it was not until January, 1904, that the furnace was blown in.

Meanwhile, under the direction of Mr. J. J. Drummond, the furnace lines had been very radically altered. The bosh was lowered, and the lines were adapted to the reduction of the local ores. A coal-washer of the Robinson type was erected, and a battery of 30 bee-hive ovens added to the old ones, making a total of 97. The washer was designed to handle about 400 tons of dry coal per day.

A new cast-house for handling the pig iron was erected. The old English blowing engines, which had been in commission for over twenty years, were thoroughly repaired and gave good service from the start. The three Cowper stoves were also thoroughly overhauled and repaired.

A second, smaller blast furnace was pulled down. The erection and equipment of an excellent laboratory, of repair shops, car shop, machine room, blacksmith forges; opening the mines and shipping and stocking ore, coal and coke occupied the greater part of the year 1903.

After the furnace was "blown in," during January, 1904, there still remained much to be done. During that year a commodious office building was constructed, the contract being handled by Rhodes, Curry & Company, of Amherst, N.S. During 1905 and 1906 much prospecting and mine development was performed under the superintendence of Mr. W. F. C. Parsons, M.E. Early in 1903 shipments of red hematite from the Torbrook mines were started, and these have continued ever since. The company now owns and controls the Torbrook mines, in addition to its large Londonderry workings.

For a time limestone was purchased from Brookfield, South Maitland, and other points. But gradually the feasability of using the ankerite, which occurs in almost unlimited quantities on the company's Londonderry lands, was proven. This is now, and has been for the past few years, used exclusively as a flux.

Coal for coking purposes is supplied by the Intercolonial Coal Company of Westville, the Cumberland Railway & Coal Company of Springhill, the Acadia Coal Company of Stellarton, and the Port Hood-Richmond Railway & Coal Company of Port Hood. Shipments are made over the Intercolonial Railway to the Londonderry branch line.

Coke is purchased from the Intercolonial and Acadia Companies.

The Londonderry Company operates about ten miles of standard and narrow gauge railway. Its rolling stock includes two standard gauge and three narrow gauge locomotives, besides many flats and mine cars.

The local ores are limonites, specular and brown hematites, paints, siderite and ankerite. Mines are operated at Old Mountain, Cook's Brook, Martin's Brook, and Cumberland, which lie from one mile to four miles west of the furnace. To the east, and reached by the Intercolonial Railway, to East Mines Station, thence by spur line to the ore trestles, are the East Mines workings. At all of these mines the above mentioned ores are found in varying quantities. At and near East Mines, immense bodies of clean ankerite have been proven.

At all of the mines brown ore, of varying degrees of hydration, is found. Old Mountain is particularly rich in specular.

It must not be overlooked that at many intermediate points between the east and west mines, rich ore has been found. There is, therefore, no cause to doubt the existence of a large, though irregular, body of ore, extending practically over all the distance between the extreme workings.

The Londonderry ores are phenomenally free from sulphur and phosphorous.

The Torbrook ores are red compact hematites and grey or red-gray magnetites. The former are rich ores, carrying about 1 per cent. phosphorous. The latter ores, though not so rich in iron, carry enough lime, in many cases, to be self-fluxing.

By a curious provision of nature, the Londonderry and Torbrook ores are mutually adapted to supplement each other's deficiencies in producing a foundry pig iron.

At this point it may be well to mention a few facts about the blast furnace, blowing engines, etc. The furnace stack stands 75 feet in height. Its bosh diameter is 17 feet, and its hearth measures 10 feet. The furnace lines, as mentioned before, were radically altered by Mr. J. J. Drummond. It is admirably adapted for the smelting of the local ores. Its capacity is about 120 tons in twenty-four hours.

The two English blowing engines, built thirty years ago by Daniel Adams, of Manchester, England, have given wonderful service. Recently they have been supplemented by a third large American blowing engine. Their united delivery at 28 revolutions is about 26,000 cubic feet of air per minute. The three Cowper stoves are soon to be supplemented by a fourth. Mr. G. C. Mackenzie, B.Sc., has been in charge of the furnace for the past three years.

In summer, Londonderry is one of the many unsuspected beauty spots which the traveller over the Intercolonial Railway misses. Soon after passing through the famous Wentworth valley, Londonderry Station, an unpretentious hamlet, is passed. Hidden behind it lie the green slopes of Folly Mountain and Old Mountain, between which nestles the Londonderry Iron Company's plant. On dark nights the dumping of molten slag illumines the whole countryside in a manner beautiful beyond description. Not only the hillsides and town, but the long stretch of fertile lowlands lying between Great Village and Truro are brilliantly lighted.

In former years Londonderry pig iron held a high place in the market. It was, indeed, acknowledged to be equal to the best Swedish. To-day Londonderry has no reason to abate by one jot this proud claim.

It will hardly be fair to close this paper without stating that it is the writer's intention to take up in later articles the geological and other features of this very interesting district. The purpose at present is merely to introduce the subject in a more or less superficial manner.

POWER FROM THE PIT MOUTH

By A. D. Ross

In the rapid settlement, growth and progress of Western Canada, there is a tendency to lose sight of the development—especially along industrial and manufacturing lines—that is taking place here in the east.

There are, for instance, here in Cumberland county, Nova Scotia, four or five coal mines in operation that ten years ago were not producing a ton of coal. They are now giving employment to hundreds of men, raising thousands of tons of coal, and are proving a rich source of revenue to the Province.

The Chignecto Mine, at Maccan, may be taken as a good example of what is being done in the way of developing the great Cumberland coal basin.

This mine was originally opened over thirty years ago by the Londonderry Iron Company, and was successfully operated for a number of years.

Owing to the unfortunate financial career of the above mentioned company, the mine was abandoned, and, for nearly a score of years, the once thriving hamlet of Chignecto remained a veritable "deserted village." The houses became untenanted. The mine filled with water. The place itself became a spot of dreariness and desolation.

About five years ago Senator Mitchell, of Drummondville, and his brother, Mr. David Mitchell, of the same place, with one or two other Montreal gentlemen, became impressed with the great future possibilities of the Nova Scotian coal areas. Mr. H. J. Logan, M.P. for Cumberland, induced them to pay a visit to a number of the mines of the county, and, as a result, they shortly afterwards acquired the lease of the Chignecto property, which embraces about 27,000 acres of the land surrounding the pit and the village.

Then followed the organization of the Maritime Coal & Railway Company, of which Senator Mitchell was president and Mr. David Mitchell was managing director.

The company had to face many difficulties. The mine had to be pumped out, and a railway line constructed to make connections with the I. C. R. The vacant houses had to be repaired, and many new ones built. All this was done, and much more. To-day Chignecto is a flourishing village, of from five to six hundred inhabitants. The mine is equipped with the most modern machinery. New stores and offices have been erected. The old houses have been repaired, and many new ones built, and the entire village presents a view of prosperity and contentment. Over one hundred and fifty men are now employed in this mine, and the daily output is steadily increasing.

The charter of the company was amended in the year 1906, and permission was secured from the Local Legislature to establish a central electric power plant at the mouth of the pit, for the purpose of supplying power and light to surrounding towns, the name of the company being at the same time changed to the Maritime Coal, Railway & Power Company.

It is expected that by the first of April the company will be in a position to supply the industries of Amherst, which is situated about nine miles from the mouth of the pit, with the necessary power to operate their plants.

A central station of brick and concrete has already been completed. The engines and boilers are now being installed. The concrete transforming station in Amherst is finished, and the "transformers" are expected to arrive this week. The wire line from the central to the transforming station is also completed. The power will be sent from the former to the latter at a voltage of eleven thousand, which will be reduced to twenty-two hundred at the transforming station and at that voltage supplied to the various industries.

It is interesting to note that this is the first plant of its kind established on the North American continent, and the third in the entire world.

Anyone with any knowledge of coal mining is aware of the fact that there is always a large per cent. of refuse or waste coal for which no market can be obtained, and it is the purpose of this company to use this waste for the production of industrial power. Even if the marketable coal is used, the company contends that it is cheaper to transmit the power direct, rather that to ship the coal.

Amherst is one of the leading industrial centres of the Maritime Provinces. It is the home of flourishing workshops, which send their products all over this Dominion. The establishment of this power plant promises to bring about a new epoch in its history. Persons or companies desirous of starting new industries will not require a large expenditure for a plant producing power. A wire from the transforming station with a motor will be all that will be required. Thus, the citizens of Amherst are looking forward with confidence to the establishment of many new industries in this town.

The company has met with such assurances of support that it has already placed an order to duplicate the original number of boilers and engines.

A coal company which has the enterprise to take up a scheme for the purpose of transmitting power direct from the mouth of the pit, instead of shipping the coal, is deserving of every success, especially when it is the first to undertake the pioneer movement.

DR. W. H. DRUMMOND

Dr. W. H. Drummond, distinguished as the poet of the "Habitant," died at Cobalt, Ont., on April 6th.

Born in County Leitrim, Ireland, in 1854, he was educated at Nohill, Ireland, and at the Montreal High School. In 1884 he graduated in medicine from Bishop's College, Lennoxville. He then practiced his profession in Montreal. For a time he occupied the chair of medical jurisprudence in Bishop's College.

Much of his time and energy he devoted to outdoor sport. He was passionately fond of the woods, and of all that an intimate knowledge of forest life implies.

It was, however, as a poet that Dr. Drummond made himself famous.

DR. W. H. DRUMMOND

Latterly, his mining interests in Cobalt took up a large portion of his time. His death has aroused universal sympathy.

A Comparison of University and Industrial Methods and Discipline

AN ADDRESS DELIVERED BY MR. FREDERICK W. TAYLOR, PRESIDENT OF THE SOCIETY, AT THE DEDICATION OF THE NEW ENGINEERING BUILDING OF THE UNIVERSITY OF PENNSYLVANIA.

The point from which I view college education is that of the employer, not that of the educator. I have had no experience with the difficult and complicated problem that faces the professors and the governing boards of our colleges. On the other hand, I have been engaged for years in organizing the shop, office, and commercial management of quite a wide range of engineering and manufacturing establishments. This has brought me into intimate personal contact with a large number of college graduates, and I have become acquainted with their strong points, which are many, and at the same time with a few of those points in which it would seem that as a class they might be improved. And in what I shall say I have principally in mind the preparation of young men for success in commercial, engineering and industrial enterprises; in other words, enterprises outside of the four learned professions.

I despise the pessimist who sees nothing but the defects and blunders of mankind; and the scold, whose pleasure it is to complain of all things as they are.

Let me say at the start, that without question, our college graduates as a class represent the finest body of men in the community. And as to the value of an engineering course for men in our profession, it has been shown through carefully gathered statistics, that within a few years after graduation the college-educated engineer far outstrips in position and salary his average competitor who comes up from the ranks.

It would be a much more congenial task to dwell upon this view of the profession, but something may possibly be gained by considering what has seemed to many of the friends of our young graduates to be the one defect which they practically all have in common.

For a period of from six months to two years after graduating they are, generally speaking, discontented and unhappy. They are apt to look upon their employers as unappreciative, unjust, and tyrannical, and it is frequently only after changing employers once or twice, and finding the same lack of appreciation in all of them, that they finally start upon their real careers of usefulness.

On the other hand, the attitude of employers toward young graduates is fairly expressed by the following written instructions given for the selection of quite a large number of young men to fill positions which presented opportunities for rapid development and advancement. These instructions were to give the preference—first, to graduates of technical schools; second, to the graduates of the academic departments; but to employ no college boy who had not been out for more than two years.

Why is it, then, that these young men are discontented and of practically little use during the first year or two after graduating?

To a certain extent this is unquestionably due to the sudden and radical change from years spent as boys almost solely in absorbing and assimilating knowledge for their own benefit, to their new occupation of giving out and using what they have for the benefit of others. To a degree it is the sponge objecting to the pressure of the hand which uses it. To a greater degree, however, I believe this trouble to be due to the lack of discipline and to the lack of direct, earnest, and logical purpose which accompanies, to a large extent, modern university life.

During the four years that these young men are at college they are under less discipline, and are given greater liberty than they have ever had before or will ever have again.

As to college discipline, it cannot be a good training for after life for a young man deliberately to be told by the university authorities that he can flagrantly neglect his duties sixty times in one term before any attention will be paid to it; while, if in business, the same young man would be discharged for being absent two or three times without permission.

And, as to the freedom offered by the modern university system, it is not true that boys from eighteen to twenty years old have the knowledge and experience necessary to select a logical and well-rounded course of studies, and even if they had this wisdom, the temptation to choose those studies which come easiest is so strong that it would be unwise to throw upon them so great a responsibility. Nor does it appear wise to leave each student free to study as little or as much as may suit him, at times doing practically no work for days, and at others greatly overworking, with no restraint or direction except the round-up which comes twice a year with examinations. At the least, it must be said that in commercial or industrial life this undirected liberty will never again be allowed them.

During the past thirty years two radical changes have occurred in educational methods. The kindergarten and its accompanying ideas has come for the children, and for the young men has come the change from the college, with its one or two courses carefully selected and rigidly prescribed by the faculty, to the university with as many different courses as there are young men, and in which, under the elective system, each student is given the choice of all of his studies.

The fundamental idea back of the change from college to university is excellent; namely, that of providing a far greater variety in the courses to suit the different tastes and abilities of the students, and to especially prepare them for their future occupations. Accompanying, however, this great step in advance, and yet, so far as I can see, in no way logically connected with it, has come the false step of giving our young men in many ways a greater liberty than is allowed, on the whole, to any other class of active workers; and of handing over to them the final decision in a subject most needing a master mind.

Commercial, manufacturing, and other enterprises in which many men co-operate, are managed more and more by delegating all important decisions to a few men whose judgment has been trained through long experience, study, and observation in those matters which they are called upon to decide. Yet many of our universities are managed by giving over to the young man, under the elective system, the final decision as to what studies will best fit him for his life's work, although he has, of necessity, but the vaguest idea of the nature of the subjects which lie before him. It is almost like asking him to lift himself up by his boot straps.

I cannot but think that in changing we have modeled largely after the English and German universities, which, as we know, are influenced in their management by traditions handed down through several hundred years; and that in adopting the great university idea of a variety of courses, we have at the same time blindly accepted the foreign idea of the elective system accompanied by a lax discipline, both of which are better suited to medieval times, when each man worked for himself, than to the present day, when the road to success lies through true co-operation.

In this change, also, too great stress has been laid upon those elements leading to knowledge or book learning on the part of the student, and too little upon the development of his character.

The kindergarten also, which has proved so great a help in training the younger children, making them observant and giving them a certain control over themselves, has brought with it one idea which has wrought great harm, and yet this bad idea is in no way properly or logically connected with the underlying principles of the kindergarten.

Somehow the average kindergarten child gets a firm conviction that it is the duty of the teacher to make things interesting and amusing, and from this follows soon the notion that if he does not like his studies and fails to learn much, it is largely the teacher's fault. Now, whatever views the parents or the teachers themselves hold upon the duties of teachers, there is no doubt that the boys should have firmly in their heads the good old-fashioned idea that it is their duty to learn, and not that it is the duty of the teacher to teach them.

Along with the kindergarten plan of interesting and amusing children, the idea has taken firm hold in a large portion of the educational world that the child and young man should be free to develop naturally, like a beautiful plant or flower. This may again be an excellent view for the older person to hold, but it is a distinctly bad one for the young man to act upon. He promptly translates the idea of developing naturally into wishing to do only, or mainly, those things which he likes or which come easy to him.

Of all the habits and principles which make for success in a young man, the most useful is the determination to do and to do right all those things which come his way each day, whether they are agreeable or disagreeable; and the ability to do this is best acquired through long practice in doggedly doing along with that which is agreeable a lot of things which are tiresome and monotonous, and which one does not like.

Now neither the kindergarten idea, the university elective system, nor the lax college discipline tends to develop this all-important habit in young men.

True co-operation, co-operation upon the broadest scale, is that feature which distinguishes our present commercial and industrial development from that of one hundred years ago. Not the co-operation taught by too many among those of our trades unions which are misguided, and which resemble the co-operation of a train of freight cars; but rather that of a well-organized manufacturing establishment, which is typified by the co-operation of the various parts of a watch, each member of which performs and is supreme in its own function, and yet is controlled by and must work harmoniously with many other members.

It is a mistaken notion that character of this kind needed for successful co-operation is developed by the elective idea of allowing each boy to choose for himself those things which he will do. It requires far more character to do successfully those things which are laid out for one by a wiser man than to do only what one likes, and in modern co-operation, while the work of each man is modified and more or less controlled by that of others, there is ample scope left for originality and individuality. We must remember that of all classes in the community, college boys are being trained to fill some day the position of leaders in the co-operative field. And there is no fact better established than that the man who has not learned promptly and fully to obey an order is not fit to give one.

An examination of the studies chosen by boys in the university academic departments will show that the logic and motive back of about one-half of the students is that of obtaining an easy course, and even the better students show generally a lack of clear-cut logical purpose in their selection. In their case, the studies are chosen because the young man likes or is interested in the subjects, or because they come easy to him, rather than because they give a well-rounded and balanced course with a distinct logical purpose. The loose, flabby, purposeless courses chosen by fully one-half of the students under the present system furnish but poor mental diet.

Why cannot all of the good features of the elective system be better attained by permitting each young man to choose in general the objects or purpose for which he wishes to educate himself, and then leave the entire course of studies to the one or more professors in the faculty who are especially fitted to plan a complete and logical course in the chosen field? Let the young man say where he wishes to go, and let the faculty tell him the road he is to travel to get there.

As to the object of college life, some boys are sent to the university to learn how to mingle with men, and to form friendships which shall prove useful and agreeable in after life. Some go there to amuse themselves, and some to get the standing given by a college degree.

Something can be said for each of these objects. Is not the true object of all education, however, that of training boys to be successful men? I mean men successful in the broadest sense, not merely successful money-getters. Successful, first in developing their own characters, and second, in doing their full share of the world's work.

Young men should not come to college mainly to get book learning or a wide knowledge of facts. The successful men of our acquaintance are, generally speaking, neither learned nor men of great intellect. They are men, first of all, possessed with an earnest purpose. They have a certain all-round poise or balance, called common sense. They have acquired through long training those habits both mental and physical which make them masters over themselves; and at all times they have the firm determination to pay the price for success in hard work and self-denial.

