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The Canadian Mining Journal

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CIRCULATION

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RESEARCH AND INDUSTRY

Since the war began there has been a great change in many industries and importers and manufacturers have been brought face to face with many new problems. New sources for raw materials have been sought in all parts of the world and methods of utilizing different raw materials have been devised. The removal of Germany and her allies from world trade has given unexpected opportunities as well as affording some initial embarrassment for certain manufacturers. The enormous demand for war supplies has created a better market for many materials and some products almost unsaleable before the war are greatly in demand. In several lines there is an opportunity now of establishing industries which, if economically managed, should be able to get a firm footing and be in position to withstand foreign competition later.

Those who establish new industries or improve old ones always have to meet many difficulties. Many of these have been removed by scientific research. It often happens that a series of experiments will disclose a simpler and cheaper method of performing some detail of a process. Everyone knows this; but it is not every manager that troubles to have the necessary research done, though few are so short-sighted as not to encourage members of their staff who carry on experiments to improve methods.

Many of the necessary investigations are satisfactorily carried on in the mine or at the mill, smelter or refinery. Many problems are, however, not tackled because of lack of proper facilities.

In this issue Mr. F. M. Turner, Acting Secretary of the Bureau of Scientific Research and School of Specific Industries, Royal Canadian Institute, Toronto, outlines what is hoped to be accomplished in Canada by the recently organized Bureau. The work accomplished by the Mellon Institute is becoming very favorably known and the establishment of a similar Bureau in Canada is much to be desired.

The "Mineral Industry" for 1914 has been issued and compares well with former volumes. Of especial interest are the notes showing the effect of the war on the various phases of the industry. In most cases the story is of depression during the first few months and then gradual or even very sudden improvement. The account of progress in 1915 will be a much more cheering one.

The market for silver has been firmer lately and predictions of good prices may yet be realized. So far, however, the advance from the lowest price of the year has not been very large.

A SCHOOL FOR MINERS

A few years ago there was established in the Marquette iron mining district of Michigan a school to increase the efficiency of the employees of the Cleveland-Cliffs Iron Co. This new departure was watched with considerable interest and there was no little difference of opinion as to how the miners would receive it. Very satisfactory results have, however, been obtained and in a paper presented at the September meeting of the Lake Superior Mining Institute, and reprinted in this issue of the Journal, Mr. C. S. Stevenson says: "On June 1st, 1915, the work of the first class, comprising 33 men, was completed, and it can be stated definitely that for the greater period of their course the men manifested a higher degree of open-mindedness and enthusiasm than is usual in high schools and universities."

The results obtained are very complimentary to those who originated the idea and developed the courses of study. One feature which doubtless appealed to most of the men was the decision of the company to choose its shift bosses from the ranks of the school. Another feature which proved successful was the fixing of attention on one subject and continuing the instruction of that subject alone instead of teaching several subjects at one time. An interesting diversion from the routine of school instruction was provided by informal discussions on topics intimately connected with the miners' work.

The school, it should be pointed out, is not, and was not intended to be, a primary school for miners who do not understand English. It is a school for the more ambitious among the English-speaking miners.

Apparently Mr. W. R. Ingalls has not much confidence in hydrometallurgical methods for the treatment of zinc ores. In a very interesting paper presented before the International Engineering Congress in San Francisco, and published in the October 2nd issue of "Mining Press," Mr. Ingalls traces the important steps in the improvement in methods of treating zinc ores. The introduction of Wilfley tables for concentrated mixed ores, Wetherill's system of magnetic separation, Blake's system of electrostatic separation, and the flotation process as used at Broken Hill, mark some of the greatest advances. Hydrometallurgical methods, while considered commercial possibilities are said to have failed to come into extensive use simply because most ores can be treated more profitably in other ways. Mr. Ingalls remarks, however, that while "the precipitation of zinc from solutions by electrolysis used to be troublesome and unsatisfactory, that seems to have been mastered."

It seems likely that control of the Jupiter mine at Porcupine will soon be taken over by the McIntyre Mining Company. The Jupiter is a promising mine, but has not yet had a chance to become a regular producer. Its addition to the list of operating properties will be another important step in the development of the Porcupine gold district.

The Department of Mines has issued a report by Albert O. Hayes on the Wabana Iron Ore of Newfoundland. The paper is a presentation of a detailed study of the petrology and chemistry of the iron ore. As the Wabana deposits are the source of the iron ore produced by the Dominion Iron and Steel Co. and the Nova Scotia Steel and Coal Co., they are of almost as much interest to Canadians as to Newfoundlanders. Mr. Hayes' work is illustrated by photos showing the oolitic character of the ore.

British subjects in the Clifton-Morenci copper mining district have appealed to the British consul for protection, and the consul has asked Governor Hunt, of Arizona, to provide it. Federal and State authorities have so far failed to send troops for the protection of lives and property in the strike district, and the British subjects are apparently unwilling to submit to Moyer rule. We don't wonder at it.

The iron industry of the United States is now experiencing one of the best periods in its history. A year ago there was considerable pessimism as to the outlook and in December, 1914, pig iron production fell to 1,495,346 tons. Every month of 1915 has registered an increase in production and September broke all records with a production of 2,834,342 tons. The improvement is a wonderful one.

UNIVERSITY OF BRITISH COLUMBIA.

The new University of British Columbia commenced its educational work in Vancouver, B. C., on October 1st. Two new temporary buildings have been completed for the departments of Geology and Mineralogy, and alterations have been made in the building formerly used by McGill College for the use of the Science department devoted to Physics and Chemistry. The library, administration offices and lecture rooms will be in another new building. These arrangements are temporary, pending the erection of the university buildings according to plans fully considered and adopted, but deferred during the war on account of financial considerations. The library contains 30,000 volumes.

The officers of the University are: President, Dr. F. F. Wesbrook; registrar, Mr. C. E. Robinson; assistant librarian, Mr. John Riddington. Two colleges and eleven departments have been organized and the staff for them appointed. Mr. Reginald W. Brock is Dean of the College of Applied Science. In the Department of Geology and Mineralogy, Mr. Brock is professor and Dr. D. D. Cairnes assistant professor. In the Department of Mining and Metallurgy, Mr. J. Moncrieff Turnbull is professor. In the Department of Chemistry, Dr. Douglas McIntosh is professor of chemistry and head of the department, and Dr. E. H. Archibald is assistant professor. In the Department of Civil Engineering, Mr. H. K. Dutcher is assistant professor. In the Department of Mechanical Engineering, Mr. I. Killam is assistant professor, and Mr. F. C. G. Wood lecturer.

CORRESPONDENCE

PERSISTENCE OF ORE IN DEPTH

To the Editor of the Canadian Mining Journal:

Sir,—In your issue of Sept. 15th, there is an editorial criticizing adversely my comments on Mr. Rickard's paper, "Persistence of Ore in Depth," given before the Institution of Mining and Metallurgy. As I consider that this editorial is not even an honest presentation of the arguments employed, I would be obliged if you would give me space to reply.

The original paper of Mr. Rickard and the discussion thereon is only available to members of the Institution, of whom there are only about 90 resident in Canada, consequently most of the readers of your article will not have had the opportunity of judging for themselves whether the presentation given in your journal is reasonable or not. Anyone who has read the discussion must be aware that a number of those who argued against Mr. Rickard's conclusions employed theories of ore genesis in doing so. For instance, on p. 39 of Bull. 129, one member says: "It seems to me that the genesis of the ore, character of the enclosing rocks. . . . . are the factors that really count when we come to consider the probable depth to which profitable ore will descend." The genesis of the ore is, of course, our conception or theory of the genesis. Again on p. 28 and for several pages following of Bull. 125 of the Institution, theory is used at length to combat Mr. Rickard's conclusions. The answer then to the indignant exclamation in your editorial, "But who under heaven would think of using any other basis?" is that those preceding the writer in this discussion had used another basis, and therefore, I think, justified the expression employed by me which the editorial refers to and even partially quotes, viz.: "Mr. Rickard's paper appears to be a most important and valuable contribution in this direction, and, I think, more likely to lead to a useful result than the voluminous discussions of the way ore has been formed and the deductions therefrom which are so dear to geologists."

The writer of the editorial professes to be unable to see the application of the illustration given of the failure of the universally accepted theory of the uniform drop in temperature with decrease in air pressure above the surface of the earth. I may say that others with whom I have discussed the matter think it pertinent, and consider that as the theory which dealt with conditions above the crust of the earth and which seemed to be beyond dispute, is found to fail entirely, we should hesitate about presenting with the confidence exhibited in the discussion under question, theories of something taking place below the surface of the earth, which is admittedly much more complex.

Yours, etc.,

G. R. MICKLE.

Toronto, Sept. 30, 1915.

LAKE SUPERIOR CORPORATION.

At annual meeting of the stockholders of Lake Superior Corporation in Camden, Harvey T. Underhill and A. H. Chitty were elected directors to succeed respectively Chas. B. Gordon and J. Frater Taylor. The remaining present directors were re-elected. Following the meeting the board organized by electing W. E. Stavert president, to succeed Thomas Gibson, who continues as general counsel. The board re-elected W. C. Franz and H. Cappell vice-presidents, and James Hawson a vice-president to succeed J. F. Taylor.

ARIZONA STRIKE.

Phoenix.—The great copper camp, comprising Clifton-Morenci-Metcalf district, will remain shut down. This is the result of the Western Federation of Miners entering the district and calling a strike September 11th which closed all departments. The mine managers of Arizona Copper Co., Detroit Copper Co., and Shannon Copper Co. have delivered to committees of employees their reply to employees' demands which was as follows:

"These companies have seen their properties closed down and their operations tied up completely by a strike called by Western Federation of Miners, and this without any presentation of grievances. Our former employees have been persuaded by agitators of the Western Federation of Miners coming from outside this district that past pleasant relations and present rate of wages should be radically changed. The companies are convinced that a large number of their old employees desire to go to work under the conditions formerly existing in this district, but they realize that any attempt to recommence under such conditions will be to invite violence and intimidation. Therefore the mines and plants will remain idle indefinitely. When it shall appear that conditions in this section warrant it and the companies are satisfied that general sentiment of the community and their former employees is unanimously in favor of a resumption of operations on basis of wages and conditions which have prevailed heretofore in this district, the companies reserve to themselves the right to decide as to whether or not they will again start up their plants.

"Our attitude in this matter is based solely on the dominant influence of the Western Federation of Miners in this district at the present time, and when this influence is dissipated we may take a different view of the situation."

At 11 o'clock Sunday, September 26th, a joint committee of employees and company managers went into session at Clifton. Unofficially, it is announced that committee of employees demanded minimum wage of $3.50 per day for underground men and $4.25 per day for mechanics. These figures are based on a 13-cent copper market, with a sliding scale upwards with advance in copper prices. At 4 o'clock no agreement had been reached; meeting was adjourned with a complete deadlock existing. Officers of Detroit Copper Mining Co. and Shannon Copper Co. stated that to meet demands made upon them would make it impossible to operate their properties profitably with copper at 13 cents.

NICKEL COMMISSION VISITING PROPERTIES.

The Ontario Nickel Commission has returned to Toronto after visiting the Sudbury, Cobalt and Porcupine mining districts. The chairman, Mr. Holloway, was especially interested in the splendid smelting plants at Copper Cliff and Coniston, and was agreeably surprised with the excellence of the electrical powers available at all three mining camps. The visit to Sudbury was merely a preliminary visit. Another will soon be made and more time spent on the properties and in gathering information and opinions from all sources in the district.

The Kootenaian, published at Kaslo, B.C., states that on September 23rd, the Rambler-Cariboo Mines, Ltd., declared its first dividend in twelve years, the disbursement amounting to two cents a share on the outstanding stock. The total payment on this account will be $35,000 of which one-half is payable on October 15th and the other half on December 15th next.

PREPAREDNESS

(As the Overseas News Agency might put it.)

All things had we prepared and planned
With scientific thoroughness,—
Supplies and schemes on every hand,
And nothing left to chance or guess:

Goosestep, and all it signifies
Of drill and tactics cut and dried;
Strategic rails,—as shuttle flies,
Our corps could shift from side to side.

The "42," and those gray-green
New uniforms that mock the grass;
The zeppelin, the submarine,
And, neither last nor least, the gas;

Our settled route 'cross Belgian soil;
Our eye on France's colonies;
That Britain's for revolt would spoil,—
We'd reckoned all such things as these.

And all of these have slow come out
(Except the few that came out wrong);
Now comes another phase about,—
A new one, that we'd figured long.

We've driven west, we've driven east,
Now south we try a new frontier;
Another proof, friend, there thou seest
Of our preparedness made clear.

Not only did we fezzes don,
But in between we sowed and tilled;
Not only promises tried on,
But certain consort chairs we filled.

A princess here, a princess there,
(Of whom a plenty we've to send),
A little Balkan throne to share,—
And Mars of Hymen makes a friend!

Let chambers, mobs or premiers vote
Howe'er they will, we've got 'em snared;
In king behind the petticoat
Their match they find—that we prepared!

—Boston News Bureau Poet (B. F. Griffin).

ZINC METALLURGY.

Developments in the metallurgy of zinc have been for many years conspicuous by their absence. A few years ago great expectations were aroused by the promises of those working with electric furnaces, but so far we have only the promises, which now arouse little enthusiasm.

Canada has an abundance of zinc ores; but produces no zinc. The United States has been producing approximately one-third of the world's zinc and consuming in her manufactures practically all her product. She has suddenly been called upon to supply the enormous demand of the Allies for zinc, for brass making purposes. Every zinc smelter in America is running at the highest possible rate, but still the price of spelter is from three to four times normal.

Localities for zinc smelters are located where there is good fire clay for retorts and condensers and where fuel is cheap. Natural gas or producer gas made from cheap coal are very desirable.

The activity in zinc is stimulating research. Ores that are valueless to the zinc smelter are being investigated to find out if it is not possible to realize on their zinc content at the present time. Such ores are sulphides of zinc, mixed with either sulphides of lead, copper or iron, or possibly all three. Such ores exist in Western Canada, but no matter how high the zinc content, if they cannot be freed from iron, copper and lead they are valueless for retorting.

Roasting-leaching Process.—Very promising results are being obtained in several different places with a sulphatizing roast followed by leaching with sulphuric acid and electrolytic precipitation of the zinc. This follows very closely the recent work in the hydrometallurgy of copper. The ore may be given a preliminary treatment by some form of concentration, in order to get the zinc content in smaller bulk. This may be done on tables or jigs, or a flotation concentrate may be produced.

The concentrate, or the original ore, is roasted at a temperature of 700° to 750°C. for from five to six hours, and then leached with a solution containing 12 to 15 per cent. sulphuric acid. The acid is neutralized with excess of roasted ore. The solution is oxidized, and iron is precipitated, by zinc oxide. Copper if present is thrown down with metallic zinc (zinc dust). The solution is then made quite acid and sent to the precipitation tanks, where it is electrolyzed, using a hard lead anode, and in some plants, a current density of 100 amperes per square foot of cathode. The cathode zinc, firm and very pure, is then melted into bars.

The ore residue after extraction of the zinc may be smelted for its lead and silver, and is more valuable to the smelter with the zinc removed.

GRANBY CONSOLIDATED.

It cost Granby Consolidated an average of 10.66 cents a pound to produce its copper during the fiscal period ended June 30th. The Phoenix mines were unable to turn out copper for less than 11.59 cents, but this was due in great part to the shut-down of last year brought about by the curtailment in production. At the new property in Hidden Creek an average cost of 10 cents was attained, but production there did not start until early in 1915.

The recovery from the Hidden Creek ores was 34.58 lb. of copper, while that from the old mine at Phoenix was down to 16.12 lb. The average for the combined operation was 23.99 lb.

At the end of the fiscal year the Hidden Creek property had estimated ore reserves of 18,000,000 tons, of which 9,205,837 tons were 2.2 per cent. copper and 8,628,000 of 0.63 per cent. material. Reserves at Grand Forks were 4,232,305 tons; the year's extraction was 611,000 tons and there was added to tonnage 152,873 tons through development.

The Bonanza mine has about 900,000 tons of developed ore, of which 414,775 tons averages 2.6 per cent. copper and 489,580 tons averages 0.7 per cent. copper. On Prince of Wales Island the company owns properties with reserves of 130,000 tons of about 1½ per cent. copper ore. The Quartz claims were bought to afford a supply of clean quartz. The Midas mine in Alaska will be ready to ship as soon as arrangements for power to operate the compressor have been completed.—Boston News Bureau.

THE VALUE OF RESEARCH TO INDUSTRY

By Francis Mills Turner.*

Under the stimulus of the present war a change which has long been impending is taking place very fast. This change is the shifting of the world's industrial centre from Europe to America. After years of constant and largely unrewarded effort on the part of a few pioneers, the manufacturers of the United States have during the last decade begun to learn the lesson taught the world by Germany, the lesson of the usefulness of the scientist in industry.

The rapid rise of the American republic to the position she now holds in the world of commerce reflects less credit on her population than has generally been assumed. That rise has largely been engineered by wasteful and unwise exploitation of natural resources so enormous and varied that even when developed in the most blundering and unscientific manner they could not but help to reward those who interested themselves in their development with a large financial return. Along with this the American business man showed an ability for organization and a genius for thinking in large amounts quite unique in the history of the world, and much of the commercial success of the United States is due to the formation of enormous corporations and syndicates, thereby reducing the cost of operation and controlling prices. But this American business mind, so alert to the possibilities of business organization, has been peculiarly blind to the benefits of scientific methods of manufacture, to the conservation of natural resources, to the improvement of products and to the cheapening of wasteful methods of manufacture and the redemption of valuable by-products.

This neglect of the proffered aid of science to industry may largely be attributed to two or three causes. The blame is not all incumbent on the man of business. The scientist, we all admit, has been too prone to clothe himself in a mantle of academic dignity and shun industry and trade as ignoble pursuits of minds of an inherently baser type. Fortunately such scientists are rarer in America than in Europe, but there have been enough of them to discourage many manufacturers from seeking the aid of scientific talent in solving their problems. Secondly, the men in control of industries in America have not, except in the New England States, been largely recruited from university graduates. This has been partly due to an unreasoning contempt for the "highbrow" on the part of the "self-made man" and partly to the fact that the colleges failed to train minds suitable for the control of great and growing industrial concerns. As a result of this absence of university graduates in the ranks of the captains of industry, there was a distrust of anything a university man might have to say regarding the conduct of an industry. It was felt that his advice was impractical and unsuited to actual working conditions. Thirdly, the resources of the land were so great that to many it appeared that they were inexhaustible, and the careful scientific struggling after the utmost efficiency which characterized the industries of Germany, Belgium, and France was felt to be out of place in America, and unwisely considered as a kind of commercial penury that ill befitted the heirs of the immense resources of mine and forest wealth Providence had seen fit to dower the American continent with.

All this had sooner or later come to an end. During the last ten years the great leaders of the industrial world of America have seen that they can no longer play the part of "Coal-Oil Johnny." They have realized that just as the natural resources of Europe have dwindled, so will the natural resources of America, only at a much faster rate, for more iron ore and coal and other natural products are consumed to-day in a single year than were consumed in a decade at the beginning of the last century.

There seem to be some persons in Canada who imagine that their country is in some way different from Europe or the United States, that because the resources of the Dominion are immense, they are inexhaustible. Nothing could be more foolish, and in view of the fact that Canada has all the experience of her great neighbor to profit by, she would be doubly foolish if this opinion found any foothold in her industrial system.

For the three reasons mentioned above, the scientist that the German industrialist made so useful in his scheme of things was not summoned to the aid of industry in America. Industry, for the reason shown above, got along very well without him—for a time, and the scientist retired to his peaceful laboratory and solved interesting and abstruse problems and thought he got on very well without industry or its material rewards.

In all these tendencies Canada has carefully copied the United States. She is to-day allowing giant corporations to wax fat and establish themselves, in spite of the fact that our papers are full of the accounts of the tremendous (and largely unsuccessful) efforts both Federal and State governments in the older nation south of us are making to control these corporations and make them serve the people and the State rather than subjugate the people and prostitute the State to their own purposes. But Canada has been equally as alert in copying the sins of omission of the American industrial system as its sins of commission, and the industrial scientist finds little more welcome and regard in Canada to-day than he does in the United States. In fact, one might say less, for whereas the American manufacturer has been slowly waking up during the last few decades, his Canadian confrere is still sound asleep. We speak in general terms. There are notable exceptions both in Canada and the United States—all honor to them.

