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CONTENTS.

ONTARIO MINES IN 1913

The report of the Ontario Bureau of Mines for the year 1913 has just been published. This report contains detailed information concerning operations during the year. Preliminary reports were issued in March; but the complete report has been, as usual, a long time in the press. What it lacks in up-to-dateness, however, is compensated by the character of the contents.

The statistical review by Mr. T. W. Gibson, Deputy Minister of Mines, is like all of Mr. Gibson's reports, full of useful information carefully presented. A concise summary of statistics of mining in Ontario during the year is always to be found in the Bureau of Mines reports and to Mr. Gibson belongs most of the credit. Mining men sincerely regret that such a splendid official is this year suffering greatly from ill-health.

The report shows that the mineral production of the Province during 1913 had a value of $53,232,311. The greater part of this total is contributed by the Sudbury nickel-copper mines, Cobalt silver mines, and the Porcupine gold mines. But many other mines and quarries contribute large amounts. That Ontario's mineral industry has become of such great magnitude is especially fortunate this year when the importance of productive industries is being impressed on everyone.

Mr. Gibson in his introductory paragraphs points out some of the ways in which the mining industry develops the country. He says:

"Diversity of occupation exercises a favorable influence upon the development of a new country. No one industry, of course, is self-sufficient, and, in these days of increasing specialization, every industry tends to become more dependent upon and more necessary to all the others. Naturally, the industries which first take root in a given area are those for which its resources are most evidently adapted. In a wooded country, such as northern Ontario, the first in order of time is lumbering. Where the land is good and railway access is afforded, agriculture comes at once upon its heels, closely followed, where there are workable minerals, by mining. Soon all three industries are found in various stages of development, each playing an important part in the settlement of the country. Felling the trees and hauling the logs give employment to the settler during the winter months and help him to earn some ready money. Lumberjacks and miners alike must be fed, and so there is a home market for all the farm produce which the settlers can raise beyond their own requirements. The settler is himself a lumberer so far as his own farm is concerned, and brings sawlogs, pulpwood, railway ties

and fence posts to market. Buildings must be put up at farm and mine, and for these lumber is necessary.

"Most of the lumberman's cut of sawlogs or the output of his sawmill is transported elsewhere to find a market, and this is the case also with the silver, gold, copper or nickel won from the mine. But in the production and handling of these commodities much labor and capital are called into use. Communities are formed, and industrial and social development goes on. Water powers, so numerous in northern Ontario, are compelled to furnish power, light and traction. Pulp and paper mills are erected to make use of the abundant supplies of spruce and poplar. Roads and railways are built. Schools, churches, hospitals, and other institutions with improvement and amelioration as their end, come into being. So too, unfortunately, do jails and 'blind pigs,' for crime and excess accompany the human animal whether he is found in forest or mine or the crowded town."

The 1913 production was valued at $4,890,699 greater than that of the previous year, when the total was $48,341,612. There has been an increase of 112 per cent., compared with five years ago.

Part 1 of the report, in addition to the statistical review of the mineral industry, contains descriptions of the mines of Ontario by Mr. T. F. Sutherland, Chief Inspector of Mines. A paper by Dr. A. P. Coleman describes the structural and age relations of the pre-Cambrian rocks north of Lake Huron, which are of great interest from both the scientific and economic points of view. Mr. G. R. Mickle, Mine Assessor, in co-operation with Professors W. H. Ellis, J. W. Bain and E. G. R. Ardagh, contributes an important paper on The Chemical Composition of Natural Gas Found in Ontario. This paper adds many interesting facts to our knowledge of this valuable substance.

Mr. T. F. Sutherland's report on Mining Accidents gives an account of the accidents and an analysis of fatalities. Numerous suggestions are given for prevention.

Dr. Coleman's paper on the pre-Cambrian rocks north of Lake Huron is presented after many years' study of the district, and is an important contribution to our knowledge of the formations which yield a very large part of the minerals produced in Canada.

The paper on Chemical Composition of Natural Gas in Ontario will be read with much interest. The literature contains scant information on this product of the Province. Natural gas is used in large quantities for household purposes and its composition is obviously a matter of great importance.

Part 2 of the report contains a description of the Kirkland Lake and Swastika gold areas, by Messrs. A. G. Burrows and P. E. Hopkins. This report was published some months ago as a separate bulletin and extracts from it have appeared in the Journal.

FOREIGN LABOR IN THE MINES

We have drawn attention in these columns to the large number of foreigners among the miners in Canada and the United States. A very large proportion of the underground force at nearly every mine is made up of men who are not natives and most of whom have been but a few years in the country. Many of our best miners are of this class. They do their work well and provided they are law abiding they are welcome. Unfortunately their lack of acquaintance with our laws and customs, and their unfamiliarity with the language are frequently the causes of regret to employers and employees alike. The miner who cannot understand the orders he receives from his captain is at a grave disadvantage and often the source of trouble for his companions. The tendency to pretend understanding while in fact quite ignorant of the captain's orders is often the cause of accidents.