It is singleness and earnestness of purpose that constitute the great motive power back of most successful men, and it is a notable fact that the moment a young man becomes animated with such a purpose, that moment he ceases to believe in the elective system, and in the loose college discipline.

In all earnest enterprises which the students themselves manage, they throw the elective system to the winds, and adopt methods and a discipline quite as rigid as those prevailing in the commercial and industrial world.

The boy who joins the football squad is given no sixty cuts a season, nor is he allowed to choose what he will do. He does just what someone else tells him to do, and does it at the time and in the manner he is told, and one or two lapses from training rules are sufficient cause for expulsion from the team or the crew.

I say in all seriousness that, were it not for a certain trickiness and a low professional spirit which has come to be a part of the game, I should look upon football and the training received in athletics as one of the most useful elements in a college course, for two reasons: First, because in it they are actuated by a truly serious purpose; and second, because they are there given, not the elective idea of doing what they want to, but co-operation, and co-operation of the same general character which they will be called upon to practice in after life.

Is not the greatest problem in university life, then, how to animate the students with an earnest, logical purpose?

In facing this question I would call attention to one class of young men who are almost universally imbued with such a purpose; namely, those who, through necessity or otherwise, have come into close contact and direct competition with men working for a living. These young men acquire a truly earnest purpose. They see the reality of life, they have a strong foretaste of the struggle ahead of them, and they come to the university with a determination to get something practical from the college training which they can use later in their competition with men.

They are in great demand after graduating, and as a class make themselves useful almost from the day that they start in to work.

Neither their earnestness of purpose, however, nor their immediate usefulness, comes from any technical knowledge which they have acquired while working outside of the university, but rather from having early brought home to them the nature of the great problem they must face after graduating. Nothing but contact with work and actual competition with men struggling for a living will teach them this. It cannot be theorized over or lectured upon, or taught in the school-workshop or laboratory.

I look upon this actual work and competition with men working for a living as of such great value in developing earnestness of purpose that it would seem to me time well spent for each student, say, at the end of the Freshman year, to be handed over by the university for a period of six months to some commercial, engineering, or manufacturing establishment; there to work as an employee at whatever job is given him, either manual or other work. He should have the same hours and be under the same discipline as all other employees, and should receive no favors. Moreover, he should be obliged to stay even a longer time than six months, unless he has in the meantime given satisfaction to his employers.

I believe that there would be but little difficulty in obtaining the co-operation of our business and manufacturing establishments in carrying out this plan, and the University of Pennsylvania, situated as it is in the foremost manufacturing city in this country, would have an especially good opportunity to inaugurate it.

My belief in the benefits to be derived from doing practical, everyday work early in the college course is not the result of a theory. It is founded upon close observation and study of young men who have had this experience, and also upon a vivid remembrance of breakfasting each morning at five-thirty and starting to sweep the floor of a pattern shop as an apprentice some thirty-two years ago, after having spent several years in preparing for Harvard College. The contrast between the two occupations was great, but I look back upon the first six months of my apprenticeship as a patternmaker as, on the whole, the most valuable part of my education. Not that I gained much knowledge during that time, nor did I ever become a very good patternmaker; but the awakening as to the reality and seriousness of life was complete, and, I believe, of great value.

Unfortunately, laboratory or even shop work in the university, useful as they are, do not serve at all the same purpose, since the young man is surrounded there by other students and professors, and lacks the actual competition of men working for a living. He does not learn at college that on the whole the ordinary mechanics, and even poorly educated workmen, are naturally about as smart as he is, and that his best way to rise above them lies in getting his mind more thoroughly trained than theirs, and in learning things they do not know. All of this should be taught him through six months' contact with workingmen.

Let me repeat, in conclusion, that our college graduates are the best picked body of men in the community. Yet I believe that it is possible to so train young men that they will be useful to their employers almost from the day that they leave college; so that they will be reasonably satisfied with their new work, instead of discontented; and to place them, upon graduating, one or two years nearer success than they now are; and that this can be best accomplished by giving them an earnest purpose through six months' contact early in their college life with men working for a living; by rigidly prescribing a course of studies carefully and logically selected, and with some definite object in view, and by subjecting them to a discipline comparable with that adopted by the rest of the world.

Philadelphia possesses and is proud of the most notable group of medical schools in this country, and among these that of the University of Pennsylvania unquestionably stands first.

The Philadelphia lawyer has been proverbial for his knowledge and shrewdness for more than a century, and this reputation can be traced largely to the fundamental training given in the law school of the University of Pennsylvania.

Philadelphia is the centre of the largest and most diversified group of engineering and manufacturing enterprises in this country. The Engineering Schools of the University of Pennsylvania already stand high; but it seems to me that the opportunity lies open to them, even more than to their famous medical and law schools, to stand at the very top. This magnificent building, equipped as it is with the latest and best of everything, is the first and a great step toward this end. But after all, your largest possibility, and one which does not exist for, and cannot be created by any other American university, lies in the opportunity for bringing your students into close touch and personal contact with the men who are working in and managing the great industrial establishments of Philadelphia.

ELDORADO COPPER MINE

By A. G. Burrows.

The Eldorado Copper Mine is situated one-half a mile from the village of Eldorado, in the township of Madoc, Hastings county. As the Moore and Coe Mines, it was operated for some years as an iron property, from which a large quantity of excellent hematite was shipped to Ontario smelters. The iron ore was obtained from an open cut and pit, the deposit being apparently a vein associated with greenstone, with strike east and west and dip about 60 degrees north. This iron ore has occurred as a large gossan capping, overlying sulphides of copper and iron. The predominating rock in the vicinity is crystalline limestone.

The Copper Deposit.

At the bottom of the open pit a shaft was sunk to a depth of 75 feet, with cross-cuts and drifts at different levels. At a depth of 35 feet in the shaft there are 105 feet of drifting; at 55 feet, 170 feet of drifting; and at 75 feet, 175 feet of drifting. At the last depth the shaft was discontinued, and mining has since been confined to sinkings in the ore body, which occurs as a shoot, with a dip east and north. Sinking has now reached a depth of 300 feet from the surface at the inclination. The vein matter is chiefly copper pyrites, iron pyrites, hematite, greenstone and calcite, but quantities of chalcocite, bornite and tetrahedrite have been encountered at various depths in sinking.

At the lowest workings the vein is about seven feet in width, with a well-defined foot wall of crytsalline limestone. The hanging wall is granite. In contact with the foot wall is a streak of copper pyrites, bornite and tetrahedrite, and beyond this a mixture of copper pyrites, iron pyrites, hematite and greenstone. At one point a width of about four feet of almost solid copper pyrites was mined. To the south of the main pit, at the surface, may be seen quantities of malachite, which would indicate copper ore. But this occurrence is not associated with the copper in the main workings, where no green carbonates have been seen.

Very little drifting has been done, practically all the mining being confined to sinking on the copper lead, which inclines to the east. The hanging wall is supported at short intervals by very heavy stulls. The ore is raised by means of a well-constructed skipway on the foot wall of the deposit, on which the iron buckets are hoisted to the bottom of the old iron pit, and from here by a vertical hoist to the surface, where the ore is partially sorted before going to the smelter. The workings are reached by a stairway with railing, in the open pit, and by ladders in the shaft. The mine is kept free of water by a Cameron sinking pump, of a capacity of 3,000 gallons per hour. The discharged water is led to storage tanks, and is afterwards used in the boilers and for other mining purposes. Sinking is done by Mac machine drills, driven by compressed air.

Equipment.

The plant consists of an Allis-Chalmers copper smelter, one 120 horse-power return tubular boiler, one 90 horse-power boiler, one half of a ten-drill air compressor, one three-drill air compressor, one seven horse-power engine, operating a 75-lamp dynamo; one 18 horse-power engine, operating the Connellsville blower at the smelter; two compound steam hoists, of 10 and 12 horse-power, also a small hoist underground, for raising drills, etc.; one diamond drill outfit. The surface workings are lighted by electricity.

Buildings.

The power plant, blacksmith and machine shop are under one roof. Other buildings include a 30 x 35 office and laboratory, well fitted and steam heated; a 41 x 35 smelter building, and a large, commodious boarding house.

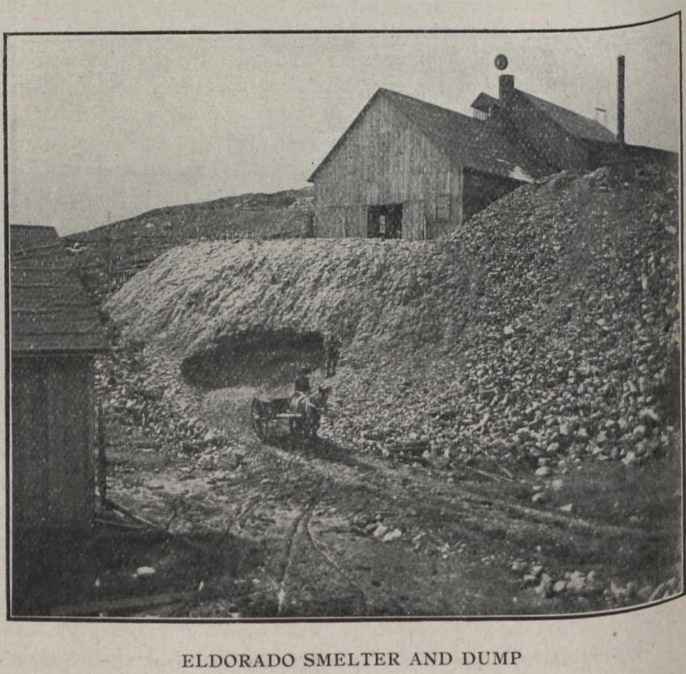
The Smelter.

The smelter is a 48-inch round, water jacket furnace, with solid cast steel crucible, and has a capacity of 50 tons of ore in 24 hours. It is located to the south of the ore dump, and on the face of a hill, affording good facilities for charging, and disposing of the slag. The ore is very basic, as will be seen from the following analysis, by the writer, of a high grade sample:—Copper, 16.40 per cent.; iron, 24.90 per cent.; sulphur, 28.54 per cent.; ferric oxide, 17.70 per cent.; lime, 1.00 per cent.; magnesia, 2.12 per cent.; silica, 5.58 per cent.; undetermined, 3.76 per cent. The only flux required for this ore is silica, which is very conveniently obtained from a quartz vein on an adjoining property. The quartz in this deposit is mined by hand drilling, and raised by a horse whim. An ordinary charge for the furnace is the following: Seven hundred and fifty pounds ore, 130 pounds coke, 110 pounds low grade matte, 135 pounds silica, 175 pounds slag. The ore is given no preliminary roasting, but is fed directly to the furnace, the sulphur, in excess, acting as fuel. The charge fuses quite readily, and the matte and slag flow continuously into a three-ton fore hearth, from which the matte is drawn at intervals. The overflowing slag is received in unlined iron settling pots, and conveyed to the slag dump. The slag is usually very low in copper, less than .02 per cent., and is essentially an iron silicate.

Shipping matte of grade 40 to 50 per cent. copper is made on the second run, and has been made on one run on high grade ore. So far, about 260,000 pounds of shipping matte have been produced. This is shipped to New Jersey, to be further refined. An analysis of matte, by Ledoux & Company, shows the following composition: Copper, 48.04 per cent.; iron, 25.04 per cent.; sulphur, 24.05 per cent.; nickel and cobalt, 0.02 per cent.; antimony, 0.02 per cent.; arsenic, 0.02 per cent.; silver, 2.6 ounce per ton; gold, 0.13 ounce per ton.

Forty-five men are employed at the mine, and are about equally divided, underground, on the surface, and at the smelter. Laborers receive $1.50 per day; drillers, $2.00; smeltermen, $1.75 to $3.00.

The property is owned by the Ontario Copper Company, and



ELDORADO SMELTER AND DUMP

leased to the Medina Copper Company, of which Cole Saunders, New York, is president.

The mine is in charge of G. H. Hambly, to whom the writer is indebted for much information.

The loading dock of the company, on the Central Ontario Railway, is only a quarter of a mile from the mine shaft. It is the intention of the company to do some custom smelting of ore from prospects in the vicinity, as there are several promising quartz-copper properties, which ore would smelt excellently with the basic ore, on which the furnace is at present running.

The region about Eldorado is very prolific in mineral wealth, and, in a radius of ten miles, there are gold, silver, copper, lead, mundic, and arsenic properties, not to mention deposits of talc, actinolite, etc.

SLAG CEMENT

The manufacture of cement from blast furnace slag is perhaps the most interesting industry that has sprung from the establishment of the Dominion Iron and Steel Works at Sydney.

Soon after iron smelting was commenced in Sydney it was observed that the blast furnace slag was exceptionally favorable for the manufacture of cement, being very low in sulphur and magnesia, and very rich in lime. Encouraged by the success of similar enterprises elsewhere, more especially that of the Illinois Steel Company, and by the excellence of the slag, as well as by the remarkable advantages of Sydney as a distributing point, a company, known as the Sydney Cement Company, Limited, made an arrangement with the Steel Company to use their slag, and undertook the manufacture of cement.

Before ordering the machinery, works in Germany and the United States were visited, and the best experts were consulted, so that the plant has been designed in the light of the most advanced knowledge of the industry.

The works are situated at the junction of the Intercolonial and Sydney and Louisburg Railways, close to the Intercolonial Railway passenger station, Sydney.

The plant consists of two Ruggles-Coles rotary dryers, one set of style A Allis-Chalmers rolls, three Prosser-Krupp tube mills, Robb-Armstrong Corliss engine, Robb-Mumford boilers, and all necessary storage bins, slacking pits with mechanical screens, etc.

The buildings, including stock houses, but with the exception of the cooperage, are built of concrete and steel. Trestles for dumping raw material are also of concrete and steel.

There is a well-equipped physical and chemical laboratory, in charge of a competent chemist, with necessary assistants, and raw materials and finished product are carefully sampled and thoroughly tested and analyzed.

Samples for some of the tests are taken every hour, night and day, from each mill.

Lime of excellent quality is obtained from Marble Mountain, Bras D'or Lake.

The capacity of the plant is over 500 barrels per day.

The product of this company was put on the market two years ago, has been used for all the purposes for which Portland cement is used, namely, foundations, marine work, pavements, reinforced concrete, building blocks, etc., and has for all purposes been found completely satisfactory.

This cement has found its way into Mexico and Cuba; as far as Montreal westward, and Newfoundland eastward.

The high grade raw material used, and the care taken in manufacture, following the most recent knowledge of the industry, have resulted in a product which fully meets all the requirements of a high grade hydraulic cement.

With cheap raw material and fuel, it seems likely that the Sydney Cement Company will, for some time to come, control the market of Eastern Canada.

Sydney's geographical situation gives the company a position unrivalled for an export trade for as much of its output as may not be required for the home market.

Breathing Apparatus for Rescue Work in Coal Mines

BY F. W. GRAY.

Next to the prevention of colliery explosions ranks the work of rescuing the survivors and the recovery of the mine after these apparently unavoidable catastrophes, and nowhere in the annals of mining heroism, numerous as they are, can there be found such deeds of daring and self-sacrifice, too often futile and of no avail. How many would-be rescuers have fallen victims to the manifold dangers that present themselves after the blast has passed, and how many men who have survived the explosion die among the gases that follow?

In view of these too obvious facts, it is a little surprising to find how little is known amongst the average mining community about the proved and tested appliances now on the market, by means of which men can live and work in irrespirable and poisonous atmospheres, and a brief account of the evolution and present status of these so-called "breathing apparatus" may be of interest.

Although it is only within the last decade that such apparatus has been made really practical, the idea is by no means a new one, as may be found by reference to the literature of the subject in the Transactions of the Institution of Mining Engineers, ranging over the past sixty years. A complete historical summary was given by Mr. W. E. Garforth in his paper, read before the general meeting in London, June, 1906.*

Between 1846 and 1874 several devices were tried, most of them depending on a reservoir of atmospheric air. The first person to adopt the accepted principle of the modern appliance appears to have been Mr. Henry Fleuss, who, in 1880, introduced an arrangement, the principle of which he explained as follows:—

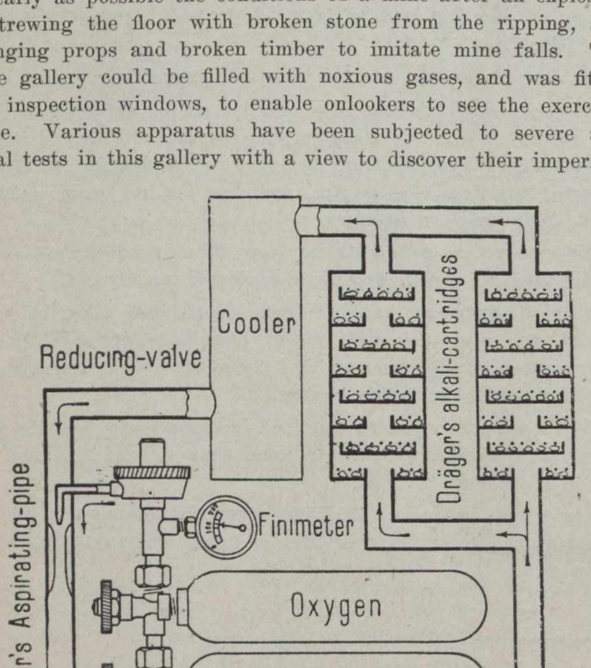
"The wearer breathes his own breath over and over again, the carbonic acid being absorbed from it at each expiration, and the requisite amount of oxygen being restored, the revivified air is fit to be again inhaled in the form of pure air."

*Note.—"A New Apparatus for Rescue Work in Mines." Trans. Inst. M. E. Vol. XXII., p. 625.

For some reason or other, Mr. Fleuss' device appears to have been practically forgotten, but it was the forerunner of the perfected modern appliance, notably the "Pneumatphore" of Walcher von Uysdal, the "Meyer," "Giersberg," "Shamrock" and "Dräger" types, and the "Weg" apparatus, recently introduced by Mr. Garforth, all of which more or less resemble each other, and differ only in modification and perfection of detail.