However, what could be forgiven in the case of the United States cannot possibly be forgiven in Canada, for the older nation had no one to act to it either as a shining example or a horrible warning, in both of which capacities the present conditions of science and industry in the United States can serve Canada.

Canada is a new nation. Many of its resources are untouched. It has the opportunity of leading the world in many lines of scientific industry, and the next few years are to be the critical ones. Many chemical and metallurgical industries formerly confined to Germany, because the processes which made them possible were the product of the laboratories of the German universities and later of the laboratories of the great chemical corporations, are to-day being carried on in America for the first time. Will they remain

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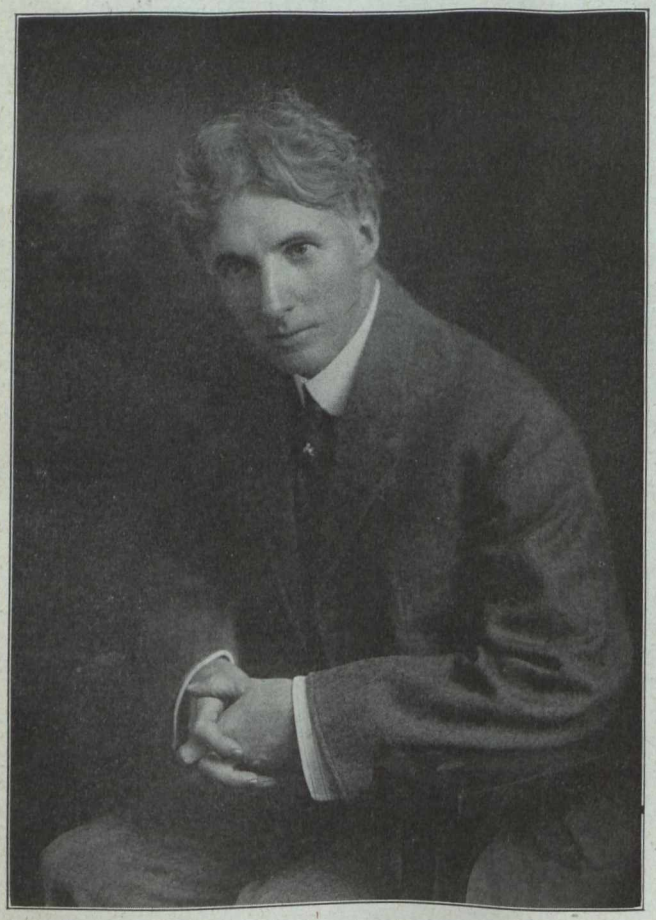
here and prosper, or will they slowly drift back to Europe when the war is over?

The answer to this question lies largely with the amount of assistance given to industrial research and institutions for the prosecution of industrial research by the people and government of the countries involved, chiefly the United States and Canada. Canada may

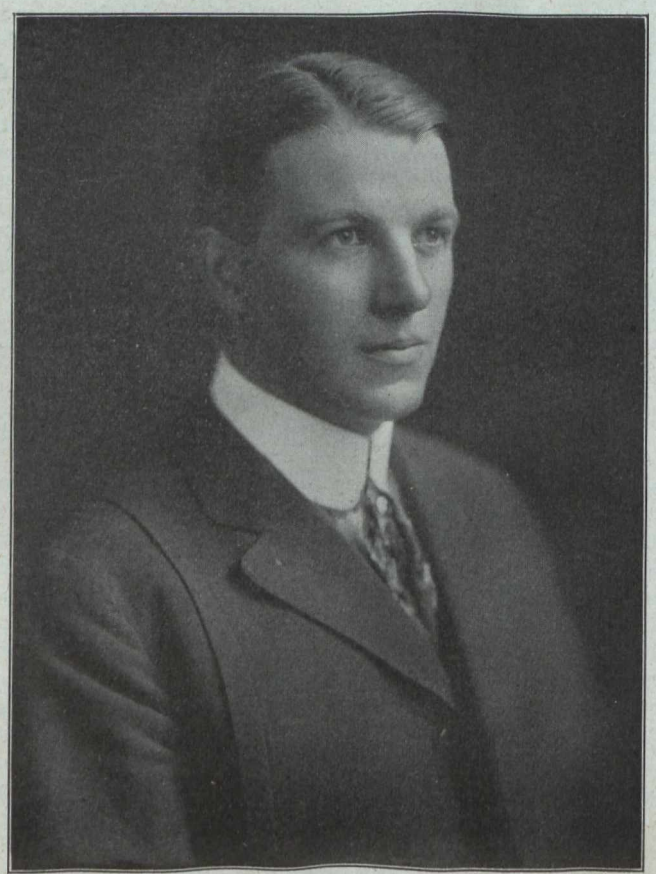


The Late ROBERT K. DUNCAN
A Graduate of the University of Toronto

have a large share of these industries if she will, and it is a problem with which the academic scientist as well as the man of commerce may well interest himself, for along with an increased and successful application of scientific principles to industry will come an increased respect for scientific knowledge in general, and it will be increasingly easy to obtain men and funds for scientific investigations even of the most abstruse and (seemingly) impractical types. To the man of business, it means more and bigger business, more money in circulation and larger opportunities for internal and international trade. To the politician it means increased commercial importance for the nation, conservation of natural resources and solution of many of the problems of industrial unrest that are today ameliorated rather than solved.

How can science and industry co-operate to the best advantage of both parties? The late King Edward said: "The prosperity, even the very safety and existence of our country, depends on the quality of the scientific and technical training of those who are to guide and control our industries." Many years ago Benjamin Franklin uttered similar remarks, when he said that the independence of a country was only assured when its industries were in the hands of men of science. It is evident then, that in the opinion of two statesmen, living in very different times, but possessed of an equal clarity of vision, that there should always be a class of scientifically and technically trained men to take charge of the industries of a country.

How then are these to be obtained, how are they to be supported and administered? Various plans exist. Many large corporations in the United States have, during the last decade, organized large private research laboratories for the solution of their own problems, and placed in charge able men possessed of high degrees from the leading universities of the world. And here I would hasten to distinguish between research laboratories and analytical laboratories. Nearly all firms maintain analytical laboratories for the testing of their products, and important as this is, it must not be confused with industrial research. Only a few firms possess real research laboratories in which a genuine attempt is being made to work out new processes and improved products, utilize by-products and invent new and valuable commodities. The firm doing this on the largest scale in America is the General Electric Company, of Schenectady, but many others engaged in the manufacture of steel, chemicals,



R. F. BACON, Director of the Mellon Institute

rubber, foods, paint, explosives, leather, drugs, and many other things have done so during the last few years with great success.

There are many firms, however, who do not feel that their problems are of sufficient extent, or their resources large enough to found a laboratory of their own, or who do not yet quite trust the ability of chemists and other scientists to solve their problems. But if this could be done at lesser expense by some institution, they would gladly submit a problem to be solved. The possible successful solution of this would encourage them to submit more or to organize their own laboratory. To some extent certain universities have taken up this kind of work, and departments for doing this have existed at the Massachusetts Institute of

Technology and other schools; but it is hard for the university to do such work in a generally satisfactory manner, and it does not seem that such is a practical solution.

Dr. Robert Kennedy Duncan.—It remained for a graduate of the University of Toronto, the late Dr. Robert Kennedy Duncan, to formulate a plan which has excelled all others for making co-operation between the manufacturer and the scientist possible and mutually profitable. This plan is the system of industrial fellowships which has grown into the Mellon Institute of the University of Pittsburg.

While travelling in Europe studying the results of scientific research on the great industries there, the results of which investigations are contained in "The Chemistry of Commerce," Dr. Robert Kennedy Duncan attended the meetings of the International Congress of Applied Chemistry, which was held that year in Rome. During those meetings, Dr. Duncan thought out a scheme for the co-operation of learning and industry that has since resulted in a great increase of useful knowledge, and has probably done more than any one other such scheme to better the relations existing between the manufacturer and the scientist who studies the pure science on which industry is based.

The conditions in the United States at the time which made the scheme at all possible of realization were the existence of a high tariff, the growth of monopolies, the existence of enormous quantities of raw materials, a rapidly increasing population, and a general intensification of competition in all industries. From his observations, Dr. Duncan saw how, especially in Germany, learning had greatly helped the industrialist in producing a better product and at a price that only the high tariff kept from causing a large exportation of these goods to the United States, and thereby taking the business of many American manufacturers whose methods were wasteful and unscientific in the extreme. If at any time the tariff should be lowered, then the only method by which the American manufacturer could survive would be by efficiency, and to get this efficiency the services of well-trained scientists would be necessary. Nevertheless, if these men were to go to the factory, many difficulties would have to be met. A laboratory would have to be built and equipped, and in many cases the use of a large technical library such as that of the Carnegie Institute in Pittsburg or the John Crerar Library in Chicago, would be indispensable for rapid and accurate advance in research, and would be inaccessible to many of the smaller places in which plants are often of necessity located. A great many other things, such as interference on the part of foremen, would also have to be contended with and would make the position far from an ideal one either personally or from the point of view of its value to the concern.

MELLON INSTITUTE, UNIVERSITY OF PITTSBURGH

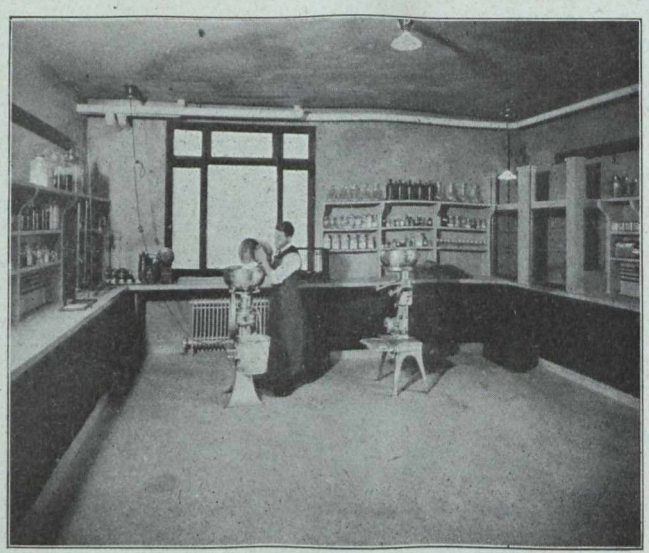
The Mellon Institute.—On Dr. Duncan's return to America he was able to put the scheme in operation in the University of Kansas, and later in the University of Pittsburg as a department of Industrial Research. Last spring, by a munificent gift by two of Pittsburg's most prominent business men, Messrs. A. W. and R. B. Mellon, the research department was reorganized, and is now known as the Mellon Institute of Industrial Research and School of Specific Industries. A fine new building, now in course of construction, will accommodate about 70 researchers. It will be excellently equipped with both general and special apparatus and a special library. The Carnegie Library is located in Schenley Park, only a few minutes walk from the Mellon Institute.

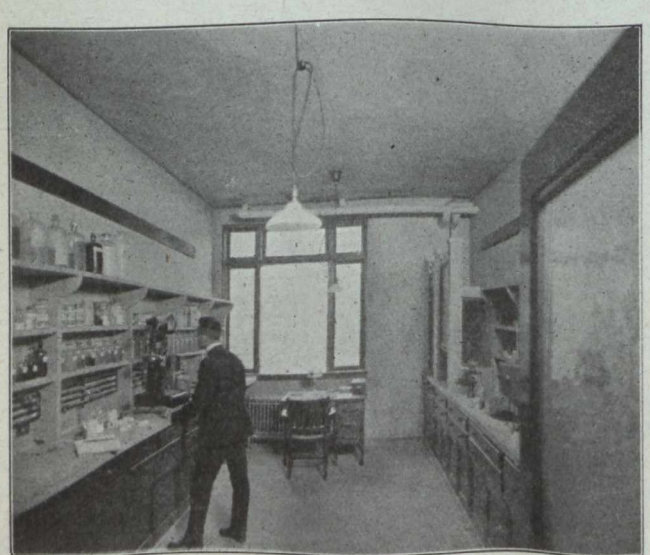
The form of contract between the Institute and the company is practically the same in every case, and provides for four parties, the Company, the University, the Public and the Fellow. From the standpoint of the

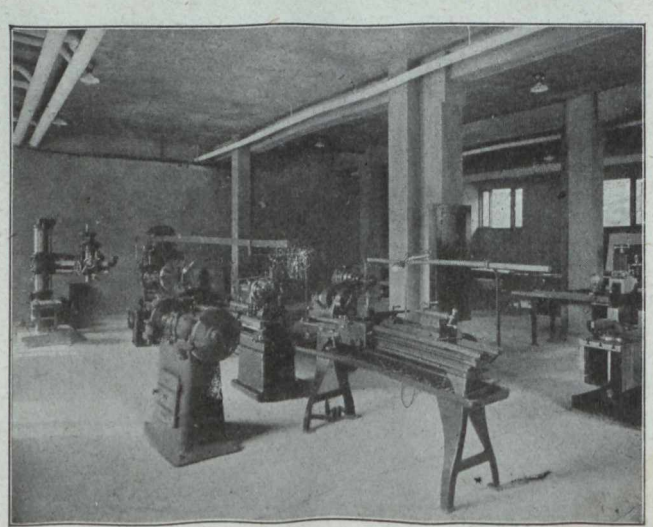
company, it has proven to be a privilege, and it has been shown many times that it is possible to accomplish results not obtainable in any other way. The Institute is provided with an equipment much larger than is possessed by the laboratories of any but the largest concerns, and in addition, the entire consultative facilities of the University, mathematical, physical, biological, engineering and economic are linked with the work of the Institute. In addition to this the various chemists in the institute co-operate and discuss their work, and thus the company has not merely the services of one isolated chemist, but of a council of expert chemical opinion. Finally, there is freedom from interference, correct judgment of progress made, and an atmosphere of intense research.

Great advantage also comes to the public through this system, for every useful fact is of benefit to the public, even though it gets to them through the agency of some company. Indeed, most new inventions and recently discovered knowledge must be taken up and developed by a company if they are ever to do the world any good. If manufacturing wastes were eliminated and scientific principles applied universally, many human needs would be lessened, and in many cases caused to vanish.

To the fellows engaged in these researches, there are many opportunities. They receive a salary according to their ability and training, and are given every chance for real achievement. Finally, if they succeed in a practical manner, they are rewarded by the bonus clause contract with the company. The very reasonable hours of work, liberal vacations and most pleasing relations with the administration, make it a very desirable place to work. In addition to this, there is the fact that while pursuing these researches the researchers instead of being isolated in a purely industrial community, are living in a university atmosphere in a great city with all the advantages of both those sets of surroundings.







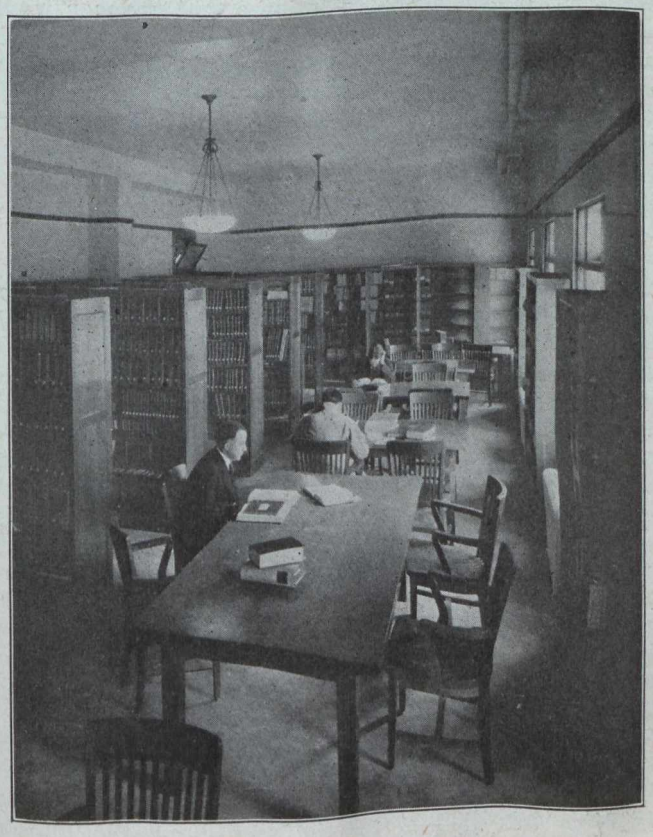
Interior views, Mellon Institute, Pittsburgh

The University, on its part, fulfils its obligation of adding to useful knowledge, as the right to publish the results of the investigations at the termination of a reasonable amount of time is assured by the agreement. Also the University is in possession of a large teaching force, as in the agreement the fellows are supposed to give part of their time to lecturing and teaching chemistry. Under the School of Specific Industries one who has had the requisite previous training may be permitted to work and study under an expert in that line.

At present there are thirty-five fellows actively engaged in the work, and a large advisory staff. The

work has been until recently carried on in a temporary building, with a number of smaller other buildings erected for larger scale operations than it is convenient to carry out in a laboratory room. Some of the problems that at present are being attacked relate to baking, the manufacture of yeast, fats and oils, the abatement of the smoke nuisance, copper, glue, petroleum, natural gas, foods, coating of steel with copper, effect o fa high potential on chemical reaction, corrosion of steel, fertilizers, flotation of ores, aluminum, glass, leather, etc.

The growth is now rapid and steady, and companies are coming continually with problems for solution. After the system was well established, many multiple fellowships were started, in which several men are under the direction of senior fellow, who is responsible to the administration for his juniors. While as yet



The Library

but few results have been published, it may be said that those that have, have been most gratifying. Of course the system could not have grown but on a basis of success. The industrialists have given a most generous trust and co-operation, and have donated much apparatus, and the best proof of the fact that the system has indeed made good is that two such prominent men in American finance have given their money and allowed their names to be used in the title of the Institute.

During the six years of actual working of the scheme, any inherent weaknesses would surely have appeared, had there been any, but such has not been the case. Let us therefore look over the system as proposed by Dr. Duncan in the North American Review for May, 1907, and subsequently in his book, "The Chemistry of Commerce," before any experiment of the kind had been tried. Then let us read his account in "Some Chemical Problems of To-day" of the work after the lapse of four years, and finally let us go through the Mellon Institute as it now is, and we will be surprised to see with what clearness the whole thing was thought out before a single fellowship was established, for in all but a few minor details it is in operation just as it was proposed over six years ago. It is an astonishing and an almost incredible thing.

To-day the Mellon Institute offers a sensible, practical scheme for the betterment of industry, the placing the university on a higher plane of usefulness, and the advance of knowledge and the public good.

That Canada has problems to be solved is not a matter of dispute. To-day people are wondering why so few metals are refined in Canada, and why it cannot be done profitably here. The question is not merely a political, but a chemical one as well. We need to know how to utilize the Canadian iron ores, how to utilize the waste of the wood pulp industry, how to utilize a hundred and one now unused natural resources.

There is no doubt that the encouragement of scientific research that could not help but result from the establishment of one or more institutions similar to the Mellon Institute of Pittsburg in Canada would be of the greatest benefit to Canada and also to all the universities in the country. Whether it will be done now, when the need is great, or not, depends on whether the people think it worth while to keep their native scientific talent in Canada or allow it to wander away to other countries. For the man who feels that research is his life-work will go where research is appreciated and honored. In every research institution in the United States are Canadians who, when asked why they left the land of their birth, invariably reply, "What was there for me to do in Canada?" The work these men have done in America, in Great Britain and in other foreign countries is ample evidence of what they would have done for their own country had their countrymen set them to work. It is not too late now to remedy this condition; this period of change and alteration in the commercial conditions of the world affords an opportunity to make a new start that will never come again. Will it pass unused?

According to Mining and Scientific Press, copper is said to be produced at the Kennecott mine, Alaska, for five cents a pound. The record of the previous decade was the seven-cent cost of the Wolverine, in Michigan, but there the cost has risen to eight-and-a-half cents. The big disseminated copper deposits lowered the record, notably the Utah Copper; later the Chuquicamata (of the Chile Copper Co.) took the palm for cheapness, at under six cents a pound.

Coal Age, New York, recently included in its personals the following items: Lowther Ferris, formerly general sales agent of the Wellington-Comox Agency, Ltd. (Canadian Collieries, Dunsmuir, Ltd.), of Victoria, B.C., has organized and will become general manager of the Columbia River Coal Dock Co., of Portland, Oregon. Large docks for coal storage and ship bunkering are to be erected at once on North Portland Harbor. Irving R. Gard has been appointed consulting engineer for the Columbia River Coal Dock Co., of Portland, Oregon. He will design and superintend the construction of the coal bunkering and storage docks which this company will erect at once on the Columbia River near North Portland. The plant, when completed, will be the largest and most efficient in the Pacific Northwest.

MINING SCHOOL OF THE CLEVELAND-CLIFFS IRON CO.*

By C. S. Stevenson.

The Mining School of The Cleveland-Cliffs Iron Company is of that class of trade schools known as Industrial Corporation Schools, the purpose of which is the mental improvement of those already enlisted in the industry. There are but a very few of this general type in the United States and each is operated on a plan peculiar to local conditions, the one thing in common being that the work taught is in harmony with the industry concerned. A great many such are operated in Germany and by many they are credited as being largely instrumental in producing the great industrial development of that country during the past twenty years.

The Purpose of the Mining School.—It is essentially true that the foreign labor which has been absorbed in large numbers by our mines in recent years is an inexperienced product. It is, however, not the purpose to attempt to teach these men (except in unusual cases) since by difference in language and a lack of early education they are not amenable to school work of this character. The prime function of the school is to train to the highest possible degree of efficiency the English speaking men upon whom this inexperienced foreign product depends for its guidance. The school, therefore, is not open to all underground employees of the company, but concerns itself only with a group of men who are carefully selected by the superintendents and mining captains on a basis of their ability and mining aptitude.

Before instituting the work a serious effort was made to locate and study the method of operation of similar schools so that the common elements of these might be taken as a frame-work around which our instructional work might be constructed. This investigation proved that there were none in the United States the aims and purposes of which were at all similar to the one we proposed to establish. Investigation did, however, indicate that a school in its ordinary sense and our Mining School should be very dissimilar in their aims and purposes. The public ones have for their purpose a broad, mental and cultural development. The Mining School, on the other hand, while not ignoring the desirability of such instruction, largely disregards the curriculum and methods thereof and concerns itself wholly with instructional work calculated to increase the workman's efficiency and co-incidently his earning capacity. In short, it is designed to have a definite value in dollars and cents, not only to the miners who participate in the work, but to the company as well.

Attitude of the Men Towards the School Work.—In the beginning it was noted that the men were as a rule indifferent, if not antagonistic. Attention, however, should be directed to the fact that a few men of especial ambition and energy welcomed it, several of whom had already attempted to help themselves through the medium of the correspondence schools. Some, however, looked upon the work with a suspicion that it was intended to benefit the company and not themselves. They felt that their minds and bodies were in a rut and that the company was arrayed against them. Gradually, but not without difficulty these prejudices were broken down and replaced with a spirit of open-mindedness and enthusiasm. The company has authorized the statement that in so far as possible all men chosen for shift bosses will be taken from the ranks of the Mining School. This gave the men a definite motive for attendance and interest and assisted greatly in quickly breaking down all prejudices, since it proved that the work was an undertaking of mutual concern to the company and miners as well. On June 1st, 1915, the work of the first class, comprising 33 men, was completed, and it can be stated definitely that for the greater period of their course the men manifested a higher degree of open-mindedness and enthusiasm than is usual in high schools and universities.

Time Given to the Course.—The students enrolled in our school are largely men with families and ordinarily quite a large portion of their leisure time is given to domestic affairs. The school intrudes on this and it would be unreasonable to suppose that the men would willingly sacrifice this time from their home affairs for a long period. For this reason the work of a single class is designed to cover one and a half years. This length of time proved, if anything, too short for the instruction in the subjects covered by the course, but this was overcome by the simple expedient of increasing the length of class periods and also the amount of home preparation.

Each miner according to our present system attends two classes a week, each of an hour and a half. If the miner is working on the day shift he attends the evening classes and if he is working on the night shift he attends the afternoon sessions. All of the class work is done on the miners' own time and they receive no remuneration from the company for that given to the school work.

Readiness With Which the Men Acquire Information.—The experience gained with our first class proved that the men can readily assimilate information if care is always taken to bring out the practical application of the instruction to their daily work. For example, a course in arithmetic would be a failure if taught as an abstract subject, but if the instruction is prepared with a view to its practical application to the daily problems of a miner's life, the student is interested and for the first time sees the purpose of the instruction which bored him in his early school days. In short, the power to assimilate information is in direct proportion to the practical value of the instruction. The men have a skill derived from long experience in mining and can perhaps more readily assimilate academic instruction relating to the industry than can the average university student lacking such experience. However, in their ability to comprehend abstract information they rank considerably under the students of the high schools and universities.

Factors Controlling Attendance.—The Mining School of our company began its first class with an enrolment of 38 men and of these, 33 successfully completed the work offered by the department. Four of the five men, who began but did not complete the course, withdrew from the work on account of business conditions, which made their attendance impossible. We are very proud of this record of attendance since we have had a much lower rate of attendance mortality than has been reported by similar schools in the United States. Many devices were resorted to for the maintenance of attendance. First of all, a high degree of personal friendship was established between the students and the instructor. In all cases it must be borne in mind that

*Paper prepared for the Twentieth Annual Meeting of the Lake Superior Mining Institute, held on the Gogebic and Cuyuna Ranges, Sept. 6th to 9th, by C. S. Stevenson, Educational Director, The Cleveland-Cliffs Iron Co., Ishpeming, Mich.

the men are not children, but of mature years and respected in the communities in which they live, and great care is taken not to wound their pride and self-respect. Infinite patience must be a virtue of the instructor, to an even greater degree than is common to the teaching profession. In case a student grows discouraged and fails to attend classes, an encouraging letter is sent to him together with a copy of the instruction paper for the succeeding lesson, and upon his return to the class room an increased amount of personal attention is given until he again feels that he is on a par with the other men. In so far as possible the formal atmosphere of the ordinary class room is avoided and replaced by conditions calculated to make the men feel comfortable and at home. Illustrations in lectures are taken whenever possible from the experience of our own company which gives the men a personal interest in the subject under consideration. In short, a feeling of fellowship and confidence must be created early in the work, after which many problems may be ironed out satisfactorily.

System of Instruction.—We have adopted with success what is known as the "Unit Course," in which the entire attention of the men is fixed on one subject until its completion. Experience has proved this system to be much better adapted to our needs than the teaching of several subjects coincidently.

As a nucleus for each course, instruction papers have been prepared in either mimeographed or printed form. These instruction papers become the property of the men and form a convenient means of reference in the future. They are, however, but a minor part of the instruction, most of which is imparted by lectures.

Development of Independent Thinking.—The experience gained with our first class has proved that perhaps the greatest weakness of the men is in their lack of power to do original and independent thinking. To correct this mental condition a series of informal discussions on mining topics was instituted early in the course. These were not a scheduled part of the course and they followed the usual class period, the discussion being led by the instructor. This interchange of ideas broadens and helps the men and is perhaps as large a factor in the production of a man of reliability and common sense as is the pure school work itself.

Topics Discussed.

Mention of a few of the topics discussed is given herewith:

Safe methods of blasting down timber.

Methods of thawing dynamite.

The use of delay action fuses in shaft sinking.

The location of holes in blasting various types of ground.

The choice of explosives for different character of ore and rock.

The proper methods of charging and tamping explosives.

The choice of drilling machines for different classes of work.

The elementary features of rock drill construction.

The care and use of rock drills.

The proper methods of setting timber and the variety of timber to use in caps and legs.

The advantages of systematic sub-level work over unsystematic sub-level work.

The relative merits of timbered and untimbered raises.

The proper thickness of a sub-level slice from the standpoints of safety, costs and recovery

The inspection and lubrication of hoist ropes.

The testing of safety catches on cages.

The cost of producing compressed air.

Underground sanitation.

Ventilation of metal mines.

The sampling of ore and its relation to the marketing of ore.

The proper degree of discipline of the shift boss over the miner.

Methods of procedure at mine fires.

The treatment of a man overcome by powder smoke and other first-aid problems.

The Workmen's Compensation law.

The proper use of the various report blanks which are filled out by underground employees.

The informal discussions above referred to were valuable, but experience proved that a few of the men had hesitancy in expressing their ideas. To reach these men we began our monthly "Suggestion Papers." These involved the preparation by each student of an essay on any mining subject of his own choosing, once each month. In the preparation of these the services and advice of the instructor were freely given. A high standard of neatness and accuracy was demanded. The papers submitted were of an unexpectedly high degree of merit and they indicated a very laudable desire on the part of the men to do real, independent thinking. They as well had a secondary value in the development of penmanship and in the use of the English language. It can be definitely stated that, as a result of this effort to mentally awaken the men, there was a marked improvement shown in their ability to do original thinking and in their power of analysis.

Age, Nationality and Previous Schooling of the Students.—The average age of our first class was 32 years at the time of beginning the course. The youngest student was 22 and the oldest 50 years of age.

The nationality of the men was as follows:

American born	13
English born	12
Finnish born	4
Swedish born	2
Italian born	2

The average number of years spent in school previous to attending the Mining School was 4.3 years. The range of time previously spent in school varied between two months and 10 years.

What Should Be Taught in a Course of This Character.—Since the time spent in the work is small it is evident that only such subjects should be taught as are of practical value to the student in procuring his advancement. It is better to teach a few subjects thoroughly than to teach a smattering of a large number of subjects. In the choice of these the limited early preparation of the men cannot be ignored and any tendency to introduce university or even high school standards must be carefully avoided. In order that the instruction in a school of this character may be sufficiently effective to justify company approval and subsidy, two principles must be adhered to: first, course of study should be developed from mining situations and be adapted to mining needs; second, the varied employments of the men should be investigated and analyzed in a search for the common elements on which group teaching can be based. The following course was followed by our first class, which completed its work June 1st of this year. It is designed to cover fundamental subjects on which foundation the student can build after he has left the school. Each of the subjects was taught in the order in which it is here

named: 1, arithmetic; 2, elementary drawing; 3, geometrical drawing; 4, mechanical drawing; 5, geology; 6, construction and use of mine maps; 7, first-aid to the injured; 8, time-keeping; 9, mine sampling; 10, mining methods; 11, business correspondence.

Detailed Review of the Work Taught.

Arithmetic.—The instruction in arithmetic has for its object primarily to impress on the men the necessity for acquiring a thorough system of making, with as much self-dependence as possible, the more simple calculations relating to the wages of miners, costs of mining and estimates. A total of 18 special instruction papers were prepared for and used in this work. These papers were designed, in so far as possible, to cover the needs of the mining industry. The parts of arithmetic treated were: Addition; subtraction; multiplication; division; cancellation; addition of fractions; subtraction of fractions; multiplication of fractions; division of fractions; addition of decimals; subtraction of decimals; multiplication of decimals; division of decimals; percentage; proportion; areas of surfaces; computation of volumes; powers and roots.

As indicating the difficulty which we encountered in the instruction in this subject it may be said that no more than five of the men had ever completed a course in arithmetic and there were many who in the beginning could not make the simple computations in addition and subtraction.

Elementary Drawing.—Drawing is the sign language of the mechanic. In discussing a practical problem the first thought of the shift boss and the mining captain is to make or attempt to make a sketch. Modern mining development demands that the shift bosses and captains be able to understand and work from blue-prints. For these reasons the subject of mechanical drawing was taught in the Mining School. In elementary drawing five simple drawings were made by each student which served largely to accustom them to the use of drawing instruments and the fundamental principles of making a drawing.

Geometrical Drawing.—This course has a two-fold value: first, it serves as a preparatory subject to mechanical drawing and, second, it gives the student a working knowledge of geometrical facts which have many common and practical applications. A total of four drawing plates, covering 24 geometrical principles were required in this course.

Mechanical Drawing.—In this subject each student completed five drawings, beginning with simple mechanical devices and proceeding to more complicated work. The prime purpose which was to teach the men how to read a mechanical drawing, was accomplished. The character of the work done by the men in this subject was of an unexpectedly high degree of merit and closely approached the work of similar nature which is done in universities. The interest which the men took in it was manifested by the fact that the majority of them have purchased mechanical drawing instruments for their own use. A considerable amount of interpretation of blue-prints was required of the students in connection with this work.

The course in mechanical drawing had a secondary value in the development of system and accuracy. In the beginning the men were found to make numberless mistakes in measuring dimensions and in the details of construction. Gradually, however, these faults were overcome and the men accustomed themselves to think and work accurately.

The work taught in elementary, geometrical and mechanical drawing is based on a printed instruction paper written for the especial needs of the Mining School.

Geology.—In so far as possible all instructional work in this subject is based on the geology of the Marquette range. A printed instruction paper is used as the nucleus of the course and with our first class this was supplemented by lectures and the study of approximately 150 specimens of rocks and minerals. The men took a very lively and almost unexpected interest in this subject. It was found that some of the men had a fairly good idea of the geology of the range in the beginning and these welcomed the opportunity of perfecting the information which they had gained largely through practical experience. Many of the men it was learned have mineral collections in their homes and many specimens of rocks and minerals were presented to the instructor for identification and discussion. It is believed that there is no course more valuable than geology in making a miner's work more interesting and less of a drudgery. The course followed the following outline:

Dynamical Geology.—1, The effect of the atmosphere on rock formation; 2, the decay of rocks; 3, the formation of sedimentary rocks; 4, aqueous agencies; 5, mechanical effects of water; 6, the formation of water falls; 7, the eroding power of streams; 8, the formation of deltas; 9, the action of glaciers, especially on the geology of the Marquette range; 10, chemical effects of water; 11, chemical deposits from springs; 12, the condition of the interior of the earth; 13, the effects of heat on rock formation; 14, organic agencies; 15, the formation of coal and limestone.

Structural Geology.—1, Exposures of rock valuable for study; 2, definition of the term "rock"; 3, classes of stratified rocks; 4, dip of rocks; 5, the outcrop of rocks; 6, anticlines, monoclines and synclines; 7, conformability of rocks; 8, fossils; 9, igneous rocks; 10, igneous rock classification; 11, metamorphic rocks; 12, structure common to all rocks; 13, joints in rocks; 14, fissures; 15, normal faults; 16, reverse faults; 17, forms of ore bodies; 18, definition of "ore"; 19, discussion of the form in which ore bodies occur on the Marquette range.

Historical Geology.—1, Discussion of the geological section; 2, discussion of the succession of rocks on the Marquette range; 3, detailed description of the rocks of the Marquette range—illustrated by specimens.

History of the Marquette Range.—1, Date of discovery and record of development; 2, history of the Swanzey range.

Iron Ores.—1, Discussion of the composition and the characteristics of various iron ores; 2, discussion of the ores of the Marquette range; 3, the use of the dip needle in the location of ore bodies; 4, the occurrence of soft and hard ores; 5, a detailed description of the ore deposits at the Maas, Negaunee, Austin, Stephenson, Lake and Cliffs Shaft mines.

The Construction and Use of Mine Maps.—In this course it is desired to teach the fundamental details of map construction with a view to facilitating the student's interpretation of the maps supplied to him by the engineering department. The experience of our engineering department indicates that there is a definite need for instruction of this character. The course is based on a mimeographed instruction paper which follows the outline given below:

A.—The Use of a Compass.—1, Description of compass; 2, degree of accuracy secured in compass work—magnetic attraction; 3, the reason for reversing the east and west points of a dial on the compass; 4, the method of procedure in using a compass; 5, problems illustrating the use of a compass in sub-level work.

B.—The Use of a Clinometer.—1, Determination of the angle for putting up a raise and use of the lines given for a raise by the engineers.

C.—Templates for Track Curves.—1, The grades of tracks; 2, use of a hand level and track level.

D.—Description of the Protractor and Engineers' Scale.

E.—The Construction of Maps.—1, Co-ordinates; 2, the relation of the co-ordinates of a sub-level to those of the sub-level above and below; 3, the scale of mine maps with sufficient problems to enable the students to take distances from maps; 4, the zero point or origin of a survey; 5, Government surveys; 6, the explanation of the use of cross-hatching in constructing mine maps, also coloring; 7, problems in mine mapping.

F.—Mine Levels.—1, Sea level datum; 2, the use of an arbitrary datum plane; 3, the proper use of elevations, supplied by the engineers, at the top of each raise. The disadvantages of having sub-level drifts meet off level.

G.—General Consideration in the Use of Mine Maps.—1, Systematic sub-level work in relation to efficiency in handling timber and supplies; 2, the relation of systematic sub-level work to maximum recovery of ore; 3, the relation of systematic sub-level work to the safety of miners and its relation to the ventilation of a sub-level; 4, procedure in locating a block of ore which has been lost on the sub-level above; 5, assay maps and their use; 6, use of maps in holeing into or connecting with other workings, whether abandoned or where men are at work.

First-Aid to the Injured.—The work of first-aid to the injured has taken a place of such importance in mining that it would seem unnecessary to elaborate on the reasons for including instruction thereon in a course of this character. This work was given through the medium of lectures, which followed the following outline: 1, The history of first-aid work and its aims and purposes; 2, the structure of the body; 3, description of the various types of bandages used in first-aid work; 4, description of wounds and prevention of infection, the treatment of shock and the use of stimulants; 5, the circulation of the blood and the control of hemorrhage; 6, bruises, sprains, dislocations and burns; 7, the treatment of fractured bones; 8, respiration and the standard methods of inducing artificial respiration.

Time-Keeping.—In view of the fact that our company is selecting its new shift bosses from the ranks of the Mining School it is important that the students be instructed on the methods of time-keeping. This subject was presented to the students in the form of a mimeographed instruction paper which explains in detail the system of time-keeping used by The Cleveland-Cliffs Iron Company.

Mine Sampling.—The instruction in this subject followed the outline given below:

A.—Theory, and importance of close attention.

B.—Methods of application in use by The Cleveland-Cliffs Iron Company in: 1, Drifts; 2, stopes; 3, raises; 4, mine cars; 5, skips; 6, railroad cars; 7, steam shovel loading; 8, stockpiles.

C.—Treatment of Samples.—1, Labeling; 2, crushing and drying; 3, quartering; 4, bucking-down.

Mining Methods.—This subject was presented to the students in a mimeographed instruction paper covering the methods of mining common to the iron ranges of the Lake Superior district. The course followed the following outline:

1.—General principles governing the selection of a mining method: (a) Open cut mining; (2) steam shovel mining.

2.—Method of mining medium and hard ores: (a) Milling; (b) underhand stoping; (c) back stoping, Case 1 and 2; (d) back stoping, Case 1 and 2; (e) substoping.

3.—Method of mining soft ores: (a) Room and pillar square set; (b) room and pillar square set using filling; (c) top slicing one set high; (d) top slicing two sets high; (e) sub-caving, Case 1 and 2.

4.—Detailed description of the methods of mining used by The Cleveland-Cliffs Iron Company in the Negaunee, Ishpeming, North Lake, Republic and Gwinn districts.

Business Correspondence.—In view of the student's inexperience in business correspondence it was thought advisable as a final course to instruct them in the art of writing a good business letter. This subject was presented to the students in a mimeographed instruction paper, each student being required to write at least twelve business letters which were graded by the instructor for neatness and their conformability to established forms and customs in business correspondence.

Instruction of Mechanics and Electricians.—This paper would not be complete without mention of the educational work which is being done by our mechanical and electrical departments. In this work engineers act as instructors and any employee engaged in mechanical or electrical work is privileged to attend the classes. Evening classes only are held, the men receiving one lesson each week. The work is very practical in its nature and excellent results have been obtained.

This paper is presented as a record of what has been accomplished thus far by the educational department of our company. We realize that the plan here presented can be improved upon and certain improvements are already under consideration. Whether or not the school is permanent may be safely left to the future. At present it meets an urgent need and will until cooperation with the public school can be effected.

STURGEON LAKE.

For some time the St. Anthony mine, now in the hands of Mr. Geo. Glendinning, of Toronto, has been under option to interests identified with the Kerr Lake mine. It is probable that the option will be taken up.