The "Dräger" apparatus consists of two bags carried on the chest of the wearer, and communicating with the mouth, one bag being intended to hold the expired breath, and the other the revivified air intended for breathing. The breath exhalations pass along a circulating pipe, and diffuse through a series of flat dishes covered with coarsely granulated hydrate of potassium or sodium, so arranged as to give the greatest possible amount of absorbent surface. This arrangement may be very happily likened to a mechanical lung. Leaving the "lung," or potash cartridge, as it is called by the makers, the air, relieved of its carbon dioxide, passes through a cooler, and thence into the aspirator pipe. (See diagram.) What may be called the motor of the apparatus is supplied by an injector communicating with two cylinders containing oxygen compressed to 250 atm. It is claimed by the makers that this arrangement will supply 3,000 cubic inches of breathing air per minute, under a pressure of four to five inches of water column, over a period of two hours. The apparatus is constructed with either one or two cylinders as desired, and weighs, complete with the smoke helmet, 28 pounds and 36 pounds, respectively. It can also be obtained without the helmet, fitted with a regulation mouthpiece and smoke goggles. Most authorities seem to advise strongly against the use of a helmet where it can be avoided. It has a tendency to heat the head and cause discomfort, but it is mostly to be objected to in that it cuts off the wearer from outside sounds and limits his area of vision, giving him a feeling of isolation. Anything that is apt to cause nervousness in the wearer, and thereby increase the rate of respiration, causes an unnecessary waste of both energy and oxygen.

The ''Weg'' apparatus has been introduced by Mr. W. E. Garforth as the result of many years' experience in rescue work, in which he has always taken an enthusiastic interest. In 1901 Mr. Garforth erected an experimental gallery, in which he reproduced as nearly as possible the conditions of a mine after an explosion by strewing the floor with broken stone from the ripping, and arranging props and broken timber to imitate mine falls. The whole gallery could be filled with noxious gases, and was fitted with inspection windows, to enable onlookers to see the exercises inside. Various apparatus have been subjected to severe and actual tests in this gallery with a view to discover their imperfec-



tions, and Mr. Garforth has collected most valuable data from the results obtained.*

Mr. Garforth's arrangement is the result of these experiments, and its chief feature is called by him ''a lung-governing valve.'' He states that, as the action of the lungs is intermittent, the supply of oxygen should be the same, and that by this valve the supply of oxygen ''is governed by the action of the lungs, in the same way that the supply of steam is regulated by the governor balls actuating the throttle valve of an engine.'' The mouthpiece is arranged something after the fashion of a dentist's bag for administering gas to a patient, and has the advantages of

*Note.—''Experimental Gallery for Testing-Life-saving Apparatus.'' Trans. Inst. M. E. Vol. XXII., p. 169.

the helmet without its drawbacks, inasmuch as the ears and head generally are left quite free. One man wore this apparatus for three hours and ten minutes, during which time he walked and crawled about two and three-quarter miles, resting a little more than half an hour during this time. The writer is not aware whether Mr. Garforth's apparatus is yet being manufactured commercially.

A device that differs radically in principle from those previously mentioned is the ''Pneumatogen,'' the invention of Prof. Dr. Max Bamberger and Dr. Friedrich Böck, of Vienna. In this arrangement no oxygen cylinders are used, the necessary oxygen being obtained by the reaction consequent on the exposure of sticks or ''cartridges'' of potassium-sodium-peroxide to the breath exhalations, the carbon dioxide and water being absorbed and oxygen given off. The apparatus thus generates its own oxygen as required, and has the advantage that an increased rate of respiration automatically increases the yield of oxygen. The absence of the oxygen cylinders very materially lessens the weight, and avoids the necessity for the numerous pressure-reducing and other valves that are a feature of the cylinder type apparatus. The whole thing is most compact and simple, very light, being only about one-fourth of the weight of the cylinder machines, and the first cost is not more than half. Its chief drawback appears to be the high temperature of the evolved breathing mixture, which, however, does not seem to cause discomfort. The makers admit the high temperature of the air supplied, but they claim it is dry and not uncomfortable to breathe, and they prefer to have it so rather than complicate the device by a cooling arrangement. The working cost of the ''Pneumatogen'' is somewhat higher than the cylinder type machines, but it is hoped, with an increased demand for potassium-sodium-peroxide, this will be considerably reduced. At present this compound is not manufactured on a large scale, and is in consequence rather dear. The ''Pneumatogen'' appears to be a decided step in the direction of simplicity and cheapness.

An arrangement of very recent date is the ''Aerolith'' liquid air breathing device, described within the past month before several of the mining societies of England by Dr. Simonis. It has excited favorable comment, but as yet no detailed description is to hand.

Enough has been said to show that there are at present available several devices of practical utility for supporting life in noxious atmospheres, but these devices are of no real use, and indeed are dangerous, unless the wearer is quite accustomed to their use. This state can only be obtained by regular practice under conditions as nearly as possible resembling those for which the apparatus is intended. Even with pure air to breathe, the work that has to be done by exploring and rescue parties after a mine explosion is most arduous, and to be really efficient the wearer of a breathing apparatus must have full confidence in it, and must have had sufficient practice to enable him to wear it with unconscious ease and without any fear of ''funk.'' The provision of a practice room is, therefore, quite necessary, and it should be so arranged that it can be filled with unbreathable gases, and fitted with observation windows, through which to watch those practising. Only in this way is it possible to weed out those who, either from physical unfitness or nervousness, are unsuitable for the work. There is also a ''knack'' in breathing that must be learned in order to get the most efficient and economical work out of the apparatus and oneself.

On the continent and in England so-called ''Rescue Stations'' have been erected to serve a group of collieries.*

A typical building of this kind consists of a practice room as above described, an apartment fitted with racks for the proper storing of the apparatus and its accessories, where they may be kept in immediate readiness for use, a meeting or club room, and

*Note.—''The work of a Joint Colliery Rescue Station.'' M. H. Habershon. Trans. Inst. M. E. XXI., p. 100.

dwelling rooms for a resident caretaker, who is also instructor. Gangs of colliery officials, and the more intelligent workmen, are systematically trained in such a manner that those acquainted with the intricacies of any one mine are not all of them underground at any one time. The gangs are composed usually of a captain or leader, whose sole business it is to direct operations. He can exchange pre-arranged signals by means of a pneumatic horn, or by waving lights, and he carries nothing else. He is the eyes and the ears of his party, who look to him for guidance. He has a deputy, or lieutenant, and the other three compose the rank and file. Discipline plays an important part in this work, and no time should be grudged to drill.

These parties can carry with them portable air stoppings, supplies of oxygen for the resuscitation of those poisoned by carbon monoxide, stretchers, etc. Their work would consist in the rescue of those who had survived the explosion, the quick restoration of the ventilation, and the obtaining of definite information as to the state of affairs underground. Generally they would act somewhat as the cavalry *vedette*.

DRAGER BREATHING APPARATUS IN USE.

Although too late to save any lives, breathing apparatus of the "Shamrock" and "Dräger" types, and several "Pneumatogens" were successfully used in the repairing and recovery of the mine at Courrières after the memorable explosion there. Just recently thirty-nine men were saved by the "Dräger" apparatus at the Redan Mine, Saarbrüc-ken, Westphalia. They were got out of the mine after the first blast. Later another blast occurred, which would certainly have killed them all, had not the presence of the breathing apparatus rendered it possible to rescue them.

The usefulness of the breathing device is not, however, limited to rescue work after explosions. They can be used to much advantage in the initial stages of a mine fire. Very often blinding volumes of acrid smoke render it impossible to approach what is only a small blaze, easily extinguishable at close quarters, but which speedily develops into a serious and uncontrollable fire. Equipped with these devices, men can penetrate the smoke and reach a point where their exertions will tell. In the case of gob fires also these devices should prove very useful.

Herr Meyer's paper on the actual use of the "Shamrock" apparatus at Courrières by the German Brigade will repay perusal, and is fully illustrated.*

A complete equipment of electric hand lamps is an indispensable part of a rescue station, for of course the ordinary safety lamp is useless under the conditions for which the rescue apparatus is designed. These lamps must be kept ready at all times for immediate use. The utility of all the apparatus in connection with a rescue station hinges on its readiness for use at a moment's notice. Explosions come unheralded, and time is then both life and money. The importance of this point is too obvious to need enlargement. Apart from the undoubted utility and additional safeguard that a properly arranged and equipped rescue station affords, the discipline and drill of the training process, especially when it is combined with instruction in first aid ambulance work, infuses a spirit of organization and *cameraderie* that should prove very useful in a time of emergency, particularly where one rescue station is the centre for a group of mines. Such an organization might very well be incorporated with, or might work in harmony with, the colliery fire brigades. Viewed in the light of an insurance premium, expenditure in this direction would appear well justified, merely from a monetary standpoint.

GRAPHITE IN CANADA

(From Our Special Correspondent.)

Although this mineral is in great abundance in the crystalline formation in this country, still until a few years ago little importance had been attached to its occurrences. The bulk of the world's supply of graphite is chiefly derived from Ceylon, and in a lesser degree from Bavaria and Austria, Siberia and the United States, but lately great attention has been paid to Canadian deposits. This is evidenced by the fact that not less than three big graphite mills are in course of construction, and this is specially due to the untiring efforts of some enterprising Americans.

The mode of occurrence of graphite shows great variety, affording quite a study in itself. Although the technical importance of the mineral has been recognized for a great many years, and although the study of the various occurrences has been facilitated by increased mining development, our knowledge regarding the geological position and origin is still imperfect.

In a general way we may distinguish in our Canadian occurrences two different modes of depositions, the vein-like and the disseminated. In the first mode of occurrence, that of veins, the graphite constitutes the filling of veins and cracks in gneiss, crystalline limestone, pegmatite and granular eruptive rocks. Both hanging and foot wall are easily discernable, and the direction of the vein is independent of the strike of rocks traversed. We find instances of this in the Grenville and Calumet deposits, near Buckingham and Templeton.

Though the vein form frequently occurs at most of the points where attempts to work the graphite have been made, and has shown, in such cases a mineral of great purity, the uncertainty of such deposits is so great that the employment of capital on a large scale in this mode of occurrence would scarcely be warranted.

The disseminated variety is less desirable from a mining point of view than the vein-like occurrence, since it involves the handling of a very large quantity of rock, depending upon the percentage of graphite contained therein, in order to obtain the pure article. However, it must be mentioned that most of the successful mines in Canada have been working on deposits of this character, the vein occurrences as a rule being of too limited extent to render their commercial extraction lasting and profitable.

This disseminated variety occurs as scattered scales or plates through certain portions of the gneiss, limestone or other strata; it occurs often in proximity to veins, and in these cases it is

*Note.—"Experiences with the German Rescue Party at Courrières after the Explosion." Trans. Inst. M. E. Vol. XXXI., p. 575.

supposed that the graphite has thence been distributed along the planes and fissures of the rock in contact from the veins itself. This has been more particularly observed where the adjoining rock is a mica gneiss, but similar occurrences are also found in limestone and other rocks belonging to the older series.

The most important deposits which have been worked for many years are those located in the country north of the town of Buckingham. Here quite a large number of deposits show the disseminated variety, and, on account of the very large demand for flaky graphite—a grade which is mostly used in the manufacture of crucibles—the mines in that district have of late displayed great activity. In addition to the several mills which are being worked in the district, the Diamond Graphite Company, composed of New York capitalists, has almost finished a 100-ton concentrating plant, while another mill of the same capacity is in course of construction. The deposits which this company operates are situated five miles north of Buckingham, on the left bank of the Gatineau, and, although they have been known for a great number of years, still it seems that their great economic importance was overlooked.

The area which contains these large bodies of the disseminated variety, and which has been thoroughly tested by twelve-foot drills and much prospecting and development work, has the shape of a triangle, with side lines of 1,000 feet, 800 feet and 300 feet. The country rock is a rusty gneiss, which becomes schistose and laminated in the graphite deposits. The graphite rock, according to many tests, is supposed to carry as an average 12 per cent. flake.

BLACK LAKE, QUEBEC.

The new mill building measures 72 x 26 feet square, and is fed from the mines by an inclined tramway. A new departure in the construction of this mill has been made by the division of the same into several sections, each section being driven by an electric motor. The motive power in the beginning will be steam, but later electricity will be generated at the big Lievre River Falls at Masson, at a distance of eight miles, and transmitted to the mine. The treatment of the rock will be as follows:—

The ore is first calcined in a roast kiln; it passes then through a Blake crusher, crushing rolls and sizing sieve, and, after it has been crushed for the second time in rolls, it is delivered to a series of Krom air jigs, which do the principal work by separating the flakes from the rock matter. The separated flakes then pass through the polishing and sizing department, after which they are supposed to be ready for the market. It is believed that the mill can treat 100 tons in 24 hours, and that the output will range between six and eight tons of flake graphite per day (24 hours).

Another American company is operating in Calumet, a station on the Canadian Pacific Railway, just half way between Montreal and Ottawa. The graphite deposits worked by this company belong to both the vein-like and disseminated occurrences, the former having a width of from eight to eighteen inches. A shaft to a depth of eighty feet on the slope of a hill has been sunk on two veins, and it is reported that the latter, which consist of very fine graphite of the lamellar and columnar variety, exhibit a great regularity, both as to dimensions and their relation to the containing formation. At present a tunnel is being driven from the foot of the hill towards the shaft; its total length is now 280 feet, while 50 feet more will be driven to reach under the present shaft. An upraise of 50 feet will ultimately connect the latter with the tunnel.

The big mill building measures 60 x 90 feet square, and is calculated to treat about 50 tons of graphite rock per day. A new departure in this mill will be made by the introduction of pebble tube mills, for the cleaning and polishing of the graphite flakes. The motive power in the beginning will be steam, but later electricity will be used, which will be generated from a water-power located four miles distant, on the Rouge River.

New discoveries of graphite have recently been made in the township of Amherst, in the north of Grenville, and it is reported that the deposits, which consist of the crystalline variety, are of large extent. Thus, on range VI., lots 15, 16, 17, about 12 miles from Jovite Station, a pit of 12 feet depth was worked in a vein 25 feet wide, the graphite raised being of an excellent quality. It is intended to build a mill on the property as soon as the snow goes off.

The Coals and Coal Fields of Alberta, Saskatchewan and Manitoba

By D. B. Dowling.

(Permission of the Director of the Geological Survey.)
(Toronto Meeting, 1907.)

Any description of the coal fields of the three Prairie Provinces, to be complete, would necessarily be lengthy, but the present paper is an attempt at a resume of the extent and character of the coals to be found there.

The rocks in which these coals are found all belong to the sediments of the cretaceous sea, and the coal horizons are in three successive portions of the period. Each one marks a time when the surface was not very much above the sea, but high enough to support a luxuriant flora. The history of the period seems to be as follows:—At the beginning of the cretaceous time, the land surface consisted of limestone beds which extended westward to the Selkirks. This began to sink along its western margin, concurrently with an elevation in the Selkirk region. This sinking went on to below sea level, but the subsidence was made up by a heavy deposit of sand and mud derived mostly from the elevated land to the west. This then gradually spread eastward, but was very intermittent, so that large land areas were formed and covered by vegetation. A great submergence beneath a muddy sea next occupied a long portion of the cretaceous time, but again the crust was sufficiently elevated to bring the muddy bottom to sea level. The western portion did come to the sea level, or above it, and coal deposits were formed; but it is not definitely known how far east they extended. One total submergence succeeded another, but for shorter time, before this new muddy surface rose above the sea for the last time; and again in its transition period coal beds were formed.

This threefold coal-forming period gives us three horizons in which to look for coal:—At the base, above the middle, and at the top of the cretaceous sea deposits.

The first we call the Kootanie, the second the Belly River, and the third the Edmonton, or Laramie.

In the three formations the quality of the coal varies under two fairly good rules. The first is that in the same district coals of the lower horizons, owing to age and pressure of the beds above them, should show a greater percentage of fixed carbon and also be more compact. The second is a general tendency to increase both the fuel ratio and the compactness in going toward the mountains, mainly on account of the increase in the thickness of all the deposits in that direction, and thus in the load over the seams. The fuel ratio is the fixed carbon, divided by the volatile combustible matter, and the term porosity is here taken to mean the percentage of water absorbed by the coal.

Kootanie Measures.

The lowest horizon is exposed in the raised and tilted blocks of the crust shown in, and in the neighborhood of, the Rocky Mountains. The quality of the coal, as given by the fuel ratio, varies considerably; and from a number of analyses the following notes will show the general range:—

In the Elk River region the variation shown at Morrissey ranges from 3.2 to 6.12. At Fernie the ratio increases from 3.22 to 4.60 in the lower seams. At Michel two seams differ slightly, the ratios being 3.5 and 3.7. The eastern outcrop of some of these seams on Marten Creek evidently show less change in the physical structure as the ratio falls from 2.08 to 1.86. In order to bring all the areas under notice, lists are added, giving full rate and thickness of seams, arranged in order of hardness. The areas within the mountains may briefly be outlined as:—

(1) The Elk River basin, with 22 workable seams containing 216 feet of coal. This, with a slight gap, extends north to the head of Elk River.

(2) Crows Nest areas, several narrow blocks known as the Coleman-Blairmore areas, with 21 seams and 125 feet of coal, and extending north, ending with the Sheep Creek area in front of Mount Rae.

(3) Moose Mountain area, south of Morley, with 2 seams, 7 and 8 feet respectively.

(4) The Cascade area, running from the mountains north of the Elbow River northward to near the Saskatchewan, having mines at Canmore and Bankhead. In the vicinity of the Bow River there are 10 to 14 workable seams, and 75 to over 100 feet of coal. Its extension north of Red Deer River has 15 workable seams, with 114 feet of coal.

(5) Palliser area, on Panther Creek, east of Cascade coal basin, several seams known. Area not extensive.

(6) Costigan area, on Panther Creek; five seams known, with 27 feet of coal.

(7) Bighorn area, running from Saskatchewan River north to past Brazeau River; only about 5 seams yet located, largest 16 feet.

Other areas in foothills, or farther north, not yet discovered.

The Kootanie coals are all so well compacted that less than 2 per cent. of water, as a rule, is absorbed by any. Their porosity is not considered in the list which here follows, but they are given in order of hardness.

List of Kootanie Coals by Fuel Ratio.