LA BELLE KIRKLAND MINES, LTD.

The La Belle Kirkland Mines, Ltd., has been formed to take over the Gibson claims in the Goodfish Lake area. Very good results have been obtained in exploratory work and machinery is being taken into the property and camps being built.

WEST SHINING TREE.

The Canadian Copper Co. has taken over from Smith & Durkee, Sudbury, the option on a copper deposit in the Township of Connaught. The location is east of the West Shining Tree district in which several gold discoveries have been made.

ZINC CONCENTRATES IN THE PRIZE COURT

The "Mining Journal," London, under date of September 25th, says:

Several cases arising out of shipments of zinc concentrates from Australia, either captured or diverted to English ports as a result of the war, were heard by the President of the Probate, Divorce, and Admiralty Division of the High Court during the current week. In all there are five cases to be tried, involving something like £1,000,000. During the course of the hearing much important information as to the interrelation of various firms connected with the zinc industry was disclosed. The circumstances with regard to the various ships concerned vary. Where the consignments were, on the face of them, to Aron Hirsch & Sohn the property was condemned, but a lengthy argument was addressed to the Court, both on behalf of the Crown and on behalf of the firms concerned, with regard to parcels claimed by Messrs. Henry R. Merton & Co., Messrs. Vivian, Younger & Bond, the Australian Metal Company, and the Compagnie des Minerais. The Solicitor-General argued that the charterers were the Metallgesellschaft, and that the Australian Metal Company and the Compagnie des Minerais were its puppets. From the correspondence it was to be inferred that the Australian company purchased the concentrates on behalf of the Metallgesellschaft, which took entire control of the sale of the lead concentrates, and merely informed their English partners of what had been done. The so-called British firm, Henry R. Merton & Co., with its intimate German commitments and German origin, came to ask the Court to help it to set up a partnership in a business mainly carried on in an enemy country.

Mr. Maurice Hill, K.C., for the claimants, said this was no question of trading with the enemy, as it was concerned with shipments made before the war. The only question was as to the enemy or non-enemy character of the goods. The Solicitor-General had referred to a German octopus which had spread its tentacles over the metal trade of the world, but it would be just as true and just as false to say that an English octopus had spread its tentacles over the German trade. Mr. Merton started the London business of Merton & Co. in 1860. He was born in Germany of English parents, and in 1899 or 1900 H. R. Merton & Co., Ltd., was formed. Mr. Merton had carried on business in England for 20 years before the Metallgesellschaft was formed in Germany. That was also a company in which Mr. Merton was interested, but to represent the whole concern as a German firm which was gradually, by means of subsidiary companies, getting its grasp on the metal trade of the world was wholly misleading. The majority of the shareholders in H. R. Merton & Co., Ltd., were English. Of the directors all except two were British. The Metallgesellschaft was formed in 1882, and the directors of H. R. Merton & Co. were the holders of a very large quantity of the shares. One shareholder, a Mr. Zuny, who died a short time back, by his will left the income on 300,000 shares to British charities. The firm of Vivian, Younger & Bond was a partnership firm. At the beginning of the war two of the partners were British born, and the third, who afterwards resigned, was a naturalized British subject. As to the Australian Metal Company, the shareholders in the majority were German—26,700 out of 50,000. The directors also at the beginning of the war were in the majority Germans—four against three. The Campagnie des Minerais was formed in 1900, and of its shareholders about 60 per cent. were German and the rest mainly Belgian and French. As to the Ore Trading Company, which came into the matter as merchants for dealing with certain ore on behalf of all these companies and firms, the large majority of the shareholders were British, American and German. He submitted that the evidence showed that the property in the zinc concentrates in question was in the Compagnie des Minerais, and the property in the lead concentrates was jointly in the Metallgesellschaft, H. R. Merton & Co., Vivian, Younger & Bond, and the Australian Metal Company. Therefore, applying the test of property, the proper order to make was to release the zinc concentrates altogether and to release the lead concentrates as to three-fourths and to condemn it as to one-fourth—the fourth share belonging to the Metallgesellschaft.

At this point the Solicitor-General interposed as a witness as to the constitution of the Compagnie des Minerais Mr. J. C. Van der Taelen, a Belgian managing a leading Belgian metal company in Antwerp, but at present connected with Messrs. Peters & Co., of London. He stated that the company did not smelt or work the zinc, but sold the ore to the smelters and bought back the metal produced. So far as he knew most of the directors were associated with the Metallgesellschaft, and the company was practically a German one.

In the course of cross-examination, Mr. W. M. Wilson, a director of Messrs. Henry R. Merton & Co., stated that his firm acted as bankers for the Australian Metal Company and the Compagnie des Minerais, and that the Gesellschaft supplied them with money to meet these charges. Since the war they had received no remittances from the Continent, and he feared at the end of the war it would be impossible for Germany to remit in full, if at all.

Further hearing was adjourned.

GRANBY.

In the annual report of the Granby Consolidated Mining, Smelting & Power Co., President Nichols says:

"Results so far attained confirm our belief previously expressed that no insolvable problems exist with respect to operations of the new properties, and while those results are highly gratifying, it is reasonable to expect that considerable progress will yet be made in the line of further reduction of costs. Fundamental conditions, both as to property and organization, continue highly satisfactory."

Following is a statement of ores treated in the year ended June 30:

	Tons Ore Smelted.	Recovery per ton ore. Copper (lb.)	Silver (oz.)	Gold (oz.)
Phoenix	611,097	16.12	116,752	23,355
Anyox	462,340	34.58	142,725	3,581
Total	1,073,437	23.99	259,477	26,936
Ores purchased	24,583	.....	118,404	4,452
Total	1,098,020	.....	377,881	31,388

During the year development at Phoenix mines added 152,872 tons to reserves, which stood at 4,232,405 tons at end of the year. At Anyox little development was done, but 187,500 tons of 2.2 per cent. ore were added to reserves, making the total 9,205,837 tons. There is a further tonnage of low-grade ore (.63 per cent. copper) amounting to 8,628,000 tons. In addition, the Bonanza mine has 414,775 tons of 2.66 per cent. ore and 489,580 tons of low-grade ore.

Of the Anyox smelter the report says: "The plant, originally designed to treat 2,000 tons of Hidden Creek ore per day, has been well arranged and constructed for the economical treatment of these ores.

THE LANE THAT HAD NO TURNING

By J. H. Patterson.

After dinner we adjourned to Strange's smoking room and over our cigars were discussing the influence of luck or chance on the affairs of men.

"Good fortune follows some men all through life," remarked Ganes, "and no matter what apparent disaster happens them it works to their advantage in the end."

"Every cloud has its silver lining," quoted Wilson, "and it's a long lane that has no turning. It is evil and good to all, just like the weather."

"I don't agree with you," replied our host, "but I suppose that you will think it heresy to contradict such ancient maxims." He went to a cabinet and brought out a beautiful lump of silver ore about the size of his fist; it was easily three-fourths metal. It was passed around and admired by all.

"Of course there is a story," I queried.

"Yes," he replied, "there is a story, and I will tell it just to prove that those wise old saws are not always correct."

"You all know the Mathews mine," he continued, "out of which I took over fifty thousand dollars worth of silver ore. Unfortunately it did not carry values to depth, but none of you know how it came to be so called.

"James Mathews was a typical prospector, rugged, raw-boned and muscular, bearded and browned by exposure to many suns. He had been in South Africa and Australia, and had spent several years in the Yukon; but had never made a discovery worth recording.

"Cobalt was just beginning to attract the attention of the world and mining men were flocking in from every quarter. Among them came Mathews, in the hope that silver might change his luck. But he was dead broke, and a friend of mine to whom he applied for a job passed him on, so he came with the request that I grubstake him, and so won me by his honesty and simplicity that I sent him north with an outfit and provisions for three months. We made an agreement to the effect that we were to share alike in any discovery he might make.

"It sometimes happens that when a man has been sent out to prospect with outfit and supplies, paid a salary and given an interest in any discovery he may make, that he will put in most of his time in the nearest hotel or good camping place and do no work whatever. I have known this to happen in more than one case.

"More than three months had passed and no word came of my prospector. One day the office boy informed me that a very ragged beggar wished to see me and would not be denied. I told him to bring him in. It was Mathews and ragged he certainly was.

"He laid the piece of ore you have just examined on my desk without a word. I was astonished at its richness.

"Well, Mathews," I said, "your luck has surely changed if you have found much of this.'

" 'It has and it hasn't,' he replied. 'I found a beautiful three inch vein of it but lost it again.'

" 'I went out as soon as I arrived in the country and worked hard as long as the grub lasted. On my way out for more I crossed a small valley. The south wall was steep and there was a little stream at the bottom. As there was water I thought that I would make some tea. I had nothing to eat. Filling my can I went up to a little knoll some sixty or a hundred yards from the stream to make my fire. As I was breaking a dead branch with my axe I accidentally scraped the moss off the rock and exposed the silver. I pulled away the moss for some distance and the vein was clear and well defined. You can imagine how delighted I was. After fifteen years of hard work I had made good at last. I did not stake as I had no food, and supposed that I could come to the place without difficulty, as I thought that I was only one day's trip from the village. I blazed an occasional tree as I went along and noted the country carefully.

" 'I had no compass with me, and as the weather was dark and rainy I got completely lost. It was not until late on the third day after making the discovery that I reached civilization.

" 'I was entirely played out, but as soon as I was able to travel I started back to where I had been working and tried to come out on my trail. I did not succeed in finding the place again, though I have been traveling the country from daylight till dark ever since, so you see that fortune has played me the most scurvy trick of all.'

"I encouraged him to hope that he would soon find his discovery again and sent him back with enough supplies to carry him on till winter. I also sent a young fellow up with him, but he was back in less than two weeks declaring that he would not work with a man who got out at daylight and traveled as long as he could see and made camp after dark.

"I heard from Mathews once, and it was not a very hopeful letter, but it was not until winter was well advanced that he came down and reported. He had not succeeded and was much cast down in consequence. The hard work he had done had told on even his rugged constitution, and he was thin and ill.

" 'I'll have another try in the spring,' he said. 'I can't be far from it now. I am dividing a block of country about six miles square by blazed lines into small areas and going over every inch. I am more than half done. I feel sure that it is somewhere within that thirty-six square miles.'

"I got him a good job here and saw him often. Always he would describe the location of the vein.

" 'One wall of the valley,' he would say, 'is quite steep and about thirty feet high. At the bottom is a small stream, which would likely be dry in summer. The knoll is nearly round, about ten feet in height and is not more than a hundred yards from the stream. It is covered with moss and the vein is there that will make us both rich.'

"He could talk of nothing else, and it seemed to me that his anxiety to make good came from a wish to know that fortune was really smiling on his as much as a desire for wealth.

* * * * * *

"Well spring came at last and as soon as the snows had melted in the north away went Mathews.

"He was as happy as a school boy at vacation and felt sure that he would soon make good. I wished to send a man along with him, but he preferred to work alone. He said that he would not write till he had some news, and it was in July when I first heard from him. He had found some of the trees which he had blazed and was now sure of finding his Eldorado before long if he was able to continue his search. If not he would write again.

"I took from this that he was not well, and at once wrote the merchant from whom he purchased his supplies, asking him to inform Mathews that I wished to

see him, and for him to advise me and remain there till I arrived.

"Early in September I wrote again and was informed that nothing had been seen of Mathews. Fearing the worst I went north. They knew him, but did not know the country in which he was working, as he never talked. As I had a general idea of where he might be I sent two men out to search for him and kept them there till winter, but they found no trace of the missing man.

"Mathews must have been very ill when he made his last trip for supplies; but believing that he was near the goal he would not give up, and going back had become worse, and so was unable to get out.

"I determined that I would find him if it was at all possible and give him a decent burial. I had become quite attached to the old fellow and of course I was quite anxious to find the silver as well.

* * * * * *

"Early next spring I had to make a trip to England, and it was June before I returned. I had a lot of business to attend to, and it was some time before I thought of Mathews. Then as I was going north I thought I would send men out on the search.

"The day before I intended to leave a man came into the office and handed me a roll of birch bark."

From the same cabinet Strange took out the roll from which he read:

"To whoever finds this, please deliver to the below address and oblige a poor prospector who is about to die. Leave me where I lie as I want the man to whom you deliver this to bury me."

"Inside was written: 'Dear Friend,—I am too weak to walk, and think that I am near my end. I have no relative that I know of, so I leave all my property to you on condition that you come up and bury me. I made my camp on a rocky knoll so my bed is hard. I should have made it in the valley by the water.

"Good-bye, good friend, and may you live long to enjoy the wealth I leave you, for me fortune still wears a frown."

"Crazy as a loon," remarked the prospector who had evidently read the letter. "He has divided the country for miles into squares of about a quarter of a mile each by blazed lines and one of them led us to his last camp. Lord knows what he thought he was doing. And then the wealth he was leaving you, I suppose he just imagined it."

"Poor old chap," I said, "it was hard to die there alone, but he was a good man and true, and I will go up and bury him. I suppose you left him as you found him." For I understood his letter at once.

"Sure we did," he replied, "and you will want to hire me to take you in."

"Certainly I will," I assured him, "and pay you well for coming down, too."

* * * * * *

In company with a friend and guided by the prospector, I set out. After a trip of two days we arrived at the valley for which poor Mathews had so long sought.

Sure enough the tent was pitched on a knoll about ten feet high. There was the valley and the little rivulet. All just as he had described them.

We dug him a grave in a little shady nook under a large birch some distance from the knoll and fenced it in with logs.

I took down the tent and removed the brush which he had for his bed. Underneath it lay the vein.

THE RECENT GOLD DISCOVERY AT KOWKASH, NORTHERN ONTARIO

By J. A. MacDonald.

The recent discovery of gold at Kowkash is especially interesting to me, for I was among the first to find traces of gold in that district. In 1905 and 1906, I was engaged in surveying the line for the new transcontinental railway north of Lake Nepigon and through the Kowkash country. The line as now constructed was laid out by our party.

With our party in 1905 and 1906 was a man who came with us principally with a view of prospecting the country. He had spent many years in gold mining in a small way along Sturgeon Lake, a hundred miles or so farther west than Kowkash. Gold mining at Sturgeon Lake has been in progress in a small way for many years. While prosecuting our surveying work and endeavoring to obtain a good preliminary line for our railway, we traversed much of the country to the north and south of the located line, and in our reconnaissance we frequently came across rock containing gold. I recall that in the vicinity of what is now called Kowkash, Mr. Frappman, the man I referred to, brought me in specimens of rock containing gold. Though the gold could be distinctly determined by the naked eye, we utilized the magnifying glasses of my transit to more readily form an idea of the value of the specimens. I took the magnifying glasses used to read the vernier of the transit, and my friend had the use of this glass for studying the specimens. I mention those facts with some little pride, and in confirmation of the truth of this recent discovery. Gold there is in the vicinity of what is now Kowkash station on the N. T. Ry.; but as to its paying qualities, or to the richness of the quartz, I have no knowledge.

All of the country directly north of Lake Nepigon contains outcrops of rock. In our work on the railway scarcely a week passed in the summer season but some specimens supposed to contain traces of gold were brought into camp. To get into that country in 1905 was a pretty difficult matter. The only route at that time, and before the N. T. Ry. was completed, was by way of Nepigon River and Lake Nepigon by canoe, and portage in summer and by dog-train in winter. By the zig-zag route we were forced to take it was an eight-day journey from Nepigon station on the C. P. Ry. to the neighborhood of Kowkash. To-day it is less than a two days' journey from Ottawa or Toronto or Winnipeg, all-rail route to within thirteen miles of the gold fields.

JEFFREY MINE FANS.

The Jeffrey Manufacturing Company, manufacturers of Tipple and Mine Machinery, have issued Bulletin No. 110 on the subject of Mine Ventilation, calling particular attention to their new "Stepped Multi-Bladed Wheel Type of Fan," which, by means of its stepped series of blades, receives and accelerates the air without shock and discharges it at low velocity, insuring maximum economy of operation. This bulletin also illustrates and describes their line of Centrifugal Booster Fans, and contains valuable data compiled to give the mine superintendent, manager or those interested in this line of work a comprehensive idea of the results obtained from various sizes of Jeffrey Mine Fans.

A free copy of this bulletin may be obtained by addressing the Jeffrey Manufacturing Company, Power Building, Montreal.

HEATING AS A PHASE OF ORE TREATMENT

By F. L. Grammer.

The ingredients lost by heating ores are chiefly moisture, carbonic acid gas, combined water and hydrocarbons, oxygen, carbon, sulphur, arsenic, chlorine and volatile substances, such as lead, zinc, mercury, which may also be driven off; but it is generally with the first four substances mentioned that we have to deal.

Usually concentrators are concerned with change of size, but not appearance nor properties, while heating changes appearance and properties, and the enhanced percentage of desired remaining substance is a virtue of heating treatment that is often overlooked.

The age of heating processes is such that the etymology is vague and confusing. Certainly the baptisms of the processes are well performed. The names usually are derived from product produced.

Clay, in its original state characterized by its plasticity, becomes by the loss of continued water rigid and hard. Limestone by the expulsion of CO_2 is converted from a durable stone to lime, a substance which disintegrates in the atmosphere. Loose coal, smoky and soft, becomes hard and smokeless in coke. Soft clear gypsum becomes white plaster. White wood becomes porous black charcoal. The word "burn" covers in popular parlance all these operations, and yet the oxidizing, if there is any, is incidental in charring and coking and possibly in brick making, and does not exist in calcining. There is a burning to get the heat, but it is a burning of coal or gas as an auxiliary.

We "burn" lime to drive off CO_2. We "burn" brick to drive off combined water. We "burn" charcoal by expelling gases from wood. We "burn" coke by expelling gases from coal. We "burn" skin by blistering it. We "burn" castings by oxidizing and reducing carbon. We "burn" the joints of lead in an acid chamber when we melt them by a flame. We most correctly burn fuel, solid and liquid, and term it combustion. In literature "burn" is a synonym for order and warmth. I have known practical people to even confuse burn and melt.

Now these processes are all associated with loss in weight. Some are distillations and some not. These operations are better designated as calcining, charring, coking, etc.

Calcining, changing carbonates into oxides by heat is a term commonly applied to the treatment of limestone, magnesite and some ores. Calcining is also applied to brick production from clay, but "burn" is in practice a more general word. Roasting also is more generally used, and neither of these last words conveys the idea of expulsion by heat.

Charring is like calcining, save that heat is often derived by partial combustion of material treated, and the volatile constituents expelled are reclaimed as distillates.

Coking is like charring, except that in coking there is a plastic or fused period. Charring is used of wood, and coking, of coal.

Where one deals with processes older than chemistry or writing, the glossary is apt to reflect early ignorance.

The term reduction covers heating with oxygen removal. Calcining might be made to cover heating without oxidation or reduction, attended by loss in weight of chemically combined material. Much inertia will be encountered in the pottery trade, however. For brick, baking is a preferable expression to burning.

Generally roasting cannot be regarded as a concentrating process, if the term roasting is restricted to oxidizing by auxiliary fuel. In pyrites the iron is raised in percentage in the residue as the sulphur burns for production of sulphuric acid. The Andean coal, which is burnt in order to ship the ash as a vanadium ore is an unusual case of concentration by oxidizing. The ash is about 20 per cent. of the coal.

Reduction is seldom carried on without later melting; but sintering devices are partial reduction and partial melting devices, and sintering is followed, as are most deoxidizing operations, by loss in weight.

Drying is simply expulsion of water held in interstices and pores.

Just as mechanical concentration, which is carried on to save fuel, remove impurities and raise the percentage of mineral sought, is usually effected at the mine in order to save freight, so we often coke at mine, char in the forest, calcine at the quarry, unless the market for by-product or superfluous heat at the smelter promises larger profits.

This ground is old. Recently two new applications have been suggested, and one of these is being carried out.

Drying iron ores before shipping.—Mr. Ruggles, in the Iron Trade Review about a year ago, showed that under existing price schedules for Lake iron ores that large returns on investment can be obtained by drying fine wet iron ores at the mine.

These driers of Ruggles and Brittner have very high efficiency in heat utilization, over 80 per cent. being attained.

While their most attractive field is in treating materials of organic origin containing 50 to 95 per cent. volatile constituents, yet with slimes—wet concentrates where moisture may run up to 20 per cent., and with very fine ores about the same—drying offers savings in freight and a better market price. Lump ores contain but 4 per cent. moisture and less; when ores are dried they often reabsorb 6 per cent. moisture from air and rain in transit in open cars and in stockpiles.

The writer thinks the inference to be drawn from the investigation is as much that the schedules should be altered, as that the ores should be previously dried completely or down to 6 per cent. Certainly drying ores in winter means easier unloading and better circulation of cars and considerable saving in demurrage. Manganese ores are bought on dry analyses, water weight being deducted. This seems sounder than the schedule obtaining for Lake ores; but is also capable of being bettered in another way.

Suppose raw wet ore contains 20 per cent. moisture and 40 per cent. iron; that a 40 per cent. ore commands 6 cents per unit and 50 per cent. ore commands 8 cents per unit; that coal cost and labor cost of drying is 37 cents, and that all forwarding is $1.80 per ton, we have then a delivered price of 43 cents in favor of drying, as indicated below:

6x40=$2.40
8x50=$4.00 less 20% loss=$3.20
$3.20 - $2.40=.80
.80 — .37=.43

Considering the tonnage a drier handles, this gives an enormous return on the money invested and suggests also that iron ores should be bought on dry analyses.

Most readers will regard this profit as fictitious, and think that the real saving is 20 per cent. of $1.80, or 36 cents, which is hardly equal to the cost of drying—if we overlooked the advantages in winter for forwarding. If the freight were $6, as on manganese ores or some slimes, the profits would be more apparent—even with more expensive fuel at isolated distant points, spots such as Russia, India, Chile and Brazil. In steamer forwarding the ore is less exposed to air and so can absorb less water, even when completely dried.

Suppose we had a fine ore with 15 per cent. moisture, that freight is $6, and cost of drying 60 cents, because coal is costly. Then we have 30 cents per ton saving. In a lesser degree drying also saves money on insurance, lighterage, unloading, railroad freight and possibly in royalties, export and import tax, demurrage, dock charges, etc. The topic is pertinent today with ocean freight at prohibitive figures and vessels difficult to find everywhere.

Heat treatment of manganese ores.—There are chemical combinations of loose bind which depart at low temperatures and which can be expelled at or near the point of origin with advantages both in freight and better price obtained.

Let us take a manganese ore with 45 per cent. manganese dry. If we expel by partial reduction 10 per cent. of its weight in oxygen, our 45 per cent. ore becomes a 50 per cent. ore. If 45 per cent. manganese brings 22 cents per unit and 50 per cent. 25 cents per unit, we have $1.35 increase in profit as indicated.

25x50=$12.50
22x45= 9.90

$2.60

Weight has been reduced 10%——$1.25
Cost of expulsion— .40

$1.65

2.60 — 1.65 = .95 cents net profit.

There is a freight saving of $6.00x10% equals 60 cents and a saving in water freight of 30 cents.

The buyer may object to receiving fine ore—but at the large shipping ports there must be much fine ore which could be handled economically, particularly if petroleum or gas is cheap.

It is a new field relatively and only sketched here. Personally I think that for electric smelting fine ores, even manganese fines, can be successfully agglomerated.

These remarks show that heat agglomeration, whether nodulizing or sintering, is accompanied by a reducing in weight, and so means usually concentration and saving in freight, duties, etc. Pressure agglomerators are not concentrators—they are diluters if a bind is added. Hence they are usually better used at the final destination.

If oxygen expulsion is done by heat and not by reducing gas, higher temperatures and more fuel will be needed. Usually only the purest pyrolusite was used as a source of oxygen; but if our economies in freight and advantages from better price will pay for oxygen expulsion by heat (not reduction), then the expelled product becomes a source of profit. I am told oxygen is now being derived frequently from fractional distillation of liquid air; but if manganese oxides—by partial expulsion—can give 3 profits one may expect an impetus to this method of obtaining oxygen.

The drier people claim it pays to dry if freight is over 3½ cents per hundred, coal below $4 per ton, and moisture over 12 per cent.

Some might expect that the drying would save money in fuel by performing work ultimately performed by the smelter. If the ore were coarse this might be so, and if there were a shortage of gas the preliminary partial reduction of ore might help; but there is a surplus of gas rich in CO in the furnace. I think little advantage can be expected from fuel saving. It might be added that the gas being lower in oxygen and CO_2, will be improved. This is no small matter where a market for gas exists.

WATER POWERS OF CANADA

The water power branch of the Department of the Interior is to be congratulated upon its enterprise in endeavoring to bring before the public a fuller knowledge of the vast water power possibilities of Canada. To stimulate interest in this subject, the branch has arranged an excellent exhibit of models and photographs of water power plants in the Canadian Pavilion at the Panama-Pacific Exposition, and it has now supplemented this work by a series of excellent monographs upon Canadian water powers for distribution at the Congress of the International Engineering Societies which met in San Francisco.

While the information contained in this booklet is intended to be brought before foreign investors and those interested in the industries that require the use of power, the subject matter forms most interesting reading to the Canadian public.

It is surprising and decidedly pleasing to be informed that in the province of Ontario, the total amount of hydraulic power capable of development is nearly 5,000,000 horse power, and that 702,000 horse power has already been developed.

In the report on Ontario powers Mr. H. G. Acres has analyzed the power possibilities of the province by grouping into districts those developments that fall together from a natural and topographical standpoint. Thus he has described the present and possible developments of the Ottawa river and its tributaries, the rivers tributary to the Great Lakes, the Winnipeg river and its tributaries, the rivers flowing into James Bay, and the international rivers of Ontario, and has outlined the hydrological and geological characteristics of each group. As a result of this, the reader is given a clear and impressive idea of the magnificent potentialities of our rivers, together with an idea of the commercial feasibility of their early development.

In the monograph by Mr. G. R. C. Conway, which is a very comprehensive record of practically all the existing water power plants at present developed in British Columbia, it will be a surprise to many to read how much has already been accomplished in the development of the water powers of the coast province. The author who, as chief engineer and consulting engineer, has been identified with the construction of several of the largest plants in British Columbia, has fortunately in the preparation of his book, received the hearty co-operation of the engineers and managers of the various power companies, and has therefore been able to give a very complete description of the

many interesting works that have been carried out during the last seventeen years, and has compiled a volume that will be a permanent record of what has been accomplished up to the present time.

Mr. Conway has prepared a very interesting table showing that already the installed capacity of turbines and impulse wheels amounts to 330,000 horse power, of which amount over one-half has been installed during the past five years—a period that has seen such great expansion in British Columbia.

In the monograph on Quebec Water Powers, Mr. F. H. Kaelin draws attention to the prominent part the extensive water powers of Quebec Province will undoubtedly play in the industrial development of the country. The Province of Quebec is extremely rich in water powers. According to Government investigation the available water powers of Canada amount to 17,000,000 horse power, of which 5,600,000 horse power is in Quebec Province. It is the author's opinion that these figures are very conservative, and could be materially increased if the flow of some of the rivers were regulated by means of suitable storage reservoirs.

In the Maritime Provinces there are about twenty strictly hydro-electric developments, with installed capacities from 100 to 200 horse power, except in one instance, where 3,800 horse power is installed. The total water power developed is believed to be about 34,500 horse power, the greater part of which is used in connection with pulp mills and saw mills. The greatest water power asset of this part of the Dominion consists in the abundance of relatively small sites in almost every part of the country, which can easily be made available for all local purposes.

One of the series of five monographs relates to Manitoba, Saskatchewan and Alberta, the Prairie Provinces, and is under the authorship of Percival H. Mitchell, E.E., of Toronto, a well known engineer and one of the consulting engineers to the water power branch.

In the consideration of the water powers of Manitoba, Saskatchewan and Alberta, two river systems stand out pre-eminently, that of the Winnipeg river in Manitoba, and the Bow in Alberta. The rapidly increasing utilization of these rivers for power purposes, the power plants at present contemplated for construction, and the value of the potential water powers not yet awarded, has required the immediate attention of the Dominion Government as to the possibilities in each case, and these demands have resulted in exhaustive investigations.

MINERS' WEEK AT THE P. P. I. E.

By F. H. Mason.

Miners' Week, September 20th to 25th, at the Panama-Pacific International Exposition, has come and gone. Whether, as a whole, it can be voted a success is doubtful, but, at any rate, for knitting up old friendships and making new it must have been gratifying to many. An engineering convention, with mining and metallurgical branches, was held during the entire week at the new, beautiful city auditorium, under the auspices of the P.P.I.E., and many interesting papers were presented. Unfortunately, in the majority of instances, the authors were absent, and only abstracts of their papers were read, and with few exceptions the discussions were of a half-hearted nature. There is the consolation, however, that many of the papers were of sterling worth, are likely to find their way into the technical papers, and can be digested at leisure.

A field meet, under the auspices of The California Metal Producers Association, The National Safety Council and The United States Bureau of Mines, was held on the lawn of the North Gardens of the Exposition grounds and competitive trials in mine-rescue work and first aid to the injured were conducted. This was undoubtedly the most interesting feature of the week; teams from eighteen different states competing. There seemed to be a plethora of prizes, which varied from a year's subscription to a mining paper to silver cups and gold medals, for these events, and, as far as the writer, who attended the presentation of awards, was able to discern, every team received some reward and everyone went home happy. The Homestake team, which scored a first in first-aid work, and the Utah Fuel team, which was first in mine-rescue work, carried off the pick of the prizes, but the contests were so keenly fought that a number of ties resulted, and, as time did not allow of the recontesting of these events, the drawing of straws had to be resorted to. The utmost praise must be given to many of the teams, who have picked up the work splendidly in a short time, and, should necessity occur, may be expected to give a good account of themselves in actual accidents.

For the tests in mine-rescue work, a "mine," which consisted of a skeleton "level," made of 2 by 4 studding, an enclosed inclined "raise," another short "level," a "winze," at the bottom of which was another skeleton "level" was provided. The "raise," short "level" and "winze" were filled with formaldehyde and sulphur dioxide. At the end of the skeleton "level," basking in the glorious Californian sunshine, was a miner who was supposed to have been overcome by asphyxiating gases. The rescue crew, equipped with oxygen helmets and apparatus, started into the "level," the captain, carrying a canary in a cage, carefully tapped the studding—I mean roof— as he went. When they reached the "raise" the captain mercifully deposited the canary on the lawn, and the team boldly plunged into the asphyxiating gases, up the "raise," along the "level," down the "winze," once more into the pure air, and along the final "level" to the "asphyxiated miner." They placed an oxygen apparatus over his mouth, and carried him back the way they had come. When the patient was brought to the "surface" he was "resuscitated" in the usual way. There were a few other obstructions, not mentioned, in the "mine," presumably caused by an explosion.

For an exhibition, made before a crowd of people, the arrangement was probably as good as could be wished, but to the practical man the trials had their comic sides, at times. Particularly was this the case when the rescue team were fixing the oxygen apparatus on the patient, and several members of the team had their feet outside the "mine."

Another instructive feature was the coal-dust explosion. For this a wooden stave pipe, 6 ft. in diameter by 120 ft. long, held together by steel rings and calculated to stand a pressure of 25 lb. to the square inch, was used. From 75 to 100 lb. of coal was distributed through this and one and a quarter lb. of black, blasting powder was fired from a cannon into it. The explosion set in motion and exploded the coal dust, causing a tongue of flame, fully fifty feet long, to issue from the mouth of the tube. An alarm was given, and five men drove up in the mine-rescue auto truck, donned oxygen helmets, and explored the "mine."

INDUSTRIAL RESOURCES OF THE NORTHWEST

An interesting five-page report of the fifty-first meeting of the American Chemical Society, held in Seattle, Washington, from Tuesday, August 31st, to Friday, September 3rd, was published in Metallurgical and Chemical Engineering Journal, New York, and that publication described the meeting as having "proved unusually successful and enjoyable." Further, "it was a somewhat 'old-fashioned' meeting in the best sense of the word, with a preponderance of general meetings over sectional sessions, with the attendance always held well together, and a true, congenial happy spirit prevailing all around." The attendance during the general meetings was nearly 200. Chief prominence was given in the report to an address by Dr. H. K. Benson, of the University of Washington, on "The Industrial Resources and Opportunities of the Pacific Northwest." The following are excerpts from the address:

"The Pacific Northwest constitutes an industrial unit which comprises the States of Oregon, Idaho and Washington, the Province of British Columbia in Canada, and the Territory of Alaska. Although composed of different political parts, whereby the natural course of industry may be hindered or benefited, yet the ultimate outlet for commodities is largely confined to the cities touching the waters of the Pacific Ocean. Material development of any portion of this area is felt throughout all of it. While it would be of great interest to discuss the potentialities of the Pacific Northwest as a whole, the lack of published data would make it necessary to collect and compile at first hand much of this information. Time does not permit of such an extended investigation of this at present, and it is proposed, therefore, to present in some detail the resources of the State of Washington as a typical example of what may be found in varying degrees throughout the entire Pacific Northwest.

"The total area of the Pacific Northwest includes nearly a million and a quarter square miles, distributed as under:

	Square Miles.
Oregon	96,607
Washington	69,180
Idaho	83,888
British Columbia	395,500
Alaska	586,400
Total	1,231,575

". . . . While a large portion of Alaska is mountainous, less than one per cent. of its area consists of permanent snowfields, and its agricultural valleys contain as much tillable land as is cultivated in the States of New York, Pennsylvania and Ohio."

After dealing generally with the lumber, fisheries and fertilizer industries, Dr. Benson proceeded:

Coal and Oil.

"In the past the industrial welfare of a community was dependent upon its nearness to a coal deposit, but in the Northwest coal has competitors in the great quantities of oil from California and the electrical power of the mountain streams of the Northwest. The annual production of coal in the State of Washington is nearly 4,000,000 tons, while that of British Columbia is 2,500,000 tons. The total supply of coal in the Pacific Coast States is estimated by Campbell and Parker at 22,000,000,000 tons, of which 20,000,000,000 tons is in the State of Washington. The coalfields of Alaska cover 12,667 square miles. The estimate of the United States Geological Survey places minimum coal resources of Alaska at 150,000,000,000 tons, which is far in excess of the original coal supply of Pennsylvania. Unlike the latter, however, much of this coal consists of lignites, the utilization of which calls for new methods and processes. Even in the State of Washington and adjacent to the coalfields themselves fuel oil transported from California displaces annually a quantity of coal greater than that consumed.

Water Power.

"The water power resources of the Pacific Northwest constitute an important factor in power production. The estimated developed water power of the Pacific Northwest, exclusive of Alaska, exceeds 650,000 horse power. The estimated undeveloped power of the Columbia River basin is approximately 20,000,000 horse power, or one-third of all the undeveloped water power in the United States, and equivalent to all the water power found in the twenty-six States east of the Mississippi River. Within economical transmission of our larger cities on tidewater may be generated at least one-fifth of the available water power of the United States, exclusive of Alaska. The water power resources of the latter are said to exceed those of the Pacific Coast States.

Mineral Industry.

"Much has been written of the mineral industry of Alaska and the Northwest, and it would become tedious to particularize concerning its extent and importance. The annual production of gold and silver in normal times is approximately $35,000,000. For the year 1913 the production of copper was valued at $11,300,000, of lead at $15,600,000, and of zinc at $2,500,000. The development of deposits of minor minerals has not been extensive, due to their remoteness from suitable smelting facilities. On the Seward peninsula is a tin-bearing district of 450 square miles. Alaska has produced since 1902 more than 560 tons of tin. Antimony ores are found in Alaska and Washington, molybdenum in British Columbia and Washington, tungsten in Alaska and Washington, while platinum is found in the sluice boxes of many of the placer camps of Alaska. Arsenic ores abound in the Monte Cristo district of Washington, and are smelted with the recovery of white arsenic at the Everett smeltery.

"Graphite, gypsum and barytes exist in commercial quantities in Alaska. In Washington and adjoining portions of British Columbia occur the only large deposits of limestone situated on deep water along the entire Pacific Coast of the United States and Canada. Extensive deposits occur in the northern tier of counties from Puget Sound to the Idaho boundary. These deposits constitute the sources for six Portland cement, one hydrated lime, and numerous lime-kiln plants within the State of Washington.

"Clay deposits suitable for use in common brick manufacture are widely distributed throughout the Pacific Northwest, as are also those adapted to the manufacture of drain tile. In numerous places are also found deposits of clays which can be used for the manufacture of paving brick, sewer tile, terra cotta and firebrick. Both Washington and British Columbia are now producers of refractory brick of a high grade. Washington now ranks fifteenth in the production of clay products in the United States, forty-five firms being engaged in the industry and producing annually wares valued at more than $2,000,000.

"Deposits of diatomaceous earth of superior quality have been investigated in five places within the State of Washington. Apparently enormous quantities of this

material exist in this State. Deposits of magnesium carbonate and other magnesium salts have been reported, but have not been utilized. Among other raw materials available in the Pacific Northwest are iron ores suitable for mineral paints and perhaps for pig iron; talc for use as a filter in paper manufacture; silica for glass, and sand, lime, brick and large deposits of stone for structural purposes. Among the latter especial mention should be made of the Alaskan marble and of the granites and sandstones of Washington. At least three extensive deposits of tufa rocks occur in Oregon and Washington."

BETHLEHEM STEEL

How Bethlehem Steel, which a dozen years ago was a creditless corporation hardly able to pay its 3,000 employees, rose to its present position under Charles M. Schwab, is being told in series of copyrighted articles in the New York Herald. The corporation to-day employs 40,000 men, has $300,000,000 of contracts for material for domestic and foreign consumption, and is spending more than $40,000,000 in extensions and improvements.

Mr. Schwab first bought Bethlehem Steel Co. in 1902, when he was president of the Steel Corporation. "I cut loose from the Steel Corporation," Mr. Schwab is quoted, "because it was managed in New York and not in Pittsburgh. The directors did not give me the freedom of action I desired. I determined to reorganize Bethlehem Steel and have it managed entirely on the ground."

After buying Bethlehem Steel for $15,000,000, J. P. Morgan persuaded Mr. Schwab not to retire from the presidency of the Steel Corporation at that time. Mr. Morgan took Bethlehem Steel off his hands and held it for two years, at the end of which time Mr. Schwab retired from the Steel Corporation and organized United States Shipbuilding Co., to which Bethlehem Steel was sold. When the shipbuilding company failed, Mr. Schwab was left with Bethlehem Steel on his hands.

The number of men employed by subsidiaries of Bethlehem Corporation are given as follows: Fore River Shipbuilding Corporation, Quincy, Mass., 5,000 men; Union Iron Works Co., San Francisco, 3,000 men; Harlan & Hollingsworth Corporation, Wilmington, Del., 2,000 men; Bethlehem Chile Iron Mines Co., 2,000 men; Juragua Iron Co., Cuba, 1,000 men. There are numerous other subsidiaries employing less than 1,000 men each.

Concerning the fourteen "boys" (directors of Bethlehem Steel and heads of departments) Mr. Schwab said: "I determined to train the prospective heads of Bethlehem Steel Co. as Mr. Carnegie had trained his boys. I selected for the dozen heads I required boys who already were at Bethlehem. Most of them were born there. I felt sure that under different direction they would all make a signal success. Not one of those boys has slipped a cog. They are the life and soul of Bethlehem Steel Co."

Among the "boys" mentioned by Mr. Schwab are "Gene" Grace, who became president of Bethlehem Steel Co. in 1912 when he was 35 years old, and who is described by Mr. Schwab as "the greatest steel man in the country." He went to work for Bethlehem as a laborer, and was "discovered" when he was running a crane at $15 a week. Another is Archibald Johnston, vice-president of Bethlehem Steel Co. None of the Bethlehem Steel officials, it is stated, gets a salary of more than $100 a week, though their incomes range from $100,000 to $1,000,000 a year, due to premiums on production or economical management of their departments.

"There is absolutely nothing in talk that I am going to retire," Mr. Schwab is quoted as saying. "I shall never stop work; never give up Bethlehem so long as I live. The mills and the men who make them are my life, which is dedicated to their progress and improvement. I propose to make Bethlehem bigger and better, and the money I make will go right back into the plant. I want to make it the highest possible success—the steel standard of the world."