Locality.	Fuel ratio.	Thickness of seams examined feet	inches
Anthracite, Alta., seam A..........	11.59	7	0
Marsh mine, lowest seam...........	8.79	4	0
Bankhead mine, seam No. 2........	7.98	8	0
Cascade River, old workings	7.50	4	0
Palliser area, Panther River	7.89	5	0
Palliser area, Pantheir River	7.30	2	0
Marsh mine, from old tunnel	7.23	12	0
Canmore, seam No.	7.10	5	0
Costigan area, 2nd from top	6.97	4	0
Marsh mine, seam above tunnel	6.92	4	0
Sheep Creek, 1st seam opened	6.92	8	0
Canmore, Alta., seam No. 1.........	6.61	5	0
Sheep Creek, higher seam	6.49	8	8
Marsh mine, upper seam	6.54	10	0
Morrissey, lower seam	6.12	18	0
Canmore, seam No. 4........	6.00 to 5.35	3	0
Marsh mine, highest seam	5.95	15	0
Costigan, seam eastern outcrop	5.84	4	9

Locality	Fuel Ratio	Thickness of seams examined feet	inches
Costigan area, lowest seam, west outcrop	5.79	11	0
Sheep Creek	5.76	10	4
Coxcomb, Mt. Jumping, Pound Creek.	5.75	3	0
Canmore, Alta., seam No. 2	5.37	4	0
Canmore, Alta., seam No. 5	5.34	5	0
Thorne mine, Moose Mountain	5.15	7	6
Canmore, seam No. 6	5.06	4	6
Costigan seam, western outcrop	4.89	4	9
Costigan area, 3rd seam from top	4.85	3	9
Costigan area, 4th seam from top	4.83	3	6
Fernie, B.C., lowest seam	4.60	22	0
Moose Mountain, outcrop of seam	4.05	5	0
Sheep Creek, Moose Mountain seams.	3.65	3	0
Snow Creek, Panther River, Cascade area	5.36	5	0
Michel, B.C., lowest seam	3.70	10	0
Michel, B.C., highest seam	3.50	15	0
Fernie, Mine No. 3	3.49	6	0
Fernie, Mine No. 1	3.41	9	0
Fernie, Mine No. 1	3.22	8	0
Morrissey, B.C., highest seam	3.20	18	0
Elbow River, branch west of Moose Mountain	3.12	5	4
Oldman River, 1 1-2 miles east of gap	2.92	5	0
Saskatchewan River, opposite Bighorn Range	2.79	5	0
Elk River, head of	2.71	13	0
Oldman River, N.W. branch, North Fork	2.70	8	0
Oldman River, South Fork	2.47	9	9
Branch of Brazeau, Bighorn Range	2.37	16	0
Marten Creek, Jubilee seam	2.08	30	0
Oldman River, near gap	1.90	5	7
Marten Creek, B.C., Peter seam	1.86	14	0
Marten Creek, B.C., small seam	1.61	2	0

Belly River Measures.

The middle horizon is exposed in the foothills, where it is brought up by a general rise toward the mountains. This is known only in small portions, and provides a good grade of very compact lignitic coal.

Under the surface of the plains it is disclosed along the deep excavation, or trough, through which the branches of the South Saskatchewan flow. A slight roll in the measures, running in the general direction of the Coteau, exposes these measures north of the surface depression of the South Saskatchwan, and beds are recognized to near the Vermilion lakes, a short distance south of the North Saskatchewan. In this northern extension little coal has yet been found, and eastward the measures are covered by higher beds, due to a slight depression of the beds in that direction. The interesting feature of the eastern extension of the formation, is its possibility of carrying coal into the central portion of Saskatchewan. Such occurrences of loose lignite near Prince Albert, and a seam reported on the face of the hills between Montreal Lake and Lake la Ronde, as well as in the bed of the Saskatchewan, above Saskatoon, appear to be encouraging. The fact that boreholes near Carlton and the Elbow of the Saskatchewan have not revealed seams, may mean only that the drilling began below the coal bed. The seams of the Lethbridge area are not numerous, the coal mined there being only about 5 1-2 feet. At other places near by the thickness does not appear so great. Near Medicine Hat a five foot seam was worked, but the coal appears to be very porous and carries a high percentage of water.

The horizon containing most of the coal is in the upper part of the formation, and thus separated by about 1,000 feet of shales from the lowest coals of the highest horizon. So that the border of the recognized areas of Belly River rocks are marked by coal seams.

Comparisons of the fuel ratios in the Kootanie coals give us what might be called a scale of their hardness. The same comparison in the fuels of the upper horizons show only the degree of alteration that has taken place in them during their change from vegetable matter toward the more stable condition as coals. They all show, in a marked manner, that their substance has not been so compactly pressed, as they all absorb much greater percentages of water. The Belly River coals are slightly denser than the Edmonton coals of the same district, but it is not until the seams outcrop near the mountains that this character is well marked.

In the western upturn they carry less than 3 per cent. of water, while the Edmonton coals run from 3 to 7 per cent. For the Lethbridge area the difference is not so strongly marked, except at one or two localities.

Coals of Belly River Formation in Western Upturn or Foothills.

Localities.	Fuel ratio.	Porosity per cent.	Thickness of seam ft.	in.
Head of Mill and Pincher Creeks	2.96	1.99	8	9
Mill Creek, 4 miles above mill	2.02	1.63	8	0
Sheep Creek, Tp. 19, R. 4, west of S.	1.62	2.16	5	0
Sheep Creek, Tp. 19, R. 4, west of S.	1.57	2.50	7	0
Morley, on Indian Reserve	1.18	1.26	6	0

Coals of Belly River Formation in Lethbridge Area.

Localities.	Fuel ratio.	Porosity per cent.	Thickness of seam ft.	in.
Taber Coal Co.	1.83	10.8	3	3
McPhee Mine, near Taber	1.72	11.35	2	7
10 1-4 miles above Medicine Hat	1.62	17.70	4	0
Belly River, Driftwood Bend	1.40	9.18	3	3
St. Mary River, 7 miles from mouth	1.38	7.02	3	8
10 miles from Medicine Hat	1.38	16.82	4	0
Bow River, Grassy Island	1.34	11.96	4	6
Red Deer River, 9 1-2 miles below Bull pd.	130	13.06	3	6
Milk River Ridge, north side	1.32	5.58	3	0
Lethbridge, main seam	1.26	6.50	5	6
Stair, main seam	1.25	20.54	5	0
Red Deer River, 4 1-2 miles below Bull pd.	1.15	13.63	1	6
Red Deer River, 2 miles below Bull pd.	1.19	12.62	1	3

Laramie—Edmonton Coal Areas.

The larger coal areas of both Alberta and Saskatchewan are of the formations and are practically on one and some same horizon which occupies the dividing line between sea deposits below and fresh water and land deposits above. Some of the coal seams are in the upper fresh water stage—the top of the Laramie; but the majority are in beds separated by sands and clays, holding remains of organisms which lived in brackish water—the Edmonton, or lower Laramie. In Saskatchewan the divisional lines between these deposits are not worked out; but in Alberta, the beginning of fresh water stage is drawn at about the horizon of the Big Coal Seam on the Saskatchewan. The formation originally probably covered a very large area, but the uplift of the western edge, and the subsequent denudation of a great part of the plateau formed of these soft beds, has left remnants only of the upper coal rocks. In Saskatchewan these remnants occupy the high lands in the Cypress Hills and Wood Mountain and a triangular area eastward from the Coteau.

A great excavated depression running outward from the mountains, branching to north and south of Cypress Hills, separates them from the plateau running north and south and sloping eastward from the foot of the mountains. The western coal area occupies a belt near the eastern edge of this slope, narrow at the south, but widening northward, reaching its maximum in the latitude of Edmonton. The coal rocks are then covered farther up the slope by heavy beds of sandstone, but emerge from under them along a narrower band just in front of the foothills in some parts, and in others, generally in the south, nearer the mountains. There is thus one part of the field which has suffered much pressure, and in this the coals show the effect of the compression. The thickness of the seams in this area appear to increase to the north. Thus, in the vicinity of Bow River, seams of 4 1-2, 6 and 9 feet are the best that are known; but in the vicinity of the Saskatchewan, seams of 8, 18, 4 and 6 feet occur near Edmonton and at the Pembina River; the horizon of the Big Seam shows 3 seams, 13, 13 and 6 feet, or 32 feet of coal.

In the Saskatchewan areas, the coal seams of the Cypress Hills and eastward to Wood Mountain, are all thin; but a 4 foot seam south of Cypress Hills may prove fairly persistent. In Wood Mountain two seams of 6 and 8 feet respectively will probably be utilized. On the eastern side of the Coteau at the Dirt Hills, three seams, 7, 3 and 6 feet, are reported. In the Souris district seams of 5 and 8 feet are being mined, the latter reported as thickening to 15 feet toward the east.

In the following list, which is here, for uniformity, arranged as the others in order of fuel ratio, the porosity runs somewhat at variance with this scheme; but if the arrangement had been by porosity only, a regular progression from west to east would have been more nearly secured, since all the coals absorbing water from 3 to 7.1 per cent. actually come from the beds in the disturbed western part of the field. All those absorbing from 8 to 14 per cent. are from the eastern portion of the Edmonton field, while all with a porosity of from 14 to 22 per cent. are from the Saskatchewan areas.

List of Laramie and Edmonton Coals in Order of Their Fuel Ratios.

Localities.	Fuel ratio.	Porosity per cent.	Thickness of seam ft.	in.
Shaw's Coal Mine, Fish Creek..	1.66	3.76	2	0
Blackfoot Reserve, 6 1-2 miles below Crossing	1.6 to 1.5	12.31	4	8
Big seam, Saskatchewan River..	1.6 to 1.3	11.14	18	0
Indian Farm, Pincher Creek	1.58	5.38	3	0
North Fork, Highwood River	1.56	6.12	1	6
Athabaska River, above McLeod River	1.53	10.58	3	0
Athabaska River, above McLeod River	1.49	11.47	10	0
Edmonton, just below town	1.49	12.89	6	0
Pembina River, Tp. 53 R. 7 west of 5th lowest	1.48	13.07	6	0
Pembina River, Tp. 53 R. 7 west of 5th highest	1.47	13.78	13	0
Red Deer River, in foothills	1.46	4.97	9	0
Rocky Mountain House seam ...	1.45	7.01	2	0
Red Deer River, 4 miles below Tail Creek	1.41	10.02	5	11
Red Deer River, mouth of Rosebud	1.40	13.08	6	0
Battle River, Meeting Creek	1.39	11.68	4	6
Sheep Creek Coal Mine, Lineham P.O........	1.38	3.08	4	0
Coal Creek, west of Cochrane, Alta	1.38	4.93	4	6
Edmonton, The Ross seam	1.34	11.47	4	0
Red Deer River, 12 miles above Tail Creek	1.33	7.66	7	0
Knee Hills Creek	1.33	9.86	4	0
Crowfoot Creek, 4 miles from Bow River	1.33	11.25	6	0
Bow River, 4 miles below Blackfoot Crossing	1.31	10.72	8	11
Big Island, 12 miles above Edmonton	1.30	8.92	3	8
Egg Creek, near Victoria, Alta.	1.24	11.91	1	1
Borehole, on Souris River, east of mines	1.26	17.78	6	0
Dirt Hills, upper seam	1.24	14.80	7	0
Dirt Hills, lowest seam	1.24	15.50	6	0
Dirt Hills, middle seam	1.11	17.53	3	0
Souris River, mouth of Short Creek	1.10	21.84	5	0
Long Creek, 1 mile north of Wood End	1.08	15.11	7	0
Bow River, three miles south of Horseshoe Bend	1.06	11.13	4	6
Poplar River Tp. 1, R. 28, west of 2nd	1.01	12.05	18	0
Willow Creek, south of Cypress Hills	1.05	16.37	4	0
Wood Mountain, lowest seam ...	1.04	12.26	8	0
Wood Mountain, Hay flat	.99	13.73	6	0
Wood Mountain, Upper seam	.96	18.61	8	0
Turtle Mountain, from locality in Dakota	.90	13.98	..	..
Long Creek, opposite Estevan ..	.63	17.97	6	6
Long Creek, near Wood End ..	.70	14.73	7	0
Big Muddy Creek, south of Willow Bunch	.58	16.28	5	0
Big Muddy Creek, south of Willow Bunch	.55	15.51	4	0
Big Muddy Creek, south of Upper seam	.54	15.20	3	0

THE SUPPLIES AND RESERVES OF IRON ORES

By John Birkinbine, Philadelphia.

(Toronto Meeting Canadian Mining Institute, 1907.)

In technical publications and in trade journals attention has been given lately to the probable exhaustion of some mineral products, and it is proper that this be considered seriously, for in all business enterprises the important question of supply and demand should receive careful study. The fact that the minerals discussed are nature's products does not suggest a different treatment from others obtained artificially.

The weather conditions which affect agriculture are features in determining the probable supply of and demand for grain, etc., each season or year, but the supplies of the minerals of which this paper treats are considered by decades or by cycles of years, for they are not reproductive. The reserves for the future exist to-day, and the problem to be determined is for what length of time these mineral reserves may be expected to supply the demand.

Progress in all metallurgical lines has been rapid, outputs of minerals and production of metals doubling and trebling in a few years, and these augmented quanties have directed attention to the problem of securing a practically permanent supply of raw materials. The question as to the time when the coal beds of the world, of different countries, and of portions of countries, will be exhausted has often been presented, and the rate at which forest areas have been denuded has directed attention to the supply of timber and vegetable fuel being curtailed.

Enormous increases in the use of copper, due primarily to the phenomenal development and utilization of electrical energy, have caused some writers to anticipate that in the near future there may be a shortage of this metal, and the probability of a scarcity of the precious metals has also been prophesied. Tremendous strides in the manufacture of iron and steel, the great combinations formed for the manufacture of these metals, and the purchases or leases of large mineralized areas have brought prominently into notice the possible exhaustion of the iron ore supply.

Some of the discussions have apparently been based solely on an assumption that if a certain rate of increment has been maintained for a specific time, that this rate will be continued, and then the calculation is simple, viz., to the known amount of material now mined, add percentages representing the increased demand for a term of years, and use this as a factor to learn how long the apparent supply will continue. But in any discussions of these problems many features must be taken into consideration.

In all mineral deposits we must face their ultimate exhaustion, because they are not reproductive, at least not to an extent which would make such reproduction appreciable in the supply and demand. In the forests different conditions prevail, but even there the rate of accretion is limited, for trees only mature after a number of decades. This, however, permits of judicious protection and propagation, and the growing appreciation of forestry gives promise, if the interest is maintained, of a supply of timber which, though restricted, may be depended upon.

Among the features which demand attention in determining the probable exhaustion of supplies of minerals are the methods employed to win them, many of which are and have been wasteful. Mining in years past, and, in some localities, at the present time, removes the better mineral only, leaving the less desirable in the ground or consigning it to the waste heap, often mixed with refuse material.

A second factor to be considered is the composition of the mineral, for only occasionally are metals found in the metallic state. Nuggets of gold are not uncommon, placers yield gold in metallic particles; lumps and even masses of native silver or copper occur, and galena is fairly abundant, but, although aggregating large quantities, these represent but a small portion of the total metal marketed. Iron in a metallic state only occurs as meteorites, but the aggregate known weight of these hardly amounts to one hundred tons.

As a rule a number of metals or elements are combined in the mineral won from the earth, and the influences of some of these components are deleterious, especially for particular uses; consequently an ore, rich in a given mineral, may be much lessened in value for present use by reason of the association in which the metal is found. But in determining the possibilities of exhausting the supply of any natural product, it is unfair to assume present practice and knowledge as limiting the use of the metal under consideration. Methods of treatment, or of beneficiating may bring into demand metallic ores which now are considered undesirable.

Taking the supply of iron ore as the subject for this paper, it must be admitted that in many localities ore has been rejected in the mines, or casts on roads or dump piles, superior to other ores which are successfully used elsewhere. This leads to the natural assumption that the deposit was wrought before its product was required, or that it was not judiciously operated, or that to reach points of consumption the mineral had to stand excessive transportation and handling charges.

In the early history of the iron industry of America the initial enterprises were developed by plants using ores, few of which to-day would be accepted as desirable. The prices received for pig metal were far in excess of what is now commanded, and the cost of production was relatively high, but the progress made in technology, and the improvement in equipment and practice which are responsible for the enormous development of iron manufacture may go far towards overcoming the objection to these now discarded minerals.

Beyond the use of ore, fuel and flux fed to vertical furnaces in which air blast accelerates combustion, there is slight similarity between the production of iron now and seventy years ago. May we not expect as radical changes in the future?

During the first visit of the Iron and Steel Institute and the Verein Deutscher Eisenheutenleute to the United States in 1890, the delegates were divided into two parties, one going north into the Lake Superior Region, and one south to Alabama. It was the writer's privilege to explain to those taking the northern trip that they were walking on a road largely composed of discarded ore, higher in iron, and lower in phosphorus, than their colleagues were contemporaneously examining in Alabama. To-day such ore is not cast into roads, but is shipped, and this shipment is profitable because of the perfected mining, handling and transportation facilities which prevail in the Lake Superior Region, and because of modern metallurgical processes.

A third factor is quantity, for the demands of a single industrial plant for a day are now as great as that of an original plant in a year's time, and the apparent extent of a deposit receives consideration not required in former years. Numerous iron ore mines which have been wrought are now abandoned and lie dormant, not all of them because of leanness of ore or of their composition, but because a number of mines would have to be combined and operated to make a material increment in the supply for a modern iron and steel industry. Most of these deposits had been used locally, but it is not improbable that a combination of several under efficient management would permit of operating them successfully, and delivering the materials to consumers by modern transportation methods at satisfactory cost.

A fourth factor is the utilization of metallic alloys and the possible substitution of other metals for specific purposes. In constructions the modern tendency is to study strains and forces, and prepare designs to secure the best distribution of material. Steel and concrete largely displace wood and brick buildings, but each member of a structure, vessel, machine or tool, is carefully calculated to reduce the weight or quantity to a minimum. If we employ wasteful metohds in mining, in smelting, and manufacture, and apply masses of metal rather than well proportioned parts, if we fail to make use of improved forms and combinations, we may expect to pay the penalty.

As to the future supply of iron ores, a number of papers written by gentlemen who are considered either as local or national authorities, indicate a tenor of anxiety, or phophesy the exhaustion of the iron ore resources of the world. It may be presumptuous to take exception to the opinions of these authorities, but the writer fails to find justification for many of the conclusions stated.

A geological survey is considered an essential feature for any progressive government, whether national, provincial or state, and a large number of academies and colleges educating the youth, teach the elements of geology, while the search for mineral wealth has encouraged the pioneer and the prospector to penetrate into the mountain fastnesses and wildernesses of all countries. But who of these is willing to assume that the world has anything like a complete knowledge of the earth's crust and its mineral wealth?

"The unexplored regions of the earth" is the caption of a recent magazine article by Mr. Cyprus C. Adams, which is illustrated with a series of continental maps, indicating by shaded areas the *terra incognita*. This shows graphically how much of the earth's surface is unexplored, and the author states: "Unknown regions have wholly disappeared only from the map of Europe. Its entire surface has been scientifically explored, though much detailed research remains to be made. Its map is approximately correct, and we have a very large, if not complete, knowledge of its material resources. . . Many years will elapse before any other continent is as well mapped as Europe. . . and a large amount of pioneer work still invites the explorer, for many of the unknown areas have much territorial extent."

As to the North American Continent, the statement is made that: "Archæologists say that their branch of science requires the exploration from their special point of view, of most of Western North America, from Nevada to the Arctic; but they cannot enter parts of this area without cutting into regions that have never yet seen an explorer. . . Official surveys in Canada have in fifteen years reduced the unexplored areas more than one-half. . . parts of Alaska aggregating an area six times as large as that of New York are still unmapped and practically unexplored."

There is scarcely a mining district which fails to show instances of early exploitation, abandoned because it was believed to be unproductive, but subsequently developed into important producing mines. The story of mines yielding good mineral, but which were conisdered as approaching exhaustion, being galvanized into new life by the discovery of parallel veins or deeper lenses is repeated, even in the older mining centrs. Giving full crdit to the ubiquitous prospector, to the energetic geologist who spends months in the field, and to the mining engineer who explores ahead of his working, can all these claim to have done more than "scratch the surface?" If not, we must believe there are in the earth many deposits of value now unsuspected, or at least not located by research. Some deposits of iron ores, passed by because they are lean, or by reason of the phosphorus, sulphur, titanium, etc., which they carry, offer inviting fields for experiment by chemists and metallurgists, for these valuable allies of the iron industry have assisted in making some minerals which would otherwise be condemned take place among those which are desirable. It is evidently unfair to eliminate from the list of iron ores those which carry considerable titanium without giving credence to the investigation of, and experiments with, electric smelting made by the Dominion Government, or the exahustive and conscientious work of Mr. Rossi. It would be equally unfair to cast aside a highly sulphurous iron ore without considering what could be done by roasting, nodulizing, and, in some cases, separating. Nor are we justified in designating a highly phosphoric ore undesirable until the possibility of separating this magnetically, or with jigs, is considered, the utilization of the mineral to produce basic or foundry pig iron tested, and the possibility of value from the phosphate extracted determined. Some silicious ores formerly rejected, but which now are sought for to mix with less silicious minerals, form another illustration.

The largest iron and steel producer in the world, having enormous reserves, has lately added to these by entering into a lease whereby it has the privilege of mining large quantities of ore from the lands of a transportation company, and the liberal rates agreed upon for transportation to upper lake ports and for royalty, has influenced the general belief in the possible exhaustion of iron ores. This contract starting with the year 1907, provides for mining at least 750,000 tons of ore during the year, and paying therefor $1.65 per ton, on which, at existing transportation rates, 85 cents may be considered royalty on ore yielding 59 per cent. of iron when dried at 212 degrees Fahrenheit. The contract also provides that in each year thereafter the quantity mined is to be increased by 750,000 tons or more, and the royalty advanced 4 per cent. For the year 1917 the minimum tonnage will be 8,250,000 tons, and the rate paid $1.90. Thereafter at least an equal amount of ore (8,250,000 tons) is to be taken out annually, but the 4 per cent. increase in the charge for royalty continues, so that in 20 years the rate will be $2.33 per ton, and in 40 years $3.00 per ton will be paid for freight to docks and for royalty. This contract demonstrates that for at least 40 years a demand for metal is expected, and as the agreement continues until the mines are exhausted, a continued advance in value is looked for.

That this lease would have a decided influence upon the iron ore trade generally was to be expected. A resume of its terms shows that for the

	Total which must be mined.	Royalty and Freight per ton.
1st 10 years	41,250,000 tons.	$1.65 to $1.96
2nd 10 years	82,500,000 tons.	1.99 to 2.30
3rd 10 years	82,500,000 tons.	2.33 to 2.64
4th 10 years	82,500,000 tons.	2.67 to 2.98

But this contract does not necessarily indicate exhaustion of the iron ore supply of the United States, it rather insures a convenient and desirable supply of raw material to plants already in operation, or under construction, where the operating company has large investments. Believing that it has a market at its own furnaces for all the ores which it can produce, the contract insures the industry a continuous supply. The lease also eliminates a possible competitor with extensive mineral properties, large capital, and an assured market for manufactured steel.

The writer lays no claim to personal familiarity with the iron ore deposits in all countries, and is willing to concede to geologists, statisticians and metallurgists of other nations a knowledge as to details which he does not possess, but an association with the United States Geological Survey for two decades brought him in correspondence with all the iron ore mines in the United States, and professional investigations of iron ore deposits in various parts of the United States, Canada and Mexico has aided him in judging the North American reserves. Correspondence extending over a number of years with specialists, and a careful study of published data, have also added information concerning the deposits which are available in other countries.

Examination of the various articles and papers which have appeared concerning the iron ore reserves, show that some are evidently influenced by patriotic feelings, or affected by the intimate knowledge one has of his own country. As an instance, the table presented by Prof. Tornebohm, of Sweden, may be cited. This table credits to various countries the following iron ore reserves:—

Countries.	Workable Ore Fields, million tons.
United States	1,100
Great Britain	1,000
Germany	2,200
Spain	500
Russia and Finland	1,500
France	1,500
Sweden	1,000
Austria, Hungary and other countires....	1,200
Total reserves	10,000

This table is not offered to criticize Prof. Tornebohm, nor to emphasize the national bias which may be expected to prevail, nor is it presented with any intention to be unfair to other countries, for the writer's basis of estimation may be open to similar criticisms in so far as the reserves of North America are concerned. An honest endeavor has been made to keep fairly within limits, for the purpose of this paper is a frank discussion of the iron ore resources of the world. If we are facing in the near future, or at any time, exhaustion of an important natural resource, the sooner this is appreciated the better.

Crediting Professor Tornebohm with superior knowledge of European ore deposits, and also of those from Asia and Africa, which have been drawn upon, his presentation of the problem may be discussed from the American standpoint. The estimated reserves allotted to the United States, 1,100,000,000 tons, are less than have been commonly credited to the Lake Superior iron ore region alone. One estimate given currency in the past year puts the total for this district above 1,500,000,000 tons, and the lease above referred to is generally accepted as covering a tonnage equal to 40 per cent. of the reserve allotted by Prof. Tornebohm to the United States.

Professor Tornebohm's figures for the United States are made up of 1,000,000,000 tons for the Lake Superior region, 60,000,000 tons for Alabama brown hematites (this omits any consideration of the red hematite deposits—the principal reliance of the Alabama-Tennessee furances), with 40,000,000 tons left to complete the total of the unmined ores in New York, New Jersey, Pennsylvania, in all the Southern States (except brown hematite mentioned), and the ores of all Western States, including Wyoming, Colorado and New Mexico, where iron ores are now won.

In criticizing these quantities, some vague optimistic statements have appeared which are not answers to the Swedish figures, and do more to befog than to clear the situation of uncertainty.

The writer had, while representing the United States Geological Survey, unusual facilities to be posted as to the iron ore reserves of the United States, but he has hesitated to offer estimates on these, because the more the subject is studied the more favorable the outlook for the future appears, and he merely suggests the following:—

If Professor Tornebohm's estimate of the United States is incorrect we may question his estimates for other portions of the world, at least those outside of Europe. The Swedish professor credits his own country with ores of high metallic contents and with ore reserves equal to those of Great Britain, twice as great as for Spain, nearly as much as for the United States, two-thirds as large as for either Russia and Finland, or for France. This may be accepted as due to a more intimate knowledge of the enormous deposits of his own country and not to a desire to minimize those of other lands. If his total of 10,000,000,000 tons is accepted as representing the ore reserves of the world, his apportionment of these must also be accepted, which is as follows:—

	Per cent.
Germany	22
France	15
Russia and Finland	15
United States	11
Great Britain	10
Sweden	10
Spain	5
All other countries, including Austria-Hungary	12

On this basis Europe would possess more than three-fourths of the iron ores of the world.

He is certainly not optimistic concerning the United States, nor do his figures apparently recognize the known deposits of iron ore in Newfoundland, Canada, Mexico, Cuba or South America. He makes small allowance for Asia, with known iron ore deposits in China, Japan, India, and in the Pacific islands. Nor does he give sufficient credit to the geological reports of Australasia, nor allow for ore reported as existing in quantity in the great continent of Africa.

Of his total reserves 7,700,000,000 tons are given to Europe, 1,100,000,000 tons to the United States, and but 1,200,000,000 tons to Austria-Hungary and other countries, which include all of Asia, Africa, Australasia, the Pacific islands, Cuba, South America and North America, outside of the United States. The limited exploitation of Canadian iron ores is evidently assumed as a basis for calculating the reserves, instead of the researches made by the Canadian Geological Survey and individual investigators.

Canada is not mentioned, but is included in "all other countries," attached as an appendage to Austria-Hungary. The known deposits of iron ore in the Dominion are believed to exceed those of Austria-Hungary, and but few of these have been exploited. The possibilities of the British possessions in North America are vast, and they may be confidently expected to outrank as iron ore producers some of the countries specifically named.

The prophecies of exhaustion of iron ore depend for their fulfillment on a practical continuance of existing conditions, such as the relative location of iron ore producing mines, iron ore consuming plants, coal deposits and coke ovens, moderate changes in labor conditions, labor saving or transportation facilities ceasing to improve, manufacturing and industrial centres being mainly limited to those now recognized, on little, if any, progress in the metallurgical processes. Moreover, such prophecies omit the possibilities of other metals or alloys being procured at a cost competing with iron at or near present prices.

Had the iron-master of half a century ago been informed that in 50 years the production of iron would reach the quantities now annually made, and had be believed this otherwise possible, he would have prophecied that sufficient ore could not be found to produce such an enormous output, and he would have expressed doubt as to the possibility of obtaining fuel to smelt the ores or of assembling the necessary raw materials at blast furnaces.

If we are to estimate the iron ore reserves for future use, we must also consider their utilization, which we have no right to assume will be kept within the limits of present industrial development or transportation facilities, nor even confined to prevalent methods of metal production. They are also to be estimated in their relation to the coal reserves if the metallurgical processes of the present are to be followed. Such considerations may make available some ore deposits which are now remote from commercial centres or distant from exploited coal fields, for unless we assume that there are to be no further advances in this particular the utilization of various coal deposits and of iron ores convenient to them is to be anticipated.

The practicability of electric smelting of iron ore, which has been the subject of detailed study and report in Canada, may be of importance in the future, especially in the treatment of ores whose composition or physical condition are in the present status of knowledge, undesirable for us in the blast furnace, and experiments with iron sands by the United States Geological Survey offer a possible reserve of iron ore of considerable importance. The same resource, ability and skill which have brought the iron and steel industry to its present status may be counted upon to overcome many objections to ores which are impure or distant, and, with new metallurgical methods, ores now avoided because of elements in their composition, may be in demand.

It is well known that some iron ore deposits are removed from present or immediately prospective transportation facilities, are distant from fuel, are lean, and must be beneficiated. But when we remember how iron ores of the Lake Superior region have been the incentive to gridiron that section with railroads and to build an enormous inland marine, equipped with loading and unloading facilities second to none, distance becomes comparatively unimportant where ores are conveyed by boat for less than a mill per ton mile, and where long railroad hauls can be provided at 3 mills per ton mile. Under such circumstances ore can be carried to fuels or fuels to ores, or the two can meet at desirable points at costs which need not be prohibitive.

The liberal use of Swedish, Spanish, African and other foreign ores by European and American furnaces, and the large proportion of the ore supply of the United States and Canada coming from the Lake Superior region, illustrate how transportation facilities affect the locality of supply. So beneficiating, modern mining methods, or economics in mechanical appliances, permit lean ores to be mined, roasted, comminuted or separated at small cost. In the existing stage of mining and mechanical development, and with the study which has been devoted to labor-saving appliances, transportation facilities, methods of beneficiating ores, etc., the leanness of ores and present distances from points of consumption, are not to be given too much importance.

Using the lease before mentioned as a basis, we may assume that transportation costs will decrease rather than increase, and accept the present rate as fairly covering this item. Deducting, therefore, 80 cents from the rates fixed, the royalty or apparent value of the iron ore in place is expected to advance from 85 cents to $1.16 per ton in the first decade, from $1.19 to $1.50 in the second decade, and from $1.87 to $2.18 in the fourth decade. In other words, if the lease continues, and the ore lasts forty years, its value in the ground will be nearly trebled.

Accepting, for the purpose of discussion, this increment of value, there would seem good reason for exploiting a number of iron ore deposits which are now inactive, because of their character or location. The convenience of using ores rich in iron and the facilities for obtaining such material as wanted by purchase, have encouraged the transportation of desirable mineral over long distances to furnaces close to which relatively inferior ores lie unused. The freight added to the selling price of these more desirable ores in some instances brings the cost or producing pig metal above what may be expected by using relatively inferior and cheaper local ores.

It is hardly equitable to compare ore reserves on the basis of what is esteemed as desirable by the present practice in various countries. Thus, in the estimates made by Professor Tornebohm for the Swedish Government, he credits Great Britain with as much ore as he allots to the United States and Germany, with double that quantity of iron ore for future use; but for the United States he assumes a yield of from 45 to 67 per cent., and for Germany from 30 to 45 per cent. In other words, the estimated 1,100,000,000 tons for the United States is all treated as of a grade superior to the richest of the British or German mineral. Dividing the ore reserves by the percentage of iron, Professor Tornebohm allots to the various countries the following:—

	Tons of Metallic Iron.
United States	603,166,600
Great Britain	295,000,000
Germany	825,000,000
Spain	249,375,000
Russian and Finland	637,500,000
Sweden	611,538,460

(This statment was prepared by Mr. Chas. K. Leith.)

Germany is thus given pre-eminence as an iron producer, and Russia and Finland, Sweden and the United States are placed next in order, followed by Great Britain and Spain. The difference in labor and transportation costs in the various countries or districts will permit those where these items are relatively low using lean ore at a profit. But, if necessary, the United States could utilize, and some plants are now smelting, mineral closely approximating the yields of iron mentioned as employed in Great Britain and Germany.

The papers and discussions upon the probable exhaustion of iron ore supplies serve a good purpose by awakening interest in a subject of importance to all who produce, manufacture or use iron or steel. Results to be anticipated from such discussions are: That known deposits of iron ore classed as undesirable by reason of location, apparent volume, physical structure or chemical composition, may receive consideration; that some ore bodies, now unopened, may be exploited, and that mines which have been wrought in the past may re-enter the list of producers, while encouragement to develop new sources of iron ore may come from the discussion.

The fact that a number of ores considered unattractive by blast furnace managers can be made available, has received less attention than would have been given had the better ores been more troublesome to obtain. But roasting pyritiferous and other ores has been followed for many years; more complete desulphurization and nodulizing of comminuted sulphurous ores is now practiced on a commercial scale; a large tonnage of magnetite is passed through magnetic separators, to reduce the silica or phosphorus contents; and practical demonstration has shown that titaniferous iron ore, when properly fluxed, may be economically smelted, while electrical smelting is being thoroughly investigated. The field for beneficiating and treatment of iron ores is large, and promises a considerable addition to the possible iron ore reserves.

The writer fully appreciates the importance of a frank study of natural resources and the folly of wasteful use of them, especially such as are not reproduced. He also is satisfied that his record as an investigator of deposits of iron ore and his reports upon industries remove him from the class of optimists who expect every indication of ore to develop into a great mine, or that each locality where ore and fuel can be assembled advantageously will become an important prospective industrial centre.

The problem is to be studied from the standpoints of deposits now exploited, of those unwrought, but concerning which ideas of their extent and character have been formulated by exploratory work, and of those whose locations are made known by prospecting, with allowances for probable iron ore supplies suggested by geological conditions.

If the study of the iron ore reserves is undertaken in connection with present or possible fuel supplies, with consideration of prospective producing and consuming centres, the time when iron may be a "precious metal" or the available supply of iron ore becomes exhausted may be so far in the future as to allay any present anxiety.

The greatly augmented production of iron is undoubtedly making such heavy draughts upon the developed iron ore mines in the world as to awaken interest in the question of future supply, and unless there are additions to these one need not be pessimistic in anticipating a shortage.

On the other hand, when the probabilities of located but not developed ores are considered, when the possibilities of advanced metallurgy are studied, and when we realize how much of the earth's surface and geology is still unknown, or imperfectly known, one need not be an optimist to express confidence that an ample supply of ore will be found to meet the needs of mankind.

But he who formulates estimates of quantities from which to prophesy the end of the world, as far as iron ore is concerned, or he who multiplies these quantities by vague percentages, demonstrates how little reliable data is available concerning the iron ore reserves.

Recent Developments in Mining in the Southern Yukon

By D. D. Cairnes, B.Sc., M.E., Geological Survey, Ottawa.

(Toronto Meeting Canadian Mining Institute, 1907.)

By permission of the Director of the Geological Survey.

In introducing this subject, it may not be entirely amiss to mention some of the conditions under which mining operations must be conducted in this somewhat northerly portion of Canada. Until very recently the common idea of this district was that it was one of perpetual snow and ice, and one very difficult of access. Pictures and newspaper accounts of the Chilcoot Pass and the building of the W. P. & Y. Railway are mostly accountable for this opinion. Now a person can travel to Whitehorse or Dawson with the same comfort as to any of the ordinary popular summer resorts of the West.

Steamers ply regularly between Seattle and Vancouver and Skagway—distances respectively of about 1,000 and 867 miles. From here Whitehorse is reached by the W. P. & Y. Railway, a distance of 111 miles, thence steamers run to Dawson—460 miles.

The placers for which the Yukon is so well known occur chiefly in the northern portion of the territory—the richest being within a few miles of Dawson, on the creeks running into the Klondyke and Indian rivers. The only places where quartz mining has been done are just west of Whitehorse and along Windy Arm to the south, and it is with quartz and coal mining that this paper has to deal.

In actual mining there are few more difficulties to contend with than in British Columbia, or many other northerly parts of the world where mining is carried on extensively. At least six months are suitable for surface working and for the necessary outside operations, and during several months of this time work can be carried on by night as well, almost, as by day without artificial light; and, although the frost extends to considerable depths, in places, this does not interfere to any great extent, except on the very surface, while working in soil and loose material. The current wage paid to miners in the Windy Arm mines this last season was $3.50 per shift of eight hours, with board and lodging included.