Project which paved way for Bethlehem to crown herself with the diadem of the largest steel plant in the world was conceived in 1857, when residents of the vicinity obtained a charter for the Saucona Iron Co. to build an iron works on banks of the Lehigh River at South Bethlehem, Pa.

First steel to be made by the bessemer process was produced at Bethlehem, October 4th, 1873, and the first bessemer steel rail was rolled two weeks later. In 1886 construction of an armor plate works was begun and in 1887 contracts were taken from United States Government for armor plate and gun forgings.

Under Mr. Schwab's management the Bethlehem Steel Co. has been a leader in the design and development of ordnance equipment, which is used at this moment by every nation on earth. During the decade of his reign the South Bethlehem works have been quadrupled in size. The South Bethlehem plant now covers an area of 1,350 acres and more land continually is being added or acquired.

One of the greatest factors in the overwhelming success of Bethlehem Steel is not only that it owns and operates ore mines, but that its supply in far off Chile and Cuba is so much purer than the domestic deposits which are at its doors, that the consequent economic benefit is more than enough to offset seeming advantage of proximity.

Tests of shrapnel are most rigid at Bethlehem. One per cent. of all shells it makes are exploded and fragments are recovered as far as possible, carefully counted, weighed and placed together. Number of pieces of one armor-piercing shell recently recovered was more than 1,000.

MICHIGAN COPPER SHIPMENTS.

Marine records of copper shipments by water disclose the interesting fact that the biggest individual shipment of red metal by boat was made on November 22nd of 1914, when the North Sea of the Mutual Line cleared from the Michigan copper country with 5,475 tons of lake copper, a cargo valued at $2,000,000. This shipment was approximately twice as large as any previous boatload of copper from this district, and is a record that will probably stand for all time as it was a risk the insurance companies will not care to accept again.

To date the shipment of copper from this district by water is approximately 25,000 tons over the corresponding time in 1914, and the total increase will be in the neighborhood of 50,000 tons for the entire season. That this will be accomplished is substantiated by the statement that copper has been moving more rapidly in the last few weeks than for the previous month.

Lake copper shipped by boat to the end of August, 1915, totaled 40,692 tons, while the total water shipment for 1914 was 54,734 tons from copper country ports.

GOLD MINING IN YUKON

The "Nelson Mining News," under date of September 15th, printed the following from a Dawson correspondent:

The Yukon territory has contributed to the outside world approximately $185,000,000 in virgin gold. This sum has come chiefly from the placers within fifty miles of Dawson. Other rich creeks within one hundred miles of Dawson have furnished the bulk of the remainder, though a portion has come from more distant locations.

Since 1910 the shipments from Dawson have approximated $5,000,000 annually. Last year they went slightly under $5,000,000 and a little below the total of the year previous, the slight shrinkage being accounted for to considerable extent by the breaking down of one of the largest dredges just as it got into the best of pay. The same dredge has been out of commission all this season, undergoing repairs, and it is not certain when it will resume work, so that it is not aiding in this year's totals.

Another dredge, which worked most of last year on Bonanza, is idle this year. But, notwithstanding the idleness of the two dredges, the other dredges are making a splendid showing. The Yukon gold dredges have been in some of the richest ground this year that they ever worked, and as a consequence the total yield for this season of the Klondike camp is ahead to-day of what it was at this date last year.

The Yukon Gold Company worked one virgin claim, No. 21, on Eldorado, this season, from which an enormous sum was taken. The claim was bought in the early days of the camp by John J. Healy, the veteran frontiersman, for the N. A. T. & T. company, and never was worked.

Representatives of the two companies say nothing of the total cleanup, but rumor has it that the dredge got fully half a million dollars in gold. Some Eldorado claims yielded much better than that by old methods. T. S. Lippy, of Seattle, is said to have cleaned up more than a million and a half from No. 16 Eldorado, and No. 17, which was owned by Jim Hall, was a marvelous producer.

Both of those claims, like nearly all the best Eldorado properties, were worked by steam thawing and hoisting methods. The old system required five or six years to work out a claim, whereas the dredges now work out several of the claims in a single season, and take up several feet of bedrock and get much gold which the miners, by the old methods, could not get.

Although the yield now is slightly lower than a year or two ago, and Bonanza and Eldorado are worked by the new methods to a large extent, other creeks which have been under preparation for the new methods are expected to begin yielding in another season. The Treadgold properties on Dominion and Quartz creeks, totaling many miles, have been in preparation for several seasons, and the first excavator or machine for working there on a large scale has just arrived and is now being hauled to the creek and is to be set up this fall.

Mr. Treadgold is expected to arrive here this fall to see it work. The machine was worked in England as a test before being sent here. Similar excavators are used for other classes of mining on an extensive scale in other parts of the world.

The gold produced in the Klondike camp now by dredges comes chiefly from the Klondike River between Bear and Bonanza creeks, and from Bonanza, Eldorado, Hunker and Gold Run creeks. The largest hydraulics are along Banzan benches and Eldorado benches. Milvain is working a dredge on Miller creek. Individual productions also come from Sulphur, which now leads in activity on old time methods; Quartz, Gold Bottom, and a few claims along other old time creeks near the city and elsewhere in the territory.

It has been estimated by some that the placers in the old Klondike district, that is within fifty miles of Dawson, still contain $130,000,000 to $150,000,000. The Treadgold properties on Indian River, Dominion creek, Quartz creek, Sulphur and tributaries alone aggregating 75 miles or more, have been estimated in the company's prospectus to contain fully 300,000,000 cubic yards, carrying 30 cents to the yard or $90,000,000. It was stated some time ago that eight miles of gravel between Bear and Bonanza creeks on the Klondike remaining to be worked and carrying gravels worth 22 cents a yard, contain fully $20,000,000.

The Yukon Gold Company's properties remaining in the camp are believed to contain fully that much if not more. They include besides properties on Hunker, Eldorado and Bonanza not yet worked. A large portion of Gold Run, Upper Gold Run, comprising 70 claims, also is practically unworked. The Yukon Gold controls Gold Run from 45 to the mouth. Many other creeks in the territory also are being worked by individuals and may yet yield millions.

Creeks which have been looked on as possible dredge propositions, but which are yet in the hands of individuals, include Gold Bottom, All Gold, Eureka, Clear, Barlow, Scroggie, Mariposa, Henderson, Barker, Thistle, Britannia, Canadian, Nansen, Livingstone, Big Salmon, some of the Kluane creeks, Highet and several others of the Mayo district, and a long mileage on McQuesten, many miles on Fortymile and tributaries, while below the Yukon boundary are numerous creeks in the gold belt in the Circle district, including Independence, Mammoth, Mastadon, Woodchopper and Coal creek; the several creeks about Eagle and others on which individuals have taken much gold.

If the Treadgold excavator works as estimated, it will bring many of the lower grade creeks into the producing zone which years ago never were dreamed of as being workable at a profit, but which are indicated to contain such pay that were they in a thawed zone would produce multiplied millions even by the old dredge methods. Some predict that ground sluicing and scraping or excavator methods, if not dredging, will yet win their golden treasure, and good profits to the operators.

NOVA SCOTIA STEEL.

New Glasgow, N.S., Sept. 29.—A meeting of the Nova Scotia Steel and Coal directors was held at the head office of the company, New Glasgow, to-day. The meeting was attended by Governor J. D. McGregor, Halifax; W. D. Ross, vice-president, Toronto; J. Walter Allison and George S. Campbell, Halifax; W. H. Chase, Wolfville; Frank Stanfield, Truro; R. E. Chambers, James C. McGregor and President Thomas Caullen, New Glasgow.

The general manager submitted statements relative to the business of the company for the past month, which was considered most satisfactory.

The output of shells for September was the largest yet shown, being forty per cent. over that of August. The orders on hand were reported as being equal to six months' full capacity of the plant at its present high rate of production. It is reported that the meeting also discussed some further large orders. A further proposal as to additional foreign cars was also under discussion.

The payroll for the past two weeks was $75,000 and the wages paid by the company in its steel plant at New Glasgow alone is now at the rate of $150,000 per month, by far the greatest in the history of the company.

WATER POWERS OF LABRADOR

By J. W. McGrath.

The peninsula of Labrador, although only explorations and prospecting of the most general nature have yet been conducted over its area, has given some notable indications of the existence of mineral ores. Last year another valuable deposit of copper was discovered. The deposit is owned by W. H. Taylor & Co., who I understand, have determined to make an attempt this season in way of development.

All the other high grade ores that have from time to time been discovered on the coast have so far, without exception, remained unworked. The comparative isolation of the district has served to dampen greatly the enthusiasm of prospective investors.

What would enhance the value of these properties if worked are the facilities in the nature of water powers that are present and which can be acquired at ridiculously low figures. This is so because of the number of powers that exist there, and the enormous sizes of many of these powers. Labrador has been termed the land of fish, the land of ice, and many other half truths. But as the region becomes to be more and more known and explored it will be termed, and correctly so, the land of the cataracts.

Labrador is a Region of Cataracts.—Take Labrador from the whole of the area of Canada and possibly 15,000,000 horse power could be developed; include Labrador and the potential water power jumps to 25,000,000.

The largest of the number of large falls there is the Grand Falls. This has a head of 302 feet and, if harnessed, would produce 120,000 horse power. If the twelve miles of rapids above and below the main falls are included it has a head of 760 feet and is capable of producing 300,000 horse power. and this is the most conservative estimate that has yet been made. Dr. A. P. Low, of the Geological Survey, estimated that the main falls could be made to yield 1,500,000 horse power, which, taken conjointly with the smaller rapids above and below, would give an estimated aggregate total of 3,600,000. These figures as compiled by Dr. Low were only given as approximations and are without doubt much too high.

In his description of the Grand Falls, Dr. Low has written "Such a fall would not be extraordinary for a small stream in a mountainous country, but is phenomenal in a great river like the Hamilton. The basin into which it precipitates itself at this point is nearly circular and about two hundred yards in diameter. It is surrounded on all sides by perpendicular rocky walls 500 feet high, except at the narrow cut at the head of the falls and where the river issues from the basin. The noise of the fall has a stunning effect and, although deadened because of its enclosed position, can be heard for more than ten miles away."

Mr. Henry G. Bryant, who has written a pamphlet on this falls, says, in part: "The height of the fall may be considered something more than three hundred feet, the vertical height of the chute thirty-two feet, and from the head of the chute to the surface of the water in the chasm about three hundred and forty-eight feet. The Grand Falls of Labrador . . . are nearly twice as high as Niagara and are only inferior to that marvellous cataract in breadth and volume of water." This great falls is situated on the Hamilton River which flows into Hamilton Inlet. To date it has been left to boom over the rapids unharnessed.

The falls next in importance, when both convenience and size are taken into consideration, is the Muskrat Falls. This fall has a head of something over seventy feet. In horse power it is capable of supplying 90,000. It is most conveniently situated, being about six miles from the tidal waters. On this same river in succession are a series of large rapids, the largest of which are the Minipi rapids, the Horse Shoe rapids and the Gull rapids, all of which contain large bodies of water.

The water powers are not confined to any particular area; but are most evenly distributed over the whole of the peninsula. In the district farther north from that which contains both the Grand and Muskrat Falls, are several gigantic bodies of water. At Nakvak the Great Silver Falls leaps 400 feet into the sea.

In the southernmost portion of Labrador, the giant falls have changed into numbers of rapids ideally situated for any hydraulic purposes, all being practically on tidal waters. There are here a multiplicity of smaller rapids capable of producing from five hundred to five thousand horse power. Rapids that are much larger than these are the Eagle rapids on the Eagle River, and the Gilbert rapids on the Gilbert River.

Flowing into the Straits of Belle Isle and the Gulf of St. Lawrence are the rivers St. Augustine, Esquimaux and Roman. At different points up these rivers are located splendid water falls, which with a minimum of expense could be made to produce large water power.

In that portion of Labrador known as Newfoundland-Labrador, perhaps the best water falls are contained, and these are especially easy to acquire at very low cost. One of these water powers was granted last spring by the Newfoundland Government to the Newfoundland Products Corporation on condition that this corporation keep an agreement made to the Newfoundland Government to establish an industry for the production of ammonium phosphate in Newfoundland. The agreement ran in part: "The Government will grant the company a water power on the Hamilton River from the head of Lake Winoeapan to the sea, or an equivalent water power on the Northwest River, Labrador," on the conditions stated above.

The company in return for this concession has undertaken to furnish up to 50,000 horse power to all persons or companies operating within one hundred miles of their power houses.

If development is to take place in mining in Labrador the water powers will be in demand. The coast is so remote that to deliver coal there even in the largest quantities would cost from $8 to $10 per ton; hence the value of these water falls to the district is readily discernible.

All mining operations therefore will be through the medium of hydraulic electrical power, which while being absolutely necessary, is cheaper than coal.

BOOK REVIEWS.

Mining World Index of Current Literature—Vol. VII. First Half Year 1915—by Geo. S. Sisley, Associate Editor Mining and Engineering World—Price $2.00 —For sale by Book Department, Canadian Mining Journal.

The Mining World Index is one of the most useful publications for those who have occasion to consult the literature on mining, metallurgy and kindred subjects. Articles published in technical journals, reports, books, etc., in America, Europe, Africa and Australia are carefully indexed in a manner which makes search easy.

HOLDINGS OF THE INTERNATIONAL NICKEL CO.

The listing application of the International Nickel Co. to list the securities of the company on the New York Stock Exchange stated that the company's ore deposits are located in the Sudbury nickel range, Ontario, being 36 miles long and 16 miles wide. About $500,000 spent in the last two years for diamond drilling and development has resulted in uncovering of paying ore estimated at 57,000,000 tons, sufficient, at present rate of consumption, for more than 50 years.

The ore consists of sulphides of copper, nickel and iron, with copper contents ranging up to 3 per cent. and nickel up to 4 per cent. The sulphides are largely massive and remarkably free from rock, so that only small expense is entailed for sorting and no concentration system is necessary. For each ton smelted a charge against earnings is made, based on estimated life of the mines, that their capital value may be amortized at extinction of the ore bodies.

The main ore supply is the Creighton mine, served by two 3-compartment shafts. Shaft No. 1 is down 300 ft. and No. 2, 700 ft. An underground crushing plant of the sixth level mines, crushes and sorts about 75,000 tons a month. The company is spending about $750,000 on a new shaft, shaft house and crushing plant. The new shaft has five compartments, and is amply sufficient to handle such increased tonnages as may be required for many years.

The Crean Hill mine supplies ore higher in copper ratio. Its shaft is down 500 ft., and its machinery hoists, crushes and sorts about 1,000 a day. No. 2 mine shaft is down about 1,100 ft. and handles about 400 tons a day. No. 3 mine has two shafts, each 300 ft. deep and fully equipped. It is unworked at present, but has a capacity of 40,000 tons a month.

The Vermilion mine, located about a mile from Cream Hill, is in process of development on account of possible occurrence of precious metals.

Canadian Copper Co., a subsidiary, has capital investment of $6,123,385 in buildings, machinery and equipment. The smelter and principal plants are at Copper Cliff, Ontario, and consist of seven large blast furnaces, five basic converters and large reverberatory plant with a capacity for treating 100,000 tons monthly. The company also owns 20 miles of main line and yard tracks directly connected with Canadian Pacific and Algoma Eastern Railway, the latter connecting with Canadian Northern.

The company's refineries, known as the Orford Works, are located at Bayonne, N.J. They consist of five large nickel furnaces, 31 calcining furnaces, five refining furnaces, two copper cupolas and five copper reverberatories, with necessary converting equipment.

The Huronia Co., Ltd., another subsidiary, owns water power rights on the Spanish River, and 3,865 acres. The water power has been fully developed and the hydro-electric plant at High Falls, Ont., develops 12,000 h.p. with which the mines and smelters at Copper Cliff are supplied. The plant, dams and other parts of the work cost $6,801,089.

The Nickel Corporation, Ltd., and the Societe Miniere Caledonienne, both subsidiaries, own 9,217 hectares of mineral land and are joint owners of 3,848 additional hectares in the island of New Caledonia. Properties are not being operated except some small mines working on a royalty basis.

WASHINGTON ORE TO TRAIL, B.C.

During nine months of the current year, ended Sept. 30, mines situated in the State of Washington shipped 23,630 tons of ore to the Consolidated Mining and Smelting Co.'s smelting works at Trail, British Columbia. In addition, ore was shipped to the Granby Consolidated Co.'s smeltery at Grand Forks and the British Columbia Copper Co.'s works at Greenwood, but no particulars of the shipments to the two Boundary district smelteries mentioned have been received. Both Grand Forks and Greenwood have a decided advantage over Trail in the matter of distance from mines in Republic camp, though not in similar degree where those tributary to the Spokane Falls and Northern Railway, now part of the Great Northern system, are concerned. The railway distance from Republic, in which camp are situated most of the Washington mines that ship ore to British Columbia, to the smeltery at Grand Forks is only 37 miles; to the reduction works at Trail it is 134 miles. Against these short distances is that by Great Northern Railway from Republic via Spokane, Everett and Seattle to Tacoma, 558 miles. Under such long-haul conditions necessarily the ore goes to smelting works in connection with shipment to which freight charges are so much lower. To what extent the position will be affected when the smeltery at Northport, Washington, shall be again operating remains to be seen.

Of the total quantity of Washington ore received at Trail during the period above mentioned, 19,774 tons was from Republic Camp mines, 3,223 tons from Chewelah, 439 tons from near Bossburg, and the remaining 194 tons from a number of other properties also situated within easy reach of the Trail works. Particulars are as follows:

Mines.	Tons.	Tons.
Republic—		
Ben Hur	11,113	
Knob Hill	2,174	
Lone Pine	1,594	
Pearl	117	
Rathfon	335	
San Poil	1,394	
Surprise	2,390	
Trade Dollar	129	
Western Union	448	
Wiseman	80	
		19,774
Chewelah—		
United Copper		3,223
Bossburg—		
Bonanza		439
Sundry Small Shippers—		
D. Jones, and others, Nighthawk	82	
Old Dominion, Colville	41	
Inland, Bonanza	12	
Gold Cord, Keller	4	
P. LaPlant, Old Boundary	21	
Sunday, Meyers Falls	34	
		194
Total		23,630

During the corresponding period of 1914 the total receipts of Washington ores at Trail were 12,881 tons, of which 10,739 was from the Ben Hur and 1,130 from the Knob Hill Mine; the remaining 1,012 tons came from fifteen small shippers.

PERSONAL AND GENERAL

Mr. A. L. Bass, formerly superintendent of the B. C. Copper Co.'s Lone Star mine, situated across the International Boundary line and immediately south of Boundary district, has been appointed assistant superintendent at the company's Mother Lode mine, near Copper Co., at Butte, Montana, late in September, accompanied by Mr. R. C. Nowland, of San Francisco, California, field engineer for Mr. D. C. Jackling, to the Valdes group of islands, situated between Vancouver island and the Mainland of British Columbia, to examine the Valdes Copper Co.'s group of mineral claims on Quadra and Steep islands.

Mr. J. C. Buchanan, of Fort Worth, Texas, who is largely interested in the Yankee Girl mine, near Ymir, Nelson mining division of British Columbia, was at the mine recently on a visit of inspection.

Mr. Chas. F. Caldwell, of Kaslo, B.C., who for some years has been manager of the Utica silver-lead mine, in Ainsworth division, intends to give attention to the Pontiac mine, on Woodberry creek, leaving the active supervision of the Utica to Mr. Clyde White, son of Mr. Oscar V. White, of Sandon, Slocan.

Mr. Clarence Cunningham recently returned to Spokane, Washington, from another visit to the Slocan district, British Columbia. He and Mr. J. P. Keane are reported to have made temporary arrangements for the use of the concentrating plant near Roseberry, Slocan lake, where they will resume the concentration of custom silver-lead-zinc ores, which business was interrupted by the destruction of fire two months ago of the Ivanhoe mill at Sandon, that had been leased and operated by them.

Mr. R. D. Fetherstonhaugh has gone to Edmonton, Alberta, after having been on the Finlay river, which joins with the Parsnip river to form the Peace river. It is stated he has been investigating placer-gold prospects on the Finlay.