With the exception of the Whitehorse copper district, little or no quartz mining, except a few assessments in scattered places by prospectors, had been done in the Yukon until the latter part of the season of 1905, when Col. J. H. Conrad commenced to develop some properties on the west side of Windy Arm. As a result of this the little town of Conrad has sprung into existence; a great many men have been employed; a waggon road has been built from Cariboo Crossing along the beach to Conrad, about 11 miles; Government trails have been build up to the mines, connecting several of them; three ærial tramways have been built to carry supplies, etc., to the mines, and to carry ore down to the beach, and a foundation has been laid for what appears to be a permanent industry in the Yukon. Moreover, men have been encouraged to prospect further, with the results mentioned below. A new mining district was also formed this season, with a mining recorder's office at Conrad, called the Conrad Mining District, embracing the Windy Arm district and extending north to include the Watson and Wheaton rivers districts.

It is not the purpose of this paper to go into details in regard to the different properties of this district—a full account of which will be published in the writer's detailed report by the Geological Survey—but merely to give the general characteristics of the district.

Topographically, the country is very rugged, the summits rising as high as 5,200 feet above Windy Arm, or about 7,360 feet above sea level. No timber exists, except in some of the valleys and part way up some of the hillsides, ceasing, however, entirely at about 2,000 feet above the valleys. Most of the Windy Arm properties are situated high up on the bleak mountain sides, and all wood, timber, supplies, machinery, etc., had to be packed or pulled up by mules or horses. This is done now mostly altogether by the ærial tramways. So that prospecting and opening up the properties was both difficult and expensive. The district is, however, very accessible. The ore having arrived at the beach of Windy Arm, is loaded on boats and carried to the railway at Cariboo Crossing. There is also a good grade for a railway from Conrad along the beach to Cariboo Crossing; or a spur could be run from Log Cabin direct to Conrad.

The minerals in this locality are in quartz veins, in true fissures, and the values are chiefly gold and silver. The Big Thing veins are in granite; all the others are in a formation I have called the Windy Arm formation. This consists of a somewhat complex series of porphyrites, diorites, gabbros, etc., which apparently represent rocks from the same magma, but which differ considerably on account of segregation and cooling under different conditions. These rocks are generally fresh looking, fine-grained, and greenish in color. Towards the edge of the series, in places, is a porphyry presenting somewhat the appearance of a conglomerate, due to portions of one porphyry being included in another.

The veins vary considerably in width, but in most cases are noticeably persistent in length. Argentiferous galena is the common mineral of value. There are also found some native silver, argentite, stephanite, pyrargyrite, tetrahedrite, chalcopyrite, jamesonite, stibnite, lead carbonate, malachite, azurite, pyrite, arsenopyrite, pyrrhotite, and sphalerite.

The principal vein on the Big Thing group was struck this summer at the end of an 80 foot drift. A crosscut was then run 60 feet on the vein and a winze was sunk, which, when seen in October, was about 55 feet deep. The vein was widening rapidly and becoming almost flat, and was, in the bottom of the winze, about 10 feet wide. This vein appears to be of the elongated lense type. The ore is chiefly secondary quartz, and is very porous, near the surface, due to leaching action. The minerals are chiefly oxides and carbonates, which will give place to the sulphides in a short distance. Some stibnite, arsenopyrite and pyrite were found near the bottom. High assays, running into the hundreds have been obtained in gold and silver, and it is claimed the ore body will average close to thirty dollars per ton.

On the Montana, a drift was run in on the vein about 700 feet, the vein being from 2 to 5 feet in width, with a streak of rich ore 8 inches to 18 inches wide next the hanging wall, which assays about $90.00. The rest of the vein may run $20.00. An incline had also been sunk on the vein, which, at a depth of 320 feet, was about 8 feet in width, from wall to wall, with over 4 feet near the centre of almost barren, leached, and somewhat decomposed porphyry with quartz stringers running through it. The values are chiefly in silver, the chief mineral being galena.

When seen in October, the Vault, which had a drift run in on the vein over 300 feet, was probably the most promising looking property in the district. This is the same vein, in all probability, as the Venus No. 1, and can be traced over 4,000 feet. It is, in places, 20 to 30 feet in width, being nearly all well mineralized quartz. In places there are 4 to 6 feet of almost solid galena. The lead here, as on the Venus, varies greatly in width, and at times is only a foot or so wide. So far, however, the vein on the Vault has been much more uniform in width than on the Venus.

On the Venus, a crosscut tunnel was run about 100 feet to the vein, and drifts were run about the same distance each way, from which a number of stopes were raised, the vein being from 18 inches to 16 feet in width. In the stopes there are from 4 to 8 feet of good ore, which will probably average over $20.00 in gold and silver. A lower crosscut has also been run 544 feet to the vein, and drifts have been run each way; but where opened up here it is narrower and leaner than in the upper tunnel. This feature is likely only of limited extent, as the property looks well both to the north and south of this place on the surface. The chief minerals are galena, lead carbonate, arsenopyrite, chalcopyrite, malachite, pyrite, and also considerable jamesonite and antimony ochre. The ore is chiefly argentiferous galena. Where the vein is wide it consists of alternating bands of quartz and more or less mineralized country rock. A 50 horse-power gasoline engine operates a compressor here to run the machine drills used in tunnels, but piping and the necessary machinery is being installed to utilize some of the water power of Pooley Canon to replace the gasoline.

On the Humper No. 1, only about 70 feet of work had been done, when last seen, mostly in the form of drifts, but the property looked very promising indeed. The vein, which can be traced for 1,700 to 1,800 feet, at least, is from 18 inches to 4 feet in width, and carries considerable argentite, ruby silver, and stephanite, and also some native silver, galena, and pyrite. About 8 inches of the vein will average over 300 ounces in silver, and a narrow streak of argentite, one-half to three-quarters of an inch in width, which is quite persistent, runs 3,000 ounces in silver.

There are also several properties, such as the M. and M. and the Ruby Silver, on which are veins only a few inches in width, often less than a foot, but which contain very high grade ore.

In the above description of claims seen, no attempt has been made to describe all the promising looking properties or to give many details in regard to those mentioned. Only a somewhat general idea of the character of the deposits and their values has been attempted. The properties are all, as yet, in the prospect stage, and only small shipments of ore have been made from time to time; but what has been done shows this belt to be very highly mineralized at least. Reports of numerous discoveries came in at different times during the season from different directions, chiefly from along Taku Arm, and the ores shown looked very good indeed.

The success met with in this district encouraged men to prospect more than in previous seasons in this locality, with the result that a number of valuable discoveries were made. On June 21st, the Gold Reef claim, on which were discovered quartz carrying free gold and telluride minerals, was staked on Gold Hill about 16 or 17 miles southwest from Robinson, and in the next 90 days 700 claims were located on the same belt. This belt or belts of schists, approximately one-half mile wide, outcrops in a northwesterly and southeasterly direction near the eastern edge of the granites, which often become porphyritic. Dykes of greenish porphyry and porphyrite occur in the granites, also near their eastern edge, and it is in this disturbed belt that the quartz veins occur. They are often quite well mineralized, the chief

(To be Continued)

THE WORKS OF THE ROBB ENGINEERING COMPANY, AMHERST, N.S.

In the year 1865, Alexander Robb, the father of the president of the Robb Engineering Company, established a foundry and machine shop in Amherst, N.S. Stoves and general castings were made, and coal mining machinery was repaired. In 1890 the company was reorganized and incorporated under its present name, the sons of the founder being the chief officers. The following descriptive sketch of these modern works will give a fair idea of one of Nova Scotia's most important enterprises:

To the average man or woman there is a pleasure in watching moving machinery. This pleasure has been greatly enhanced for those who have the opportunity of visiting the modern steam or electric power stations, with their masses of bright machinery, producing thousands of horse-power with entire smoothness and little apparent effort, or a large machine shop of modern construction, consisting of a spider-like structure of steel, high roof and walls more than half glass, an industrial crystal palace, filled with curious machines for planing, drilling, turning and shaping steel and iron. The observer is first attracted by the overhead electric cranes operated by what appears to be a human fly perched in his little cage attached to the huge crane which is running back and forth at the beck and call of the workmen on the main floor of the shop, carrying parts of machinery weighing tons suspended in mid-air.

The cleanliness, light and order of the work form a great contrast to the old-fashioned machine shop, with its small windows, dirty floors and grimy workmen.

The works of the Robb Engineering Company, at Amherst, N.S., especially the new machine shop and electric power house, form one of the best examples of a modern industrial establishment, and arouse the interest of the visitor to an unusual degree. Visitors are always welcome, and to actually see the shops and operation thereof is much better than any description, but we will do our best to give some idea of their extent and system of operation, which will doubtless be interesting to many of our readers.

General Plan.

The works are situated on both sides of La Plance and Lawrence streets, the land having an extent of about 10 acres. Facilities for receiving and shipping material are provided by a system of standard gauge tracks leading through the yards into the machine shops, boiler shops and warehouses, and connected to the extensive station yard of the Intercolonial Railway at Amherst. Narrow gauge industrial railways, for the distribution of raw material and supplies, connect the various shops and warehouses with each other.

Power House.

The steam and electric power house of the company, which is situated between the engine department and foundry, practically in the centre of the works, is a model of perfection. It contains a 350 horse-power Robb-Armstrong Corliss engine, directly connected to a General Electric dynamo of corresponding size. From a large marble switchboard in this power house electric current is taken to all departments of the works which are driven by electric motors of the Bullock, Westinghouse and General Electric make. The switchboard is so arranged that either power or light may be supplied to any portion of the works, and is under control of the engineer. The power house also contains a smaller steam engine and dynamo, of the same description as the larger one, for use at night or for running a portion of the works only. Two Robb-Mumford boilers of 150 horse-power each are used to furnish steam.

The economy of this plant is very marked, as compared with the original steam plant having long steam pipes and engines located in various parts of the work, and leaves nothing to be desired in smooth running and freedom from repairs, as there have been practically no repairs or stoppages since the plant was started, about two years ago.

Adjoining the engine room is a large heating plant, which supplies warm air in winter by underground ducts to various parts of the works, the heat being obtained from the exhaust or waste steam.

New Engine Shop.

The latest and best of the buildings is the new machine shop, built in 1904, for manufacturing the Robb-Armstrong engines. It is a brick structure, of the latest slow-burning construction, 250 feet in length, 100 feet in width and about 50 feet in height. One side of the building, 50 feet by 250 feet, and the full height to the roof, is used for assembling, erecting and testing engines, and is served by a 25 ton electric crane, travelling the whole length of the shop. The other half of the building has an upper floor or gallery, the lower half or main floor being occupied by the heavy machines and the upper floor by the light machines and hand fitting benches. The machinery in this building is of the latest design and is especially adapted to the building of the Robb-Armstrong engines. Many of the machines have been especially built for this work and are capable of machining the parts of these engines from about 15 horse-power up to compound engines of over 2,000 horse-power. The system of work, which has been carried out from the beginning, when these engines were intro-

ENGINE DEPARTMENT, LOWER FLOOR—ROBB ENGINEERING COMPANY, AMHERST, N.S.

when finished is numbered to correspond with the drawing and patterns, so that customers can readily obtain duplicate pieces by and work shops, show every piece of each engine in detail from which the patterns are numbered, and every part of each engine duced, is very perfect. Record drawings, duplicates of which are kept in the vault of the company, as well as in the drafting office sending in the number of the engine or part required. The machine work is all on the interchangeable plan, the parts being made to standard gauges, all turned work being carefully ground and flat surfaces scraped to standard sizes and perfect surface. A large quantity of spare parts are constantly kept in stock for use in assembling engines as the orders come in and to supply the orders of customers for duplicate parts. The workmen having nearly all entered the works as apprentices, have been trained in this special system, so that the organization may be compared to a perfect machine, all its parts working in harmony. A premium system is in use in this portion of the works, and is giving good results. The details of work to be done on each portion of every engine is carefully described and specified to correspond with the drawing, and a set time is apportioned to do each part of the work. If the workman is able to do the work in less time than is specified he is entitled to receive a premium amounting to one-half his regular rate of wages for the amount of time saved. Every piece as it is finished is carefully measured and inspected before being stamped and placed in stock.

BOILER SHOP.

The boiler shop is the next largest department to the engine shop, and is about 100 feet wide x 200 feet long, with several wings. It is also of modern construction, fitted with electric cranes, a complete plant for hydraulic riveting, capable of driving rivets up to 100 tons pressure on each rivet. An air compressor plant, with compressed air pipes to all parts of the boiler shop and other departments of the works is used for pneumatic caulking, drilling, tapping, bending tubes, and almost all the operations of boiler-making and machine work which were formerly done by hand. The shops are also fully equipped with machines for drilling and reaming the rivet holes of boilers, the best modern boiler specifications requiring double butt straps and rivet holes drilled in place, so that there is no danger of imperfect holes and no necessity for drifting and distorting rivet holes, as is found necessary when they are punched without reaming.

This company does a large amount of boiler work under Government inspection, as well as under the local inspectors of British Columbia, Quebec and other Provinces where rigid inspection laws are carried out.

GENERAL MACHINE SHOP.

In addition to the large machine shope, which is used exclusively for engine work, the company have a general machine shop, which its about 55 feet x 200 feet. In this shop special machine work, such as piping, shafting and general machine repairs is

ENGINE DEPARTMENT, UPPER FLOOR—ROBB ENGINEERING COMPANY, AMHERST, N.S.

done; and also a line of portable sawmill machinery, which is used extensively in the Maritime Provinces and British Columbia is manufactured. The details of the work are carried out on the same general system as in the other departments of the works.

FOUNDRY.

The foundry, which is in the centre of the works, and connected to the engine building shop and boiler shop by the industrial railway, is equipped and operated on the latest system, having electric cranes, pneumatic lifts and other appliances for handling heavy materials and melted iron quickly and cheaply. The company makes all its own iron and brass castings, in fact everything is manufactured on the premises from the raw material except special fittings, as oil cups and light trimmings required for engines and boilers.

FORGE.

The company has its own forge, which produces machine forgings of all descriptions necessary to engine work, boiler work and the other lines manufactured by the company.

PATTERN SHOP.

The pattern shop is another department well worth a visit, as it is under the direct control of the drafting department, every pattern being made to follow the system of drawings used throughout the works and with numbers corresponding to such drawings. As the patterns are used over and over, they require the greatest strength, lightness and accuracy of dimension that it is possible to get. Some of them are marvels in these respects, when it is considered that they are all made of soft pine, except such small and special patterns as are afterwards reproduced in iron or brass.

STORES SYSTEM.

The stores system of the company has been developed on modern lines, and is arranged so that all the material, parts of the engines and other machines are stored in the warehouse of the company, under control of a general store-keeper, who has a force of helpers to deliver materials or supplies, as called for by requisitions, to all parts of the works. A complete inventory of all the raw materials and work in progress is kept by a card index system, giving a perpetual inventory of these materials, as well as their cost. The system also includes a cost-keeping department, which enables the company to obtain readily the cost of all materials, either in a raw or finished state, and of complete contracts.

The products of the Robb Engineering Company have a world-wide reputation, the company having the distinction of supplying Canadian engines for Great Britain, Spain, Australia, West Indies, British Guiana, Austria, and India, as well as in all parts of the Dominion, from the Atlantic to the Pacific. We noticed among the list of orders shown us under construction engines and boilers for mines, factories, electric light installations and lumber mills in every Province of the Dominion, including the following prominent cities and towns: Sydney, Cape Breton; Halifax, N.S.; St. John, N.B.; Montreal, Quebec; Ottawa, Toronto and Hamilton, Ont.; Winnipeg, Manitoba; Saskatoon, Sask.; Calgary, Blairmore and Bankhead, Alta.; Golden, Kitchener and Vancouver, B.C.

CORRESPONDENCE

[THE CANADIAN MINING JOURNAL, while it welcomes letters on current topics, is not responsible for opinions expressed by correspondents.]

To the Editor of THE CANADIAN MINING JOURNAL:

There are some further arguments in support of the magmatic origin of the hot waters discharged by hot springs, geysers and volcanoes, which I will add here.

The silica, lime and other mineral salts carried in solution in those hot waters would be deposited along the path of ascent and completely fill all pores in the rock by cementation, thereby preventing the access of any surface waters. The deposit of geyserite at the surface in the shape of a small crater surrounding the discharge from such springs, is evidence that there is a surplus of such material carried in solution. These solutions would penetrate the walls of the crater or fissure along which they rise, and when encountering rocks cold enough to cause precipitation would part with a portion of their salts, thereby completely isolating their path from all connection with meteoric waters.

The process of cementation would begin at the point of rock flowage at a depth of thirty-five to forty thousand feet and rise gradually to the surface; the crater of geyserite at the surface being the final evidence that the path is isolated from surface waters.

The cementation of such a channel, fracture or crater, would act in the same manner as the casing of an oil well. It would completely shut out the surface waters, and only differ from the casing in being composed of crystallized rock filling built up from the bottom, instead of an iron pipe driven down from the surface.

At several places in Yellowstone Park it is possible to catch trout from the lake, and, without detaching them from the hook, to dip them in a boiling spring. This fish story will illustrate how completely isolated the path of the hot water or steam is from the cold water inhabited by the fish. Many geologists assume that the hot waters discharged by such springs and geysers are surface waters, which penetrate into the earth until they come in contact with intrusive hot rocks, and are thereby heated and discharged at the surface. They are willing to admit the absurdity of this argument when applied to the waters discharged by volcanoes, but they hesitate to take the necessary plunge and cut loose from the only source of water supply that they know anything about. The difference between a hot spring and a volcano is only a difference in volume and temperature. One discharges a small amount of hot water with mineral salts in solution, the other throws out millions of tons of atomized or fluid lava, together with a great quantity of incandescent steam or streams of boiling mud.

To illustrate the action of surface waters being heated by coming in contact with hot intrusive rocks, I will refer again to the cementing action of the mineral-laden solutions. If such waters were heated in the manner referred to, the cementation of th adjacent rocks would quickly form an impervious shield about the source of heat and completely shut off all circulation. It is, therefore, only possible to account for a constant discharge of hot water through a long period of time by assuming that the supply is of magmatic origin.