Mr. Edward H. Hamilton, manager for the Virginia Smelting Co., at West Norfolk, Virginia, U.S.A., was on the Pacific coast recently, having been one of a party of engineers who visited Victoria and Vancouver on their return journey east from a trip to the Panama-Pacific International Exposition. In Victoria he renewed an old-time friendship with Mr. W. Fleet Robertson, provincial mineralogist, to whom he was known in the early eighties of last century at McGill University, from which Mr. Robertson graduated in Applied Science in 1880 and Mr. Hamilton in 1884.

Mr. Gomer P. Jones, general superintendent for the Hedley Gold Mining Co., on the occasion of the fiftieth anniversary of his birthday last month, was the recipient of a silver loving cup suitably engraved, which was presented by the staff and other employees of the company, in the service of which he has been for between fifteen and sixteen years.

Mr. Frederic Keffer, of Spokane, Washington, last month arranged to leave that city early in October on a trip to the Panama-Pacific International Exposition, going to San Francisco via Portland, Oregon.

Mr. Oscar Lachmund, general manager for the British Columbia Copper Co., left Greenwood on September 13 for San Francisco, to there attend the meeting of the American Institute of Mining Engineers and visit the Panama-Pacific International Exposition.

Mr. R. G. McConnell, Dominion Deputy Minister of Mines, when in British Columbia several weeks ago, went to see the Molly molybdenite mine, distant 14 miles from Salmo, in Nelson mining division.

Mr. O. S. McKenzie, of San Francisco, after having been to see some of the ore showings in Franklin camp, Boundary district of British Columbia, went to Nelson, where it was announced he would investigate some mining properties in West Kootenay.

Mr. Dudley Michell, instructor in First Aid and Mine Rescue Work for the Provincial Department of Mines, returned to Victoria, B.C., on October 2, after having been to San Francisco, where he was one of the judges in the mine-rescue competition held at the Panama-Pacific International Exposition.

Mr. W. G. Norrie, who for a while after leaving Vancouver, B.C., was at the Consolidated Mining and Smelting Co.'s works at Trail, is now superintendent of the Silver Standard Mining Co.'s mine on Glen mountain, four miles east of Hazelton, in Omineca mining division, British Columbia.

Mr. J. M. Turnbull, who in 1897 graduated B.A. Sc. from McGill University, left Trail on September 23 for Vancouver, to enter upon his new duties of Professor of Mining Engineering, with Mrs. Turnbull, was presented with a silver coffee pot by members of the Trail Lawn Tennis Club.

Mr. W. E. Zwicky, of Kaslo, B.C., manager of the Cork-Province mines and concentrating plant, has been quoted by the Nelson Daily News as having stated that the raise from the long crosscut tunnel in the Payne mine, near Sandon, Slocan, would be 720 ft. in length. Later advice is that the raise has broken through to the old No. 8 level of the mine.

The directors of the Rambler-Cariboo Mines, Ltd., are reported to have declared a dividend of two cents a share, half to be payable on October 15 and the remainder on December 15. The total amount to be distributed is $35,000. The Kaslo "Kootenaian" states that it is twelve years since the company paid a dividend.

Mr. C. H. Poirier is in Duluth.

Mr. R. B. Lamb has transferred his office from Toronto to New York.

Mr. S. W. Cohen is in California.

Mr. M. W. Hotchkin, formerly mine superintendent of the Tough-Oakes mines, Kirkland Lake, is now manager of the Kenzie property, Boston Creek, Ont.

Mr. J. A. Baker is now on the staff of Moose Mountain, Ltd., at Sellwood, Ont.

A Ketchikan, Southeast Alaska, correspondent of Mining and Scientific Press, states that the Granby Consolidated Co. is shipping nearly 12,000 tons of ore a month from the Mamie mine at Hadley, and more than 3,000 tons from the It mine, near Kasaan. Both mines are situated on Prince of Wales Island. The ore is shipped to the company's smeltery at Anyox, Observatory Inlet, B.C. The company's report for its last fiscal year has not yet been received, but in that for the year ended June 30th, 1914, its superintendent of mines reported of these two properties as follows: "Mamie—The ore here (135,200 tons) will average 2.25 per cent. copper, and from 25 to 30 cents gold and silver. The ore has a value also as a flux. Undoubtedly a small amount of development work will increase the tonnage in sight to a great extent." "It-Dean—We have done so little work here that it is not possible to deal accurately with tonnage and value. We have at least 5,000 tons of ore that will run from $15 to $20 a ton. The properties are fully equipped and mining costs should not be excessive. We are very well pleased with the results so far obtained."

JOHN McMARTIN

The story of Canadian finance contains many romantic figures, but few whose career towards eminence in the financial world has been more interesting than that of John McMartin. Like a great many other Canadians who have gone to the top, the subject of this sketch was born with no silver spoon in his mouth. He had his own way to make in the world—and made it. To-day there are probably few more wealthy men in the country.

Descended from Scottish United Empire Loyalist ancestry John McMartin first saw the light of day in Glengarry, Ont., a district which has produced many remarkable Canadians. After receiving an education in the schools of his native place he set out at the early age of sixteen to carve his own niche in the commercial Hall of Fame. His first experience was in railroad construction work. At that time the Dominion Government had in hand the construction of a section of road near Port Arthur, which now forms part of the Canadian Pacific Railway system. With that thoroughness which is so strong a characteristic of the Scottish-Canadian generally, John McMartin made himself acquainted with every detail of the business of railroad construction. Lumbering experience in the State of Michigan followed the early railroad experience, and by this time, having attained a degree of confidence in his own ability, as well as a perfect knowledge of the business, he started operations on his own account.

As a builder of railroads John McMartin achieved considerable success, and while yet a young man was on the highway to fortune. If he had continued in his business there is little doubt that the time would have come when John McMartin would have acquired considerable wealth in the ordinary way of business. One of those curious freaks of fortune, however, which are said to occur at least once in the life of every man, brought Mr. McMartin into contact with the mining industry and with what was destined to be the greatest mining boom Canada had ever seen. Along in 1903 one Fred La Rose, a blacksmith by trade, employed on the construction of the T. & N. O. Railway, took to prospecting in his spare hours.

The outcome of the prospecting of La Rose was the discovery of the mine which later took the name of the La Rose Silver Mine. When the matter of registering claim, proving title and commencing mining operations came to be dealt with, difficulties were encountered in claims to the property made by other parties on the ground of prior discovery. The ensuing litigation, which was carried through the Canadian courts and to the Privy Council, is still remembered by many Canadians interested in financial and mining matters. All this litigation cost considerable money and the expenditure was made always with the prospect of the property failing to show return for the outlay made. In this way Mr. McMartin was one of the first, if not actually the first, to lay out any considerable sum of money on the development of Cobalt properties.

That his tenacity was well rewarded is now a matter of history. By perseverance and holding on to every point gained he and his associates made a fortune out of their Cobalt interests. Subsequently there came the discovery of valuable deposits in Porcupine, and to these the attention of the McMartins and others were drawn. Here again Dame Fortune smiled bountifully and, in conjunction with his brother, the Timmins brothers and D. A. Dunlap, John McMartin became part owner of the mine that was eventually to become more famous than their first property—the Hollinger.

When the news of the huge potential wealth of the Hollinger deposits began to be bruited about it was received, of course, with a certain amount of scepticism. The expenditure of considerable sums of money in preliminary development work was necessary before any of the actual wealth of the Hollinger could be laid bare. Porcupine properties at the outset had not met with success, and it was predicted that the Hollinger would meet with no more success than other prospects. Under these circumstances John McMartin and his associates hesitated to go into the market seeking public money for development work. They were prepared to stand or fall by their own personal expenditure on the property, and it was not until it was proved beyond the shadow of a doubt that the Hollinger was a real gold mine that the Hollinger Company was actually put on the market. Since those days many fortunes have been taken out of the Hollinger mine, and John McMartin and his original associates, the Timmins brothers and Duncan McMartin's estate still retain control of the company.

Mr. McMartin is also heavily interested in mining properties in British Columbia and in real estate in the Canadian West and Labrador.

Mr. McMartin is a Liberal in politics and, according to recent reports, has been approached with a view to representing in Parliament the constituency in which he resides.—Financial Times.

OBITUARY

Andrew Gordon French, who died on August 16 last at his home at 4 Anne street, Glasgow, Scotland, in his seventy-eighth year, was well known in Nelson, where he spent several years working on the French process for the treatment of complex ores, which treatment the Provincial Government has decided to support financially in the reopening of the smelter at Fairview.

Mr. French, who was a metallurgical chemist, spent most of his life in the study of the treatment of complex ores and was associated with some of the largest smelters in Great Britain, notably in Sheffield, Glasgow and Swansea. While in Swansea he made an important discovery in zinc treatment when he invented a process for the treatment of the Constantine zinc ores, which are mined in the Mediterranean and present smelting problems of a complex nature.

He spent several years in Australia studying the treatment of the complex ores of that country, and was associated with various companies, among which was the Broken Hill Mining Company. His son, Thomas French, of Nelson, has been continuing his father's efforts in the province since the latter returned to Scotland a year ago, and will be in charge of the plant at Fairview, which it is expected will be placed in operation at an early date. Gordon French was twice married and leaves one son by his second marriage.—Daily News, Nelson, B.C.

Announcement has been made that the Hardinge Conical Mill Co. has received an order from the Dome Mines Co., Ltd., of South Porcupine, for two 8-ft. diameter ball mills, which are to take the place of stamps now in use at the Dome Co.'s plant.

It has been reported from Yukon Territory that much road repairing has been done in the Dawson district this season by the Government. Some roads, it is stated, have been widened to 24 ft., others to 30 ft., and made with a good raised crown in the centre.

SPECIAL CORRESPONDENCE

NOVA SCOTIA

Dominion Coal Outputs.—The production of the Glace Bay mines for September was approximately 419,000 tons, compared with 341,935 tons in September, 1914. For the first time in the present year the aggregate outputs to date are greater than for the corresponding period in 1914. To September 30th the production for 1915 totals 3,372,000, compared with 3,340,000 in 1914, showing an increase of 32,000 tons. The three remaining months of 1915 will in all probability show further increases over 1914 figures.

Compared with 1914 the increase in production is not attributable to any increase in the output capacity of the mines, but is due to an improvement in business conditions, and particularly to the increased demand made by the works of the Dominion Iron and Steel Company, now working to full capacity.

Compared with the early summer of 1915 the output capacity of the mines has been woefully diminished by the number of enlistments among the mining population. The production of the Dominion Coal Company's Glace Bay mines has suffered by enlistments to the extent of at least from 3,000 to 4,000 tons per day.

As forecasted in these columns several weeks ago, the monthly contribution of the employees of the Dominion Coal Company to the Canadian Patriotic Fund is steadily mounting towards the desired figure of $1,000 per month. The contributions in September totaled $876, and in October it is probable that the collections will reach well over $900, which will bring the contribution of the Dominion employees during the first year to approximately $8,000. The officers of the Cape Breton branch of the Patriotic Fund have had some anxious hours in endeavoring to meet all the claims made upon the fund, and they gratefully acknowledge that the contribution of the Dominion employees has come to be regarded as the mainstay of the Fund, and as a source of regular and ample supply without which the Patriotic Fund Committee would be badly embarrassed.

In addition to the Patriotic Fund collections, the workmen of the Dominion Coal Company have given generously to the fund for the purchase of machine guns, and although the total of the contributions made is not yet quite complete, it is certain that the amounts subscribed will reach $8,000, or sufficient to provide eight guns.

Men, money and guns make an excellent combination with which to oppose the enemy, and in the provision of these requisites the employees of the Dominion Coal Company do not intend to be behind hand. As they say in Cape Breton, the miner is "a good provider."

NEWFOUNDLAND

The marble quarries owned by the Colonial Mineral and Trading Co., Ltd., situated at Little Canada Harbor, Canada Bay district of St. Barbe, are doing excellent work the present season. These are the first marble quarries to be worked in Newfoundland. Although in operation only about two years, very substantial progress has been made. A good plant has been installed, the initial difficulties have been overcome, and some first-class material has been turned out. The company hopes in addition to being able to supply all local demands to make large shipments abroad in the near future. The company's property contains sixteen hundred acres, and is said to contain several million tons of pure white marble of an excellent quality. The property originally was owned by Newfoundlanders, who sold it to a party in England, who is financing and working it at present. Apart from this particular marble deposit all our geological reports unmistakably point to the fact that Newfoundland has many other large marble deposits only needing development.

Our American friends have recently become very much interested in the immense gypsum deposits of Newfoundland, and a company has been recently formed in Boston, Mass., to operate one of those deposits. Immense deposits of this material surround St. George's bay and the Codroy rivers, West Coast, Newfoundland.

An attempt was made a few years ago to work some of these deposits, and from 1891 to 1894 the customs returns show that $4,300 worth of gypsum was shipped abroad; but since then no shipment has been made. In view of the fact that large quantities of gypsum are mined and shipped yearly from Nova Scotia, Cape Breton and the Magdalen Islands to the United States markets, and the uses and demands for this material are growing larger every year, there is every reason to hope that the gypsum beds of Newfoundland will ere long become an important factor in her industrial life.

Unabated activity continues in the iron mines of Bell island, owned by the Dominion Iron and Steel Co. and the Nova Scotia Steel and Coal Co. The largest output of ore since the opening of the mines went forth last week. Day and night the work proceeds, something like 2,000 men being employed. Every day sees one or more ships at the different piers loading ore for the smelting works at Sydney, C.B., or for the English and American markets.

The workings of these great mines are extended to a distance of two miles or more out under the bed of the ocean, two miles from the Island under Conception bay. The great tunnels or shafts which extend beneath the ocean's bed are electrically illuminated. They are stupendous feats of engineering, and a lasting monument to the ability of those engineers whose work it is.

What promises to be another very valuable iron ore mine is the "Snow's Pond" deposit, situated near Brigus, Conception Bay. The property is owned by the Port-de-Grave Mining Syndicate, Ltd., the personnel of which comprises some of Newfoundland's most prominent commercial men. The president of the company is R. B. Job, of the firm of Job Bros., Ltd., and the directorate consists of Hon. John Harris, president of the Newfoundland Savings Bank, and President of Legislative Council of Newfoundland; Hon. John Harvey, of the firm of Harvey & Co.; John Munn, manager of the Newfoundland branch of the mercantile firm of Bowring Bros., Ltd., and J. W. McNeilly, clerk in Department of Forest and Mines. Work on the property has been going on very successfully the past twelve months. Two shafts have been sunk and some crosscuttings made; in testing out the extent of the lode, the following is an assay of the ore: 60.08 iron; 0.016 phosphorus; 0.14 manganese.

It may properly be called a limonite ore, not hematite. The Bethlehem Steel Co. is said to be negotiating for a purchase of the property, and its engineer, Willard L. Cummins, spent several days on the property very recently.

Information has just been received of the discovery of a very rich deposit of copper ore, bornite, or peacock copper, in Northern Labrador.

The order has gone forth that the Dominion Iron & Steel Co.. one of the companies operating the iron mines of Bell Island, intend to carry on operations in full force all winter, and will employ the maximum number of men in the mines. Preparations are now being made to work No. 3 slope, which has lain idle the past eight years; additional machinery is being erected and tram tracks are being laid, giving employment to an additional number of men. A new slope is to be opened, known as No. 4, on the western end of the island, where there is another large deposit of ore. It is said the work of driving No. 4 will entail some of the greatest feats of engineering that have ever been undertaken by the company.

The amount of ore mined by both Dominion and Nova Scotia companies and shipped each week, shows no decrease as the season advances, and with the large demand for iron in the foreign markets, both companies are making a supreme effort to keep the supply up to a full standard, and be in position to meet all emergencies. It is thought that by the spring of 1916 the demand will be still larger.

Recently some of the newspapers of this country have been commenting adversely upon the policy of allowing all this raw material to be shipped abroad, from which Newfoundland they say only gets the "skimmed milk." The contention is that the ore should be smelted in this country, thus giving additional employment to the people, with increased prosperity to the people in general.

It was reported this week that one of the iron ore prospects of Conception Bay was bonded to a company, owner of large iron mines in Duluth, Minn., U.S.A., and that operations on a large scale would commence shortly.

Work in all the Newfoundland copper mines is going on steadily, and each week sees a shipment or two of copper ore to England or the United States. Last week a small cargo of this ore was shipped to New York from the copper mines of York Harbor—Bay of Islands—one of the many copper mines of this country which has been closed down for a number of years.

It looks as if the company which is to operate the gypsum deposits at St. George's district intends doing things on a large scale. The plant when installed will cost $400,000 and the company contemplates shipping one million barrels of manufactured material yearly to the United States. Contracts have been signed with several large firms in different parts of America, who yearly dispose of large quantities of this material.

Several enquiries from England and the United States have recently been made to the Department of Agriculture and Mines for deposits of antimony. It is said that the antimony mine at Moreton's Harbor, Notre Dame Bay, which has not been in operation since the year 1900, is now to be opened up again by an American company. In a report on the minerals of Newfoundland made by Jas. P. Howley, Esq., F.G.S., in the year 1898, he says: "I visited the antimony mines at Moreton's Harbor last spring and a close examination of the property convinced me that it was a valuable deposit." The price of the ore at that date, Mr. Howley says, was $80 per ton, which is about the same price quoted at present, though for many years past the price ranged from four to six cents per pound.

The shipments of manganese ore from the workings at Brigus, Conception Bay, during the past summer must have proved satisfactory, as report has it that the property has recently been sold to the Bethlehem Steel Works, Philadelphia, U.S.A.

COBALT AND SOUTH LORRAIN

Kerr Lake Co.—The annual report of the Kerr Lake Mining Company has just been issued and shows that on August 31st there was still a deficit on the year's working after dividends had been paid, but since dividends still amount of $620,000 a year, this is a remarkably good record for a company that has already paid $5,820,000 in dividends. It is also satisfactory to note a considerable decrease in the cost per ounce. The total cost per ounce amounted to 21.45 cents, a considerable decrease over that of last year. Mr. Adolph Lewisohn, president of the Kerr Lake, points out that reduction was principally due to the saving in the cost of mining, which was reduced from $5.09 to $4.15 per ton. This reduction in costs almost counterbalanced the reduction on account of lower price of silver.

Mr. Robert Livermore, manager of the company, points out that ore put in sight during the year was less by 1,526,300 oz. than the ore produced. The estimated ore reserves amounted to 4,172,400 oz., of which 2,596,400 oz. was of high grade. This estimate is known to be quite conservative, and as in the past the actual production will probably exceed it. Mr. Livermore is not at all optimistic as to the prospect of finding more ore. He says that the lake bottom has been well explored and the blocks remaining unexplored are all small. Development in the diabase and Keewatin formations in the south of the property have so far not been encouraging. Nevertheless the Keewatin vein is still very strong and regular, and it is hoped that further development both in sinking and raising will open other ore. The balance for the year amounted to $891,868, a reduction of $69,225. This reduction can be attributed solely to the lower price in silver. It is noted in the report that the Kerr Lake Mining Company has purchased 837,400 shares of the Caribou Cobalt Mines Company for $50,000. This gives the Kerr Lake control of the old Drummond mine, comprising 70 acres of property about one-third of which is in the conglomerate. This conglomerate area has been pretty well explored and mined out.

The Lewisohn interests in control of the Kerr Lake Mining Company have decided to take up their option on the old St. Anthony mine in the Sturgeon Lake country. Mr. M. C. H. Little, who sampled this property for them, has been sent from Cobalt to take charge. The St. Anthony is one of the best known of the older gold mines of the province. From it some very spectacular ore has been taken, and it has been sampled again and again by various companies and for reasons not connected with the physical condition of the mine it was turned down. There is a mill on the property, but it is so antiquated that it is not possible to obtain anything better than 50 per cent. extraction, and if the Lewisohn interests do finally decide to take up their option they will certainly have to build a cyanide mill.

Nipissing Mining Co. have again been in luck in securing the extension of valuable ore bodies from neighboring properties. In the last monthly report it is

stated that "ore of quite good width and assay has now been exposed in the Cobalt Lake fault at our line, by the Cobalt Lake Mining Co. This development is on the 285 ft. level. Steps will be taken in the immediate future to develop this ore on the Nipissing side of the line. The orebody referred to has already been developed on three levels by the Cobalt Lake. It is remarkable ore and is 26 inches wide in many places of 2,000 oz. grade. It was known some weeks ago that this ore would probably pass into the Nipissing, but outsiders did not realize that it would occur so soon. This is undoubtedly the explanation of the strength of Nipissing in the last month. The production for the month was within a few thousand dollars, the same as last month. The Nipissing shows no disposition to raise production to its old level, although they are in the market for all the high grade ore that they can get for their high grade mill. The production for the month was $178,484, and bullion shipped from Nipissing and Customs ore amounted to $120,967; of this amount of production, about one-third was produced from high grade ore.