In the paper on "Magmatic Waters" it was pointed out that if the central magma contained only 0.1 per cent. of water by volume, that this would show that there was still more water in the interior of the earth than there is on the surface. An average of 15 known volcanic gases, according to Kemp, shows 1.66 per cent. of water. An average of 14 rhyolites gave 1.16 per cent. water. An average of 13 granites, 0.55 per cent water. It would appear from these analyses that there is several times as much water in the interior magma as there is on the surface of the earth. The opening through which communication is kept up with the interior magma would necessarily be small, and the pressure and temperature of the water gas would finally pass beyond the critical point, where it would be a permanent gas.

According to Chamberlin, Vol. I., page 218, the critical temperature of water is between 610 degrees and 635 degrees Fahr., and, with an initial temperature of 80 degrees and an increase of 1 degree for each 70 feet of depth, this condition of water would be reached at about 39,000 feet. Wherever along the thread-like pipes of hot springs or volcanoes the temperature and pressure pass beyond the critical point of water, the rocks must be in a state of potential fusion, and it only requires that sufficient openings occur for their rapid liberation to cause volcanic action.

The frequent elevation of the sea bottom in the shape of volcanic islands, which later sink from sight, is an illustration of the escape of such hydrous fusions to the surface.

Yours truly,

HIRAM W. HIXON.

Victoria Mines, March 25, 1907.

The Editor CANADIAN MINING JOURNAL:

Dear Sir,—I notice an editorial in your issue of April 1st in reference to Larder Lake and the difficulty of guaging the commercial value of the prospects in any way from a hand sample.

It may, therefore, be of interest to you to know that we have made arrangements to keep our laboratories open for the entire year, particularly with a view to testing ton and car load lots of such ores by amalgamation, concentration, cyaniding, etc.

This will not doubt be of considerable value in determining the treatment process necessary, but in connection with such free milling ore as the Larder Lake, it will be of greatest use in determining the average of a large tonnage of ore and making an actual bullion return.

Yours truly,

S. F. KIRKPATRICK.

Professor of Metallurgy, School of Mining, Kingston.

School of Mining, Kingston,
April 8th, 1907.

Editor CANADIAN MINING JOURNAL, Toronto:

Dear Sir,—The following may be of some interest to you. The writer had submitted to him a sample of rock, supposed to be talc of soapstone. In appearance, feel, cut, etc., it gave every evidence of being talc. More for the satisfaction of getting its exact composition, than because of any suspicion that it was not what it appeared to be, analysis was made of it. To the writer's surprise, instead of magnesia, alumina was found.

The complete analysis was: Silica, 65.60 per cent; alumina, 28.80 per cent.; ferric oxide, practically absent; lime, practically absent; magnesia, practically absent; water (by difference) 5.60 per cent.; total, 100.00 per cent.

The sample was then tested with cobalt nitrate, which gave a good blue color. So that, instead of talc, it proved to be pyrophyllite. Whether it would serve the same purpose as talc is a question. As far as the use of talc in lining furnaces, etc., is concerned, the pyrophyllite should be better, as being a silicate of alumina one would expect it to be more refractory. Possibly you or your readers can, through previous experience, throw some further light on the subject.

Yours truly,

NORMAN HOLLAND,

Superintendent McCaskill, Dougall & Co.,
Varnish Manufacturers, Montreal.

In the tantalum lamp, a very fine tantalum wire is used instead of a carbon filament. The tantalum wire has a length of two feet, and but half the current is needed to produce a light of the same intensity as that of the ordinary incandescent lamp with a carbon filament. The light is so much brighter, and the life of the lamp is so much larger, that a saving would be effected in paying one dollar for a tantalum lamp, even if one could get the carbon lamp for nothing.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

The prospects for continued peace of the Springhill collieries is rendered doubtful by the action of the union men in trying to force the non-union men into the society known as the Provincial Workmen Assocciation, or out of the town. As the non-union workmen form a small, a very small, minority, trouble will in all probability result. The management maintain a strict neutrality. It is to be hoped, for the welfare of all concerned, that the works will not be interfered with. It is difficult to understand the union men's contentions. It is well known that when a strike is declared in Springhill, very few "scabs" are in evidence. A few driver boys have even been known to stampede the whole working force. When men are so subservient to union rules it seems obsurd to dub them non-union men, even if they have not joined the society. There would appear here little left to differ about.

The collieries at Springhill are in full operation again. The uneasiness caused by a small section of gob heating in No. 3 mine has completely died out. The prompt action taken in "shutting off" the affected district and thorough ventilation of the recovered sections, all tended to inspire confidence in the perfect safety of the mine. The number of workmen at work in this mine at this date is slightly in excess of the number employed at the time of the "scare." The thickness in this seam, "the overlying seam of the series," varies from 4 feet 6 inches to 11 feet 6 inches.'' The coal is of good quality and easily worked. The system adopted in working is ''board'' and pillar. The depth of stope is 4,500 feet, with a grade of 30 degree average.

Glace Bay.

Glace Bay, 30th March.—The Provincial Workmen's Association is at present pursuing a very aggressive policy in the colliery lodges around Glace Bay, but the recent endeavors to augment the membership has not been marked by the cautious wisdom which has for some time past been a distinguishing feature of the P. W. A. propaganda.

The lodges have adopted the plan of naming a day by which all men employed at any one mine must join the P. W. A., giving notice that otherwise they will close down the mine and refuse to work with non-union men. Following the success of this method at the No. 3 mine of the Nova Scotia Steel & Coal Company, at Sydney Mines, notice was given at Dominion No. 1 that after the 19th of March the P. W. A. men would refuse to work with non-union men. After a two days' stoppage of the mine, practically every man came into the union, and the men signified their readiness to return to work. The Dominion Coal Company had previously given warning that they could not countenance the closing down of their mine in this way, and that if this step was taken the mine would be closed for repairs. This was done, and No. 1 is now undergoing a much-needed overhaul, having been running without interruption since operations commenced after the fire.

The attitude of the Coal Company in this matter has been clearly defined by the management, and appears to be a perfectly proper and natural one. They gladly recognize the utility of the P. W. A. as a means of dealing with their men as a body, and as a channel for the proper representation of grievances, but they cannot allow the ''closed shop'' in their mines, nor any policy that would interfere with the independence and individual rights of their workmen. The action of the Dominion Lodge was further a direct violation of the terms of the ''Three Years Contract'' which has hitherto been loyally observed by both the men and the Company. Judging from the ease with which the non-union men were induced to enter the P. W. A. it is evident that judicial moral suasion would in all likelihood have achieved the same end, and it appears to be generally recognized that the action of the Dominion Lodge was somewhat hasty and ill-considered.

The output of the Dominion Coal Company's collieries for March this year was lower than it has been for the past five years, the weather delays having been of a quite exceptional nature. During the larger portion of the month snowstorms followed snowstorm, all of them accompanied by high winds and heavy drifts, and traffic was more or less interrupted during the whole month. The blizzard of the 7th March is said to have been unprecented in the meteorological annals of Cape Breton.

Quebec.

The asbestos properties of the Glasgow & Montreal Asbestos Company and the Manhattan Asbestos Company, in Black Lake, were recently sold to Mr. H. M. Whitney, of Boston. These properties, which adjoin, are considered valuable asbestos-bearing territory, but the lots were too narrow to admit of their being operated advantageously as individual properties. As a result of the present consolidation, both properties will be operated from one central machinery plant, while the number of pits will be limited, perhaps, to one or two. As space for dumping ground on the property of the Manhattan Company is limited, it is equipped with a tramway 3,000 feet long, over which all the waste rock will be carried to Cariboo Lake. The new company is meanwhile replacing the old plant on the properties with new equipment for mining and separation. Mr. H. M. Whitney also owns the King Bros. mine in Thetford, the largest asbestos producing property in Canada, and the American Asbestos Company, in Black Lake. The Standard Asbestos Company, operating at Black Lake, has disposed of about 300 acres of its asbestos land to an American syndicate, and a 100 ton separation plant will be erected shortly on the premises.

The Bell Asbestos Company, of Thetford, formerly controlled by British capital, was recently taken over by Americans, the property having been acquired by a manufacturing firm at Andles, Pa.

Mr. Martin, of New York, a well-known operator of asbestos mines, exercised the option which he held on an asbestos property in Tingwick. After a thorough test, by means of pits, a small asbestos refining plant was also installed at the property.

By recent changes in the ownership of a number of the largest mines in the asbestos region, the asbestos industry is now largely controlled by Americans, who own the more productive properties. There will shortly be in operation fourteen properties, of which one-half are American owned, six being held by Canadians and one under British control.

Cobalt—The Foster Mine.

Cobalt, Ont., April 10.—The mine is located on the southeast part of the north half of lot 4, concession 4, Coleman township, and consists approximately of twenty acres land and twenty acres water. The water takes in the middle of Glen Lake and the northwest corner post is on the north shore of the lake.

COBALT LAKE
Showing new buildings, Cobalt Lake Mining Company

The land lying on the south shore of the lake consists of a knoll of conglomerate, overlying the Keewatin series, the contact dipping northwest. There are diabase and Huronian and Keewatin contacts approximately parallel to the shore of the lake.

Eight veins have been exposed by stripping.

No. 1, on the lake edge, yielded several cars of high grade ore in 1905, strike northwest, and was worked by an open cut seventy feet long and thirty feet deep; vein four inches wide.

No. 2. In the Huronian. Strikes northeast. Vein from two to six inches wide. Two shafts have been sunk 120 feet apart, and 73 feet and 78 feet deep. Connecting drift is at 47 foot level, 180 feet long, and the ore has been partially stoped above this drift and also underhand along a Keewatin contact. Shafts 5 x 5 and 6 x 9, round timbers and cribbing.

No. 3. Strike a little west of north, close to Lawson boundary, and worked by an open cut 60 feet long and 30 feet deep.

No. 4. Northeast strike. Small shaft, 25 feet deep, vein one inch to two inches wide.

No. 5. Large, well-defined silver and cobalt vein, northwest strike. In places, 14 inches wide on the surface. Shaft at west end of vein sinks 72 feet, and drifts northwest and southeast are being driven at 70 feet. Present lengths of drifts, 60 and 20 feet, respectively. Shaft is 8 feet x 4 feet 6 inches in the clear, and is timbered with square sets and will be used as the main hauling road. A cage is on the ground and will be used on arrival of a large hoist, now on order. Thirty foot gallows frame is erected, and shaft house is being completed.

No. 6 shaft, 5 x 8 feet, 78 feet deep, round timbered and cribbed; 20 foot gallows frame and shaft house completed, 5 x 6 hoist, operated by air, installed in small engine house. Strike, northeast; vein, two to five inches wide. Drifts at 65 feet. Northeast drift, 80 feet long; southwest drift, 127 feet, cut No. 5 vein at 123 feet. Drift northwest on vein No. 5(east end) is now in (30 feet). A small stope is being raised on southwest drift, No. 6.

Nos. 7 and 8, northeast veins, parallel and close together, about one inch wide each, showing bloom and silver.

The equipment consists of an eight drill air compressor, built by Allis-Chalmers-Bullock Company; two 60 horse-power Ames boilers; Knowles feed water heater; Knowles supply pump, delivering into 5,000 gallon tank at an elevation of thirty feet above engine room floor; Knowles duplex feed pump; four k.w. direct

COLONIAL MINING COMPANY

acting Allis-Chalmers-Bullock engine and dynamo; one 8 1-3 x 10 hoist; two 5 x 6 hoists; three air receivers; eight 3 inch air drills; one 2 1-4 inch air drill.

The buildings consist of No. 5 shaft house, No. 6 shaft house, cobbing house and ore shed, smithy; power house, 50 x 30 feet; power house, 10 x 12; thaw house; store house, 20 x 24; barn; office building and manager's house, 24 x 30; dining camp, 80 x 24, ice house and three sleep camps. Mine houses are all sheathed with galvanized iron. Office and dining camp are boarded, painted and shingled. The buildings are supplied with water works and steam heated. One hundred feet of fire hose and five hand extinguishers, to provide against risk of fire.

Two thousand cords of wood have been cut and stacked, and no difficulty is expected with fuel this year.

The Temiskaming & Northern Ontario Kerr Lake branch has been started, and should be through by the fall. It crosses the property at the southeast corner.

Montreal River.

Considerable interest is being taken in the recent discoveries of silver and cobalt in the Montreal River district. The area at present being prospected is to the north of Lady Evelyn Lake, on both sides of the Montreal River, and as far north as Smythe township, and including the townships of James, Tudhope, Barber, Auld and Smythe. The area to the west is in the Temagami Forest Reserve, and it is necessary to have a special permit to carry on prospecting and mining.

The Montreal River is a navigable stream for small steamers from Latchford to Pork Rapids, or a distance of eight miles, where there is a short portage; then to Mountain Lake by another steamer line. Thirty miles from this point the river opens out into a series of long lakes, one, Elk Lake, is now attracting a lot of attention, owing to the silver finds made in James township.

At the time of the writer's visit there was two feet of snow on the ground, and it was only in the higher parts or ridges that the formation could be observed. Alternate low ridges of granite and diabase outcrop, with a general course of northwest and southeast, or nearly parallel to the Montreal River. It is in the diabase that the silver occurs. Several claims in widely separate parts of James township and Smythe, show calcite veins, in which native silver and cobalt bloom are found. Silver was also seen to the west of James township, and on Maple Mountain, to the north of Lady Evelyn Lake.

Very little can be said about the future of the district yet, except that native silver and cobalt has been found over a large area; the country rock is diabase, the formation in which some of Cobalt's richest mines occur; that the fissuring is extensive, and for the amount of development work done the prospects are encouraging for a permanent silver camp.

A recorder's office is to be established in Latchford for the Temagami Reserve. This will be a great convenience, as extensive prospecting will be done on the Reserve. Already the great influx is showing the faith of the community in this most interesting field.

Latchford once more is experiencing its annual boom, and building lots have again advanced to fabulous prices. Its last year's experience, and also that of Cobalt, should be a lesson showing the distastrous effects of such a policy.

The rich silver strike on the Temiskaming and Hudson Bay property, adjoining Sasaginaga Lake, has been one of the sensations of the week.

Cape Breton.

Some prospecting work is being carried on in the iron areas known as Father McPherson's areas, situated on the top of the Boisdale Hills, in the Island of Cape Breton.

This property has been well known for a number of years, but very little work has been done towards testing it. It is situated geologically in the Precambrian, and the ore is associated with George's River limestones and felsites.

This work is now being carried on by Mr. W. F.Jennison, who controls the property, and the showing thus far is very encouraging. Ore was struck very close to the surface, and crosscut to a width of 20 feet. A shaft was put down on it 30 feet deep, and found the same width of ore. The sinking of this shaft is being continued.

Shipments are being made to the Nova Scotia Steel Company. This is practically the first development of low phosphorous ore that has been discovered here. Phosphorous runs as low as .006 and iron as high as 58.42. It carries sufficient lime and magnesia to flux the silica. The situation has an elevation of 650 feet above the sea level, and is only half a mile from the Bras D'Or Lakes. Its position is ideal, either for railroad or water shipments, and is only 21 miles from the plant of the Dominion Iron & Steel Company, Sydney.

Mr. Jennison is now putting in steam pumps, hoists and drills. This, with an ærial tramway to railway, will make a complete equipment by which he can handle the ore at a very reasonable cost. We are looking forward for this property to develop into an important mineral industry of the island.

MINING NEWS

After hot debate, the Western Coal Operators' Association and the Union Mine Workers of America succeeded in reaching an agreement at their conference in Calgary. The net result is that miners will receive a 5 per cent. increase in the outside wage scale. The agreement stands for one year.

Dr. G. A. Young, of the Geological Survey, will probably be sent to Nova Scotia this summer to investigate thoroughly the occurrence of tin throughout the Province.

The Great Bras D'Or Gold Mining Company, of Middle River, C.B., are tunneling actively on their property. Placer gold, found in small amounts in neighboring streams, led to the exploitation of this area.

Twenty-one cars of zinc and silver lead ores were shipped from Whitewater mines, Kaslo.

On March 21st the eight-hour smelter bill passed its second reading, and was reported in committee on March 22nd.

An Act to incorporate the Cariboo & Pacific Mining, Smelting & Development Company is sought from the Provincial Government by Messrs. Edgar Bloomfield, R. G. Spinks and G. C. Van Horne, of Vancouver. The capitalization of the company is to be $1,000,000, in ten thousand shares of $100 each.

The Hamilton Iron & Steel Company are providing for additions to their present plant, involving an outlay of $350,000. The capacity of the blast furnase will be increased, and the steel mill enlarged.

A 40-drill air compressor, ordered by the Dominion Copper Company, is soon to be installed. It will have a delivery of 937 cubic feet per minute.

The new hoist at the Centre Star mine, Rossland, is the largest of its kind in Canada. It is designed to hoist ten tons from a depth of 2,000 feet.

The entire output of La Roi mines, some of which has hitherto been shipped to Trail, B.C., will now be sent to the Northport smelter.

Yukon, March 16th.—Acting Commissioner J. T. Lithgow, on his recent return from the Twenty Mile country, reported great activity there on the part of the Consolidated Company. Water power plants are being installed, flumes constructed and roads and telegraph lines constructed.

The Klondike Mines Railway is hauling 200,000 feet of lumber from North Dawson to the Guggenheim Consolidated dam, above Discovery or Bonanza.

Material for a large dredge, which is to operate in Walker's Fork, has been assembled in Dawson. Mr. W. J. Hunter is superintending the freighting, and will be in charge during the coming season. The dredge has a five-foot bucket and a capacity of 2,000 cubic yards per diem. It will be ready for work about June 1st.

Fort William is now supplied with power from the Kakabeka Falls on the Kaministiquia River, 25 miles west of Fort William. The power is electrically transmitted by two lines. The generating and distributing machinery was manufactured and installed by the Canadian General Electric Company.

At Fort William and Port Arthur a large number of industrial plants are under construction, or are being projected. Among these are the Atikokan Iron Company, the Canadian Northern Coal & Ore Dock Company, the Canadian Iron Foundry Company, and the Northern Steel Company of Collingwood. The last named company are negotiating for the erection of a plant for manufacturing wire and nails.

The Laurentian Mine, Manitou, has been equipped with a new pump of 500 gallons per minute capacity. The 20-stamp mill will run double shift in future.

Kenora, April 3rd.—The Mikado Gold Mine is being unwatered for examination. It is under option to Mr. R. H. Ahn.

Many complaints are heard of wholesale blanketing in the Montreal River district. A prospecting license allows its holder to stake three claims, and no more. Licenses are, however, pooled; and men are despatched to the field holding ten, twenty, or even thirty licenses. Hence the fly in the ointment.

The Dominion copper smelter, near Greenwood, is being remodelled and renewed. An electrical blower is to be part of the eqiupment. The reorganized plant, it is expected, will be capable of smelting about 1,400 tons of low grade copper ore daily.

A company, under the title of the Vancouver Copper Company, Limited, is being organized to re-open the Lenora Mine at Mount Sicker. The consulting engineer is Mr. Cecil M. Bryant, A.R.M.S.

The Provincial Workingmen's Association has been carrying out its policy of forcing non-union men to join its ranks. Serious delays have been caused within the past year at Westville, Springhill, Sydney Mines and Glace Bay. At these collieries the union men stopped work until the non-union men had either joined the association or left the country. Dominion No. 1 colliery is idle now on this account, and further complications are threatened. The company stands for "open shop," and to this the men are strongly opposed. One significant fact is that the new labor law defines a strike as "ceasing to work."

The sixth annual meeting of the Nova Scotia Steel & Coal Company was held in New Glasgow on March 27th. Mr. Cantley's report for 1906 was very interesting, showing increases in all branches. It also showed that the plant of the company was in a high state of efficiency, and development work at their mines well up to the standard. President Harris went fully into the financial standing and future policy of the company, and stated that the management was exploring their submarine area at Wabana, and favorable results were anticipated, as they expected soon to strike the ore in paying quantities. He also stated that there was sufficient ore in sight at Wabana mines to supply the blast furnaces at Sydney Mines for twenty-five years.

MEN AND MATTERS

The late Commissioner of the Yukon Territory, Mr. W. W. B. McInnes, has been engaged by the Guggenheims to look after their interests in the Yukon.

The Dominion Coal Company have appointed Mr. Angus W. Macdonald as employment agent, thereby creating a new office, which has become necessary, owing to the large increase in the number of employees consequent on the increased coal production. Mr. Macdonald has filled a similar post with the Dominion Iron & Steel Company for the past six years.

We are glad to learn that Mr. A. P. Low, the Director of the Geological Survey, has so far recovered from the effects of his recent severe illness that he is now able to travel. Mr. Low left Ottawa on a visit to the South on the 4th of April. He is expected to return towards the end of the month.

Mr. John Knox, formerly in charge of mines at Camborne, B.C., was recently appointed underground mining superintendent for the Calumet and Hecla.

Mr. J. D. Kendall, well-known to many of our readers in British Columbia as for many years the resident partner in Vancouver of Bewicke, Moreing & Company, returned to England from a visit of inspection to the Cobar mines, New South Wales, Australia, of which he is a director and consulting engineer.

The election recently of our foremost geologist, Dr. Frank D. Adams, of Montreal, to fellowship of the Royal Society is a well-earned tribute to and recognition of the eminent attainments of a Canadian scientist, of whom the Dominion has right cause to be proud. In congratulating Dr. Adams, we congratulate ourselves.

Mr. Thomas H. Drummond, late general manager of the Dominion Copper Company, B.C., has been engaged by the Nipissing Mines Company, Cobalt.

Mr. H. Harris, formerly superintendent of the Hall Mining & Smelting Company's plant, has accepted a similar position at the Brown-Alaska smelter at Prince of Wales Island, under General Manager Thomas Kiddie.

Mr. J. H. Plummer, president of the Dominion Steel Company, went to England late in March.

An exhibition, or, rather, exposition of ores, machinery, mining methods and of every phase of mining operations, will be held at the Grand Central Palace, Lexington avenue, 43rd and 44th streets, New York, from April 15th to April 17th, inclusive. The exposition is under the auspices of the North American Mines Exhibition Company. Mr. Harold P. Davis, who has been arousing local interest in the exhibition, is collecting a large number of Cobalt specimens. Mr. Davis informs THE JOURNAL that show tables will be provided for ores from Northern Ontario. Indeed, specimens from any part of Canada will be welcomed.

Dr. J. Bonsall Porter is about to start west with a party of mining students. His itinerary will include visits to Cobalt, Lethbridge, Frank, Coleman, Coal Creek, Moyie, Nelson, Rossland, Trail, Grand Forks, Phœnix and Greenwood, probably with special excursions afterwards to Sandon and Vancouver. The party will work for about a week in field geology, under the direction of Dr. Adams, and will then visit mines as above outlined under the direction of Dr. Porter and Mr. J. W. Bell. This excursion is the regular spring session of the mining students in McGill University. A series of such trips has been made in the last ten years. The West has been visited several times, Michigan once, Eastern Pennsylvania and Northern New Jersey twice, Nova Scotia twice, Newfoundland once, and Sudbury and vicinity once.

The appointment of Mr. John W. Bell, M.Sc., as Assistant Professor in Mining Engineering, McGill University, has been announced. Mr. Bell succeeds Mr. John F. Robertson, who has been connected with the University for some years, but who is now resigning to enter engineering practice in British Columbia. Mr. Bell is an old graduate of McGill, and was a member of the staff some years ago, but for the last seven or eight years he has been practising in British Columbia, the Western States and Mexico.

The recent fire has not damaged the McGill Mining Department. The loss in the Departments of Electrical and Civil Engineering is very great, and, in Mechanical Engineering, is considerable. The main engineering laboratories are, however, merely damaged, and by next September they will be in complete working order again. It will take longer to rebuild class rooms, etc., but the authorities expect to make temporary arrangements which will enable them to give full courses next year in all subjects.

Under protest THE JOURNAL publishes the following alleged poem. It is sincerely hoped that the Muse responsible for such an effusion will see the error of her ways:—

The Cobalt and the Silver flies,
The Minerals and the Men depart;
Still stands the Ready Sacrifice,
The Victim of the Fakir's art.
Single or married, young or old,
The Fakir parts him from his gold.

With Stocks and Things the Victim fools;
With Paper and with Promises;
And not a whit his Ardour cools,
He scorns the Doubting Thomases.
But ever what he thought he'd get—
He hasn't yet! He hasn't yet!

Far flung the Dollars disappear;
But still remains the trouble which
Makes ev'ry Fakir's progress clear;
That trouble is the Cobalt Itch.
Fakirs and Itch and Fools, you bet,
We have them yet! We have them yet!

Along with Canada's industrial awakening another manifestation of activity is observable. The poet is rehabilitating himself. No excuses are offered for reproducing these verses, for the simple reason that no adequate excuse can be found:—

My way lies ever far and far,
Beyond the dim horizon;
By day the blaze, by night the star:
I hate a town like pizen.

O'er mountain, gully, barren, swale,
Till worn, and wet, and weary,
I pitch my tent in moonlight pale,
And sleep, and don't feel skeery.

The sun is scarcely risen, when
I rub my eyes and waken;
My meal is as the meal of ten,
'Tis mostly beans and bacon.

As through the day my ringing pick
Makes music on the boulders,
I always hit an extra lick
And straighten up my shoulders,

From thinking of the dusty streets;
Of pavements hot and dirty;
Of people missing all these sweets;
The whole thing makes me shirty.

But when the trail is extra bad,
When hot and spent I stagger;
I must confess I'd swap my wad
For one long pint of lager.

EXCHANGES

The Mining World, March 30th, contains an article on the "Qualifications of the Engineer," by John Hays Hammond.

The Mining Investor, April 1st, is the annual statistical number. It contains many figures of production, etc.

The Maritime Mining Record for March 27th gives an unusually breezy and readable summary of coal mining matters in Nova Scotia.

In The Engineering and Mining Journal, March 30th, the geology of the Ely Trough iron ore deposits is described.

An article on "Rare Metals and Minerals and Their Uses," and a sketch of Cobalt by Mr. John E. Hardman, of Montreal, are outstanding features of The Engineering Magazine for April.

The Coal Trade Journal, April 3rd, in ar editorial entitled "The State of Trade," gives a cheerful prevision of the coming season's coal trade.

The Mining and Scientific Press, March 23rd, contains the second instalment of a very valuable series of papers on "How the Miner's Dynamite is Made."

A description of "Electric Furnaces Without Electrodes" marks The Mining Reporter for March 28th.

The Iron and Coal Trades Review, March 22nd, in discussing the pig iron market, deprecates the pessimisitic tone of a newspaper correspondents and describes the outlook as, at least, cheerful.

"Mining Anthracite by Longwall" is the leading paper in Mines and Minerals for April.

The Bi-Monthly Bulletin of the American Institute of Mining Engineers, among other good technical articles, contains one on "An Early Instance of Blowing-in Without 'Scaffolding-Down.'"

The March-April number of Economic Geology is of more than ordinary importance. "The Relation of Ore Deposition to Physical Conditions," by Waldemar Lindgren is an able exposition.

The Industrial Advocate for March urges the question of greater publicity upon the Nova Scotian public.

Fuel, for March 26th, and The Science and Art of Mining for March 23rd, have been received.

STATISTICS AND RETURNS

The week ending March 23rd saw the following shipments of ore in Southeastern British Columbia districts:—Rossland, 7,403 tons; Boundary, 24,933 tons; east of Columbia River, 2,714 tons.

Nipissing Mines Company.—The financial statement for the eleven months end March 30, 1907, disclosed the following information:—Estimated number of tons produced for 11 months: First-class ore, 11,000 tons; second-class ore, 1,300; cobalt ore, 32 tons. Amount received from sales, including ore on hand, $1,008,-000; inventory May 1, 1906, $624,000; total, $1,632,000. Cost of production and all other expenditure, $176,000; net, $1,456,000. Dividends, etc., $800,000; surplus, $656,000. The surplus is made up of the following items: Cash and ore en route and at smelters, $546,000; accounts receivable, $28,000; mining equipment, $82,000; total, $656,000.

Dominion Coal Company.—Output for March, 1907, 210,890 tons; shipments, 153,000 tons, as against an output of 297,958 tons and shipments of 173,000 tons for March, 1906.

Cumberland Railway & Coal Company.—Shipments for the month of March were 27,982 tons.

CANADIAN PATENTS

March 26—104256—B. F. Henry, San Pedro, Cal., and G. W. Drake, Los Angeles, Cal., hoists.

104260—W. S. Gemmer and E. J. Schleecher, St. Louis, Mo., ærial tramways.

104268—A. L. Haines, Ft. Fairfield, Me., conveyors.

104285—W. A. Merralls, San Francisco, processes of cyaniding and apparatus therefor.

104286—W. B. Moore, Seattle, magnetic separators.

104289—W. H. Broughsedge, Ottawa, Ont., gold washing screens.

104289—J. F. Sauerman, Russellville, Ark., ore and coal crushing machine.

104365—W. H. Heard, London, Ont., safety clutches for power driven pumps.

104369—E. P. Mathewson, Anaconda, Mont., blast furnaces.

PUBLICATIONS

In writing for any of the following publications, readers are requested to mention THE CANADIAN MINING JOURNAL.

Catalogue No. 3, of the Montreal Steel Works Limited, is a handsomely printed and bound work, designed to facilitate the ordering of springs, steel castings, switch material and other articles manufactured by the company.

A. O. Norton & Company, of Boston, Mass., and Coaticook, Que., are sending out a neat and instructive catalogue of their ball-bearing jacks.

"Suuction Gas Plants" is the subject matter of a pamphlet issued by the Economic Power, Light & Heat Supply Company, of Toronto, Ont.

The Canadian Westinghouse Company have adopted the "loose leaf" system to their distribution of catalogues. Their customers are supplied with serviceable binders and the catalogue is forwarded on the installment plan as monthly circulars, in which are described the new lines manufactured by the company.

Bulletin 22, being instructions for erecting and running the No. 5 Wilfley concentrator, is being sent out by Mussens Limited.

We would acknowledge the receipt of three handsome and instructive catalogues from the Chrome Steel Works, Chrome, N.J., dealing respectively with (1) Chrome steel stamp mill wearing parts, (2) rolled shells and rings, (3) Canda tempered steel jaw plate.

Messrs. Sheldon & Sheldon, Galt, Ont., manufacturers of drying, heating and ventilating appliances, forge and cupola blowers, exhausters, etc., have adopted the plan of issuing tehir catalogues in sections. These booklets, which are perfect gems of the printer's art, are more than mere catalogues. They are, indeed, text-books on the subject mechanical draft in all its forms. Copies will be sent on application to interested parties.

An exhaustive catalogue, illustrative of the use of the Davis-Calyx diamondless core drill, is number K53 of the Canadian Rand Company Limited, Montreal.

Proper methods for thawing dynamite are explained in a neat booklet published by the Dupont Company, selling agents for the McBeth Fuse Works, Pompton Lakes, N.J. The same people are sending out an instructive folder on exploders and batteries.

"Mine Cages, Skips and Ore Cars" is the title of Circular No. CA-3, a handsomely gotten up booklet, issued by the Wellman-Seaver-Morgan Company, Cleveland, Ohio.

A rather exhaustive treatise, of nearly a hundred pages, copiously illustrated, has been issued by the Standard Diamond Drill Company, of Chicago, covering the history, development and use of the diamond drill.

A handbook and illustrated catalogue of engineers' and surveyors' instruments of precision has been received from C. L. Berger & Sons, Boston, Mass. It is a book of some two hundred pages, and full of useful information in regard to the use of all sorts of delicate scientific and engineering instruments.

The Peabody Coal Company, Chicago, have published a most complete atlas of the shipping mines and coal railroads of the central commercial district of the United States, accompanied by valuable chemical, geological and engineering data. The atlas is 16 3-4 inches by 18 inches in size, 149 pages, is serviceably bound in handsome green cloth covered board, and is printed on paper of excellent quality. The atlas was compiled by A. Bement, and is published at $5.00.

MARKET REPORTS

London, week ending March 23rd.—Copper—The market is still unsettled, but a fresh buying movement is expected. Tough is quoted at £115 10s. Electrolytic at £117 10s. to £119.

Tin.—Large transactions and pronounced movements in values in this market. English ingot tin is quoted at £190.

Lead—After a weak opening, this metal recovered all lost ground; £19 15s. to £20.

Spelter has improved to £26 10s.

Iron and Steel—This market is in good shape. Cleveland iron is quoted at 54s. 5d.

Antimony—£98 to £100.

Quicksilver—£7 per bottle.

Silver—30 7-8d. spot and 30 5-8d. forward. Fine silver, 33 5-16d. spot, and 33 1-16d. forward.

New York, March 27th.—Lake Copper—Per lb., 25 1-2 cents.

Electrolytic Copper—Per lb., 25 cents.

Silver—Per oz., 66 3-8 cents.

Tin—Per lb., 40 1-4 cents.

Lead—Per lb., 6 cents.

Spelter—Per lb., 6 8-10 cents.

INDUSTRIAL NOTE

The Cleveland-Cliffs Iron Company has placed an order for a 60-drill Sullivan air compressor for its new Maas Mine at Negaunee. Michigan. The machine will be of the Corliss-Cross compound condensing two stage type, with large receiver intercooler. The steam cylinders will be 24 x 46 inches in diameter, with a 48-inch stroke, and the air cylinders 40 x 24 x 48 inches, with a displacement capacity of 4,000 cubic feet of free air per minute at 60 R.P.M., or nearly 5,000 feet at 70 R.P.M. The compressor will be built at the Chicago works of the Sullivan Machinery Company.

COBALT ORE STATEMENT

Period—March 25th, 1907, to March 30th, 1907. Coniagas Mine shipped to American Smelting & Refining Company, Perth Amboy, N. J., 65,070 lbs.; Nipissing Mine shipped to Nipissing Mining Company, New York, 42,200 lbs.; O'Brien Mine shipped to Canadian Copper Company, Copper Cliff, 81,860 lbs.; Cobalt Townsite Mine shipped to Canadian Copper Company, Copper cliff, 43,000 lbs.; Trethewey Mine shipped to American Smelting & Refining ompany, Per Amboy, N.J., 60,090 lbs.; Trethewey Mine shipped to American Smelting & Refining Company, Perth Amboy, N.J., 41,560 lbs.; O'Brien Mine shipped to American Smelting & Refining Company, Perth Amboy, N.J., 64,130 lbs.; Right of Way Mine shipped to Anglo-French Nickel Company, Swansea, South Wales, England, 3,800 lbs.; Nipissing Mine shipped to Nipissing Mining Company, New York, 75,520 lbs.

TAILINGS

The great English-French-German technical dictionary, begun in 1901 under the auspices of the Society of German Engineers, is nearing completion, and printing is to begin early in 1907. Over 3,000,000 word cards have been collected. Dr. Hubert Jansen, of Berlin, is editor, and about 2,000 firms and individuals in Germany and elsewhere are assisting in compilation.

While the electric furnace cannot compete with other processes in the general production of iron and steel, Dr. R. S. Hutton, the British metallurgist, finds that it may be used to advantage where water power is cheap, and that it has a fairly clear field in the manufacture of iron alloys not easily made in the blast furnace. Many electric plants have been established in Savoy and Isere, in the south of France, the furnaces ranging from 200 to 2,000 horse-power. At Grenoble five furnaces of 1,200 horse-power and four of 2,000 horse-power are used to produce ferro-silicon, ferro-chomium, silico-spiegels of varying composition, and manganese-silicon, and the output is between 7,000 and 8,000 tons a year. The Giraud works, soon to be enlarged, now have an output of about $1,700,000 per year from furnaces of 18,000 horse-power. The product is 5,000 tons of ferro-sicilon of 50 per cent. and 1,000 tons of 30 per cent., 2,000 tons of ferro-chromium, 900 tons of ferro-tungsten, 50 tons of ferro-molybdenum, and 10 tons of ferro-vanadium.

One of the largest blowers ever built in Canada is being built by Sheldons Limited, of Galt, for the Diamond Coal Company of Calgary, for ventilating their mines near Lethbridge.

The blower, which is all of steel, will stand, including foundation work, 27 feet high. It will weigh 14,000 pounds, and will deliver 156,000 cubic feet of air per minute under a pressure of one ounce per square inch. The wheel is 16 feet in diameter and 6 feet wide, and will be driven by a 75 horse-power Westinghouse motor, and, under full load, will make 105 revolutions per minute.

Extra heavy steel is used in the construction of this blower, and it is provided with steel doors and ducts, and can be used either as a blower or an exhauster.

The blower is to be delivered in September.