Temiskaming.—For the first time for two and a half months the drills at the Temiskaming mine were used for stoping ore. Previously they had all been used in development. A 34 to 42 ton car, containing over 250,000 oz., came from high grade ore developed at various portions of the old mine. To fill the car five tons of remarkable ore was broken in two rounds from the new vein at the 500 ft. level.

PORCUPINE, KOWKASH, BOSTON CREEK

Kowkash.—The fervor of the Kowkash rush has subsided. There was a period when it seemed likely that the whole camp would be neglected after the snow had fallen and prospecting had become difficult, but discoveries made about forty miles west of Kowkash have led to the continuance of interest in this particular portion of the gold fields. Several well-known prospectors in Porcupine have brought down samples which have been checked and re-checked in Porcupine assay offices. The results were surprising, since the quartz did not show any gold; in two cases assays ran to almost $50. As a consequence a number of prospectors who were prepared to resume their ordinary work in the mines have returned to the bush and will probably remain there this winter. Around the Dodds claim there is some assessment work being done.

Boston Creek.—The rich syndicate of New York capitalists who are in control of the Kenzie property at Boston creek have decided to proceed forthwith with the installation of machinery and a vigorous campaign of development. Considerable work has already been done on the surface on the very strong vein. It has been stripped for 450 ft. Two shafts have been sunk 250 ft. apart. These shafts are respectively 28 and 30 ft. deep. On the surface where the ore has been sampled the pay streak is 12 in. wide, but there is little doubt that the vein will carry sufficient enrichment to enable a good stoping width to be obtained. There is much gold visible in the ore, but it is very fine. There is a little molybdenite and it is rich in sulphides. Sampling of the vein gives very satisfactory results. Across one end of the shaft grab samples gave a return of $41 a ton; across the other the returns were even higher. At the bottom of the 30 ft. shaft there is a very remarkable exhibition of free gold.

The only other claims upon which sufficient surface work has been done to justify any importance being attached to it is that now under option to the Dominion Reduction Co. The orebody here is white and glassy quartz, 20 or 30 ft. wide. It is not anticipated that the ore will run more than five or six dollars, if it does stand up to that average. The Dominion Reduction Co. is determined to put on a plant and start work at once. The country is very promising, and quite a number of prospectors are working in the townships of Pecaud, McElroy and Boston itself. The T. & N. O. Ry. Commission has decided to place a station at the settlement near Boston creek and lay a spur for the handling of supplies.

Imperial.—A very promising discovery has been made on the Imperial mine in the township of Deloro. This old prospect has resumed operations under Mr. Taylor, the president of the company. From the drift on the low grade orebody a couple of shots were put into the hanging wall. These shots revealed the presence of a much higher grade of ore than had previously been discovered in the mine. There is some free gold, but the ore is chiefly notable for its sulphide contents. Although no careful sampling has been done as yet the assays are remarkably good. The orebody is about 8 in. wide. The drift will be continued to develop it and discover if there is any considerable depth to it.

Recruiting in Porcupine.—Lieut. Alec Smith, one of the first engineers to make his home in the Porcupine camp, has been very energetically recruiting for the Pioneer Regiment which Col. Davis is forming in Canada. With the able assistance of Mr. Globe and other members of the Hollinger staff, a recruiting rally was inaugurated with the results very gratifying to the patriotism of the Hollinger staff. Four prominent members of the Hollinger staff have enlisted. Three go with the Pioneers and one has gone to train with the Aviation Corps at Toronto. Many electricians have volunteered, and a fair percentage of the best men on the Hollinger pay roll will go to the front. Lieut. Smith will take at least 80 men out of the Porcupine camp for his regiment. He already has over 30 awaiting him at Haileybury, and more men are coming in for it, as the Pioneer Regiment is very popular. Capt. R. P. Rogers is also recruiting in the district for the detachment to the Royal Engineers, which he will command. Four well-known mining men have been secured as officers and non coms. in this Imperial contingent. All men enlisted are miners. Preference will be given to those who have had experience in soft rock, and it is understood that tunneling will be the particular work of this corps. The corps will be mobilized at Pembroke, and will be sent to the front not more than two or three weeks after recruiting has been completed. Capt. Rogers wishes to get three hundred men for his company from the north.

BRITISH COLUMBIA

An announcement of much interest to miners as well as to other workmen was made in Victoria on September 30, namely, that the Provincial Government has appointed a committee to inquire into the various of the several Workmen's Compensation Acts in force in Eastern Canada and the United States. The members of the committee are: Mr. Avard a. Pineo, representing the Government; Mr. David Robertson, of Robertson & Hackett, Vancouver, for the

employers of British Columbia, and James H. McVety, representing the Trades and Labor interests of the Province. This committee is to at once enter upon its duties, and it is understood that the members propose visiting those provinces that have in force legislation of the kind under review; also, that they will tour neighboring States with the object of also ascertaining what has been done in them in this connection, and whether the measures adopted are giving satisfaction to those chiefly affected by them. The chief object of the committee's labors is to obtain information to embody in a report to be made to the Provincial Government to assist it in framing legislation along the best lines ascertainable. Last session the Government placed before the Legislature a draft of a proposed Workmen's Compensation Act, but nothing was done toward adopting it.

East Kootenay.

Fort Steele Division.—Comparatively little is known of a number of copper claims in the part of this division known as the St. Mary River section. The publication early last month in the Cranbrook Herald of an account of a visit paid by Cranbrook men to the mining properties of the Evans Brothers has drawn some attention to this practically undeveloped part of East Kootenay. The only information given in the Minister of Mines Report for 1914 concerning this part of the division, was as follows: "The St. Mary River section also received some attention, and it is understood that the large low grade copper deposits are to receive a thorough inspection and sampling to determine their economic value. Some of these deposits cannot be described as being in ledge form, but apparently are part and parcel of the formation and are probably 'sills.'" Mr. Stuart J. Schofield, of the Geological Survey of Canada, who spent the field seasons of several successive years (1909-1913) in East Kootenay, included the following brief notice of two of the copper properties under notice in his report on the Geology of the Cranbrook Map-Area:

"**Evans Group of Claims.**—The Evans group of claims, owned by C. and W. Evans, of Marysville, is situated on the western slope of Evans mountain, at an elevation of about 6,000 ft. The mountain is composed of easterly dipping Aldridge quartzites intruded by diorite sills, the upper one forming the summit of Evans mountain. The lower claims contain a tunnel 200 ft. long, driven into a low grade orebody of the differentiate type contained in the gabbro sill about 400 ft. thick and forming the lowest of the three sills. The ore consists of pyrrhotite and cupriferous pyrite, impregnating a coarse grained hornblende granite. The upper claim contains a fissure vein about 4 ft. wide, striking N. 45 deg. E. in a sill of normal hornblende gabbro, which forms the middle of the three sills. The ore consists of chalcopyrite, pyrite and some pyrrhotite and native copper in a quartz calcite gangue. Work is being pursued on both groups of claims with a view to determine the size and relation of the two types of desposits.

"**McKay Claims.**—The McKay claims are situated on the northern slope of Whitefish creek and about seven miles from where it joins the St. Mary river. The country rocks consist of Aldridge quartzites intruded by hornblende gabbro sills, all dipping at an angle of 65 deg. to the northeast. The vein, 8 ft. wide, which occupies a shear zone in the hornblende gabbro, strikes S. 85 deg. W. and dips 78 deg. to the south. That the fissure is a shear zone is supported by the alignment of the feldspars in the hornblende gabbro parallel to and in close proximity to the surface of the fissure. In tracing the continuation of the vein into the underlying quartzites, it was seen to pinch out within 8 ft."

West Kootenay.

Trail.—Ore shipments to Trail from district mines were about 3,000 tons higher for four weeks ended September 23 than for a like period to August 26. There was a smaller output from mines in both Ainsworth and Slocan divisions, but this was more than compensated for by an increase of nearly 4,000 tons from Rossland mines. The totals for the two periods, respectively, were 27,974 tons for four weeks ended August 26, and 30,976 tons to September 23.

An addition to the blower room at the smelting works is about completed. The erection of a building for the zinc-saving plant to be put in here is in progress. The installation of plant will follow quickly, for it is intended that the production of zinc shall be commenced before the end of this year.

Zinc Ores at Nelson Fair.—Prof. Arthur Lakes recently contributed to the Nelson Daily News an account of exhibits at the local Annual Fair that attracted his attention. He wrote, in part: "Turning to the very creditable display of minerals, I was particularly interested in the white zinc crystals and stalactitic masses from the zinc discovery at Salmo. The white crystals are especially fine, the finest I have ever seen, and the stalactitic aggregations, like bunches of grapes, or what geologists call botryoidal (grape) deposits, were specially interesting, showing that this crystaline secondary deposit, very like deposits of botryoidal chalcedony or agate in cavities, and some lime stalactites or stalagmites in caves, was deposited by water, hot or cold, probably the former, which, percolating through original deposits of black-jack or sphalerite, dissolved that mineral and carried the solution down into open cavities in the rock and redeposited it in the altered chemical and crystaline form in which it is to-day found in such unusually large quantities in the mine at Salmo. The ease with which the usually refractory zinc mineral can be treated when in this altered mineralogical form is well known and appreciated by metallurgists, and the discovery bids fair to be one of the most valuable and important in British Columbia. Another peculiarly interesting feature was that of the zinc spelter produced at the Trail smeltery by an electrolytic process. There were many other good displays—of copper and gold and silver mineral, and I was also glad to see the handsome native grey crystaline marble there represented by large and well-polished slabs."

In connection with the zinc exhibit to which Professor Lake referred, it may be mentioned that a few days earlier the Daily News printed some information relative to the property from which the fine specimens exhibited came, as follows: It is reported that a remarkable find of zinc ore was made last week at the Zincton mine, near Salmo, in the southern part of Nelson mining division, when a crosscut was driven into a large body of ore at 200 ft. vertical depth. Mr. P. F. Horton, who was formerly interested in the mine, last night brought to the city samples of the ore for exhibition at the Nelson Fair, and he stated that where the strike was made the orebody shows a width of 7 ft., but its full extent had not yet been determined. The ore is said to assay 46 per cent. zinc. The Zincton mine and the adjoining H. B. property were last July taken over by Mr. R. K. Neill, of Spokane, Washington, and both are being operated by him. The

strike is credited to him as a result of his efforts to further develop the Zincton mine. This year the H. B. and Zincton mines have together shipped to Springton, Illinois, between 3,000 and 4,000 tons of zinc ore averaging between 30 and 35 per cent. zinc. Mr. Horton states that a carload of the newly discovered ore has already been taken out. Twenty-five men are employed on the two properties.

The Zincton, H. B., Leadville, Aspen group, and other mineral claims in which lead and zinc ores have been found, are on Deer creek, a tributary of Sheep creek, from which latter stream the neighboring lode-gold camp took its name. The Deer Creek properties are eight to ten miles from the Nelson-Spokane Railway at Salmo, and ore for shipment has to be hauled that distance in horse-drawn wagons. On a mountain on the opposite side of the Sheep Creek valley, to the southward, is situated the Emerald lead mine, while a few miles to the south-east, above Lost creek and 14 miles from Salmo, is the Molly molybdenite group now being developed by a Vancouver syndicate, which has announced its intention to put in a small concentrating plant with which to make a marketable molybdenum product.

Vancouver Island.

At the end of September, Mr. Thomas Richardson, M.P. for Whitehaven, England, and Mr. Robert Baird, of Glasgow, Scotland, arrived in Victoria, Vancouver island, where they interviewed the Premier, Sir Richard McBride, who is also Minister of Mines for British Columbia, who promised to give them all the assistance he can toward the attainment of the object of their visit, which Mr. Baird outlined to a representative of a local newspaper, as follows: Coal miners being needed in large numbers in Great Britain at the present time, and requisitions for miners having been received from coal mining companies operating in Cumberland, Yorkshire and Scotland, it had been arranged to endeavor to facilitate the return to Great Britain of a number of miners who had made representations to friends in the Old Country that they were out of work on Vancouver island and without means to provide for their transportation back across Canada and the Atlantic. Officials of Miners' Unions in Great Britain having been informed of the position, had taken the matter up with mine owners, who, in turn, placed the information, together with a statement of their need of men, before the Imperial Government, and, as a result, a commission had been appointed to visit the Canadian West and place before the unemployed miners the conditions on which assistance will be given them to return to Great Britain. These conditions, as published, are: All wishing to return will be required to register. Their competence will be thoroughly investigated. If it shall be found that they are of the class for which there is so great demand in Great Britain at present, they will be asked to formally agree to the repayment of the cost of their transportation to the respective places of their future employment, the money for defraying which is to be advanced by the Government. In the first place, the company which hires them is to pay the Government the man's or men's traveling expenses; the latter, in turn, will pay their employers by weekly instalments, based on the number of days a week they shall work. Five days will be counted as a full week; if less time is worked, the deduction will be proportionately less. It is expected that from 100 to 200 first-class men will be obtainable from among the miners on Vancouver island now unemployed, and Messrs. Richardson and Baird expect to remain some time on the island making the necessary arrangements for the removal of the men to the Old Country. Mr. Richardson is known to a number of the local coal miners, for he visited Nanaimo two years ago, so was chosen as the representative of the British Miners' Unions, while Mr. Baird represents the coal mine owners.

COBALT SHIPMENTS.

Ore shipments for the week ending October 8th were as follows:

	Pounds.
Mining Corporation	248,334
Nipissing	130,585
Dominion Reduction	88,000
Temiskaming	63,354
Beaver	61,083
	591,356

Bullion shipments were:

	Bars.	Ounces.	Value.
Mining Corporation	17	21,733	$10,632
(Omitted last week.)			
Nipissing	202	250,790	120,976
Mining Corporation	14	17,579	8,777
O'Brien	31	31,758	16,514
Total	264	321,862	$156,901

Bullion shipments for the year to date are as follows:

Mine.	Ounces.	Value.
Nipissing	4,450,391	$2,182,428
Dominion Reduction	654,888	321,988
Crown Reserve	292,670	145,000
Caribou Cobalt	80,683	40,332
O'Brien	403,005	201,206
Buffalo	440,081	212,500
Crown Reserve (Silver Leaf)	19,000	9,500
Mining Corporation	175,133	86,188
Trethewey	2,321	1,148
Miscellaneous	2,293	1,126
Total	6,520,467	$3,201,418

CROW'S NEST PASS COAL.

The Crow's Nest Pass Coal Company has wiped out its indebtedness and has a comfortable credit balance in the bank. It is stated on good authority that a dividend will be declared, likely at the rate of 4 per cent. per annum, before Christmas. The earning power of the company has been restricted during the past couple of years because of hard times in the West, but economies have been initiated in an effective manner. At present the company is earning 8 per cent. on the stock.—Financial Times.

LE PAS GOLDFIELD.

Mr. R. B. Watson and party left Toronto last week for Le Pas where Mr. Jack Hammel has located an orebody containing gold and copper.

DAVIDSON.

The Davidson property in Tisdale Township, Porcupine district, formerly under lease to the Crown Chartered Mining Company, has been optioned to a Toronto syndicate and will be examined shortly.

MARKETS

STOCK QUOTATIONS.

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

October 8, 1915.

New York Curb.

	Bid.	Asked.
Alaska Gold	34.25	34.50
British Copper	.50	1.00
Braden Copper	9.62½	9.75
California Oil	317.00	320.00
Chino Copper	48.75	49.00
Giroux Copper	.50	1.00
Goldfield Cons.	1.31¼	1.43¾
Green Cananea	40.00	41.00
Granby	86.87½	87.25
Inspiration Copper	45.75	46.00
International Nickel	216.00	218.00
Miami Copper	34.87½	35.00
Nevada Copper	15.12½	15.75
Ohio Oil	155.00	157.00
Ray Cons. Copper	26.87½	27.00
Standard Oil of N. Y.	406.00	408.00
Standard Oil of N. J.	480.00	....
Standard Oil (old)	14.50	....
Standard Oil (subs)	1050.00	....
Tonopah Mining	5.25	5.50
Tonopah Belmont	3.50	3.75
Tonopah Merger	33.00	38.00
Yukon Gold	2.25	2.50

Porcupine Stocks.

As of Oct. 9, 1915.

	Bid.	Asked.
Apex	.03	.03½
Dome Extension	.25	.26
Dome Lake	.21½	.22½
Dome Mines	.21	.23
Foley O'Brien	.32	....
Hollinger	.25	.26
Jupiter	.11½	.12¼
McIntyre	.47¼	.47½
Moneta	.07½	.08
Pearl Lake	....	.00⅜
Porcupine Gold	....	.00½
Porcupine Imperial	.06	.06¼
Porcupine Crown	.75	.79
Preston East Dome	.05¼	.05½
Porcupine Vipond	.69	.71
Porcupine Tisdale	.01¼	.02
West Dome	.09¼	.09½

Cobalt Stocks.

	Bid.	Asked.
Bailey	.04⅞	.05
Beaver	.27½	.28½
Buffalo	.45	.65
Chambers Ferland	.13	.15
Coniagas	4.00	4.50
Crown Reserve	.40	.40½
Foster	....	.04½
Gifford	.01¾	....
Gold Reef	.00½	.00⅞
Gould	.02⅝	.03
Hargraves	.01⅜	.02
Hudson Bay	.20	.24
Kerr Lake	3.50	3.75
La Rose	.48	.50
McKinley	.31	.37
Nipissing	6.90	7.20
Peterson Lake	.21¾	.22¼
Right of Way	.04½	.05
Silver Leaf	.01½	.02
Teck Hughes	.13	.14
Temiskaming	.37½	.38
Trethewey	.12	.16
Wettlaufer	.05½	.06
Seneca Superior	....	.68
Homestakes	....	.20
York Ontario	.02½	.03

TORONTO MARKETS.

Oct. 12, 1915—(Quotations from Canada Metal Co., Toronto)
Spelter, 18 cents per lb.
Lead, 6¼ cents per lb.
Tin, 37 cents per lb.
Antimony, 40 cents per lb.
Copper casting, 19 cents per lb.
Electrolytic, 19 cents per lb.
Ingot brass, yellow, 13c.; red, 15 cents per lb.

Oct. 12. 1915—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $7.75 per ton.
Coal, bituminous, $5.25 per ton.

NEW YORK MARKETS.

Oct. 8, 1915—Connellsville coke (f.o.b.) ovens—
Furnace coke, prompt, $1.80 to $1.85 per ton.
Foundry coke, prompt, $2.30 to $2.60 per ton.

Oct. 8, 1915—Tin, straits, nominal, 32.50 cents.
Copper, Prime Lake, 17.87½ to 18.12½ cents.
Electrolytic copper, 17.87½ to 18.12½ cents.
Copper wire, 19.25 to 19.50 cents.
Lead, 4.50 cents.
Spelter, scarce.
Sheet zinc (f.o.b. smelter), 16.00 cents.
Aluminum, 55.00 to 57.00 cents.
Platinum, soft, $50.00 to $54.00 per ounce.
Platinum, hard, $54.00 to $58.00 per ounce.
Quicksilver, $92.00 per 75-lb. flask.

SILVER PRICES.

September—	New York. cents.	London. pence.
24	49⅜	23¾
25	49⅜	23¾
27	49⅜	23¾
28	49⅛	23⅝
29	49⅜	23 11/16
30	49½	23¾
October—		
1	49¾	23⅞
2	49⅝	23 13/16
4	49⅝	23 13/16
5	49⅜	23 13/16
6	49⅝	23⅞
7	49¾	23 15/16
8	49⅝	23 15/16

INTERNATIONAL NICKEL.

The Sudbury district is still increasing production while in New York the market price of International Nickel has risen to $220 per share. Creighton mine is breaking all records for ore output and the smelter at Copper Cliff and the refinery at Constable Hook are being taxed as never before.