Mr. T. W. Gibson in his recently issued report says of these men:

"A large proportion of the labor in mine and lumber shanty, and in railway and wagon road-making, is of the unskilled type, where muscle counts for more than mind. Very much of this is supplied by immigrants from foreign lands—chiefly those of continental Europe—and hence a surprisingly large share of the industrial population of the north is composed of Finns, Poles, Austrians, Italians, Bulgarians, etc. There are also Syrians in considerable numbers, and Greeks, but they are usually in trade, and are rarely found engaged in manual labor. Whether or not the presence of large numbers of non-English-speaking laborers is wholly desirable, this is perhaps not the place to discuss, but the fact is they are there, and in response to a demand. Mine managers and railway contractors assert, and no doubt with truth, that they could not operate their mines or build their embankments were it not for this foreign labor. Anyone looking over the list of mining accidents, compiled by Mr. T. F. Sutherland, Chief Inspector of Mines, cannot but be struck with the large percentage of names of foreign origin. Doubtless there is a connection between this fact and the comparatively high death and accident rate in the mines of the Province. In part this may be due to unfamiliarity with the English language and the difficulty of comprehending quickly spoken orders in an emergency. Mental traits have also to be reckoned with, and the fact that very few of these men were miners before coming to this country, or at any rate to this continent. Ignorance of the risks in mining and the handling of explosives, a certain lack of resourcefulness in the presence of danger, amounting almost to inertia or even stupidity, and other characteristics, contribute to the same result. The building up of a strong force of capable and experienced miners such as the mining industry of Ontario now imperatively requires, will be a slow process, but when accomplished it will mean very much for the effective and economical operation of our mines."

INTERNATIONAL GEOLOGICAL CONGRESS

The twelfth session of the International Geological Congress held in Canada in August, 1913, was undoubtedly one of the most important events of the year, bringing together as it did a host of learned men from all parts of the world.

At the meeting many papers were read and there were several spirited discussions. But the papers were given little attention compared with the excursions to all parts of the Dominion which were arranged and carried out so admirably.

The volume of transactions has now been distributed. It is a large volume of 1,034 pages with several illustrations and contains an account of the organization of the Congress, the work of preparation for the meeting, the entertainment of members, the meeting, the excursions, and reports of the officers.

Mr. R. W. Brock, general secretary and treasurer, in his report shows that owing to the liberality of the Dominion and Provincial Governments, the Canadian Northern railway, the Coniagas, Mond, Canadian Copper, Hollinger, Canadian Collieries, Le Roi No. 2, Union Natural Gas, Seneca Superior, Provincial Natural Gas, and Cobalt Lake companies, the Congress was a financial success.

Mr. Brock mentions particularly the services rendered by Dr. F. D. Adams, G. G. S. Lindsey and Stanley Leckie. To these gentlemen belongs a large share of the credit for the grand success of the Congress. To these names should, however, be added that of Mr. Brock and a host of others who contributed their services.

Several of the papers of most interest to mining men appearing in the Transactions have already been published in this Journal. In this issue will be found Dr. Leith's paper which brought out one of the most lively discussions at the meeting. Some of the contributed remarks will be found in our next issue.

BETHLEHEM STEEL CORPORATION.

If one were asked to name the individual U. S. steel corporation which will make the best showing in 1914, a year of the greatest prostration in steel in a decade, the answer to be correct would have to be Bethlehem Steel.

This company up to the first of October was operating at 70 per cent. of capacity, and it is understood that even with the slump of the last month has not gone greatly below that figure. In fact, foreign supply orders in sight or actually booked make it probable that this 70 per cent. ratio can be maintained during the balance of 1914.

An official of Bethlehem Steel is authority for the statement that the company will this year earn 5 per cent. dividend on the $14,908,000 preferred more than five times over. Or, stated in terms of the $14,862,000 common, Bethlehem Steel should this year earn between 15 and 20 per cent. against 34 per cent. in 1913 and 13.8 per cent. in 1912, or the second best record the company has ever made.

Of course Bethlehem Steel has had the immense advantage during 1914 of coming into the year with nearly $25,000,000 of unfilled orders on its books.

Bethlehem Steel is reaping the benefit of its policy of consistent development out of earnings. During the period from 1909 to Dec. 31 next the company will have earned nearly $40,000,000 net, during which only about $3,000,000 has been returned to shareholders. The balance has been reinvested in plant and working capital and goes a long way in explaining why the company is a low cost producer and why it can make hay when the clouds are hanging leaden over the great bulk of steel manufacturers.

There has been a good deal of talk about the benefit which the war has conferred upon Bethlehem Steel because of its ordnance and armor plate departments and its special departments for production of Government munitions. This is more of a theory than a reality to date, however. In fact, the war has so far hit its ordnance department harder than any other. It is only fair to state, however, that the company is in line for some big foreign gun and armor plate work if present conditions hold. If there is any man in the world who knows how to sell steel products, it is Charles M. Schwab and his standing in the councils of the warring Governments at present is second to none. Mr. Schwab is now in England.

KITCHENER.

T. P. O'Connor writes in part in Collier's Weekly:

The silent Sphinx; the emotionless machine; the harsh and heartless commander; all these picturesque phrases applied to Lord Kitchener are absolutely misleading.

When met at a dinner party he is eager to talk, and talks admirably, with a certain directness and terseness, but not without imagination, and with great insight. In the intimacy of his own room at night and with only a friend or two, he can talk the whole evening through; and nobody thinks of interrupting the stream of interesting reminiscence and shrewd comment.

The emotionless machine has plenty of emotion, though well under restraint; is considerate to subordinates—scarcely says a harsh word—never utters a harsh comment behind anybody's back, and often has distinguished himself from more excited subordinates, not by the rigor, but by the greater humanity, of his judgment and action. This man without emotion has, in reality, a keen and abiding sympathy with those eastern people among whom his life has been mainly spent. He speaks their language, understands their nature.

This man, who has fought such tremendous battles, prefers a deal to a struggle; and, though he can be so stern, has yet a diplomatic tact that gets him and his country out of difficult hours.

One of his greatest qualities is his accessibility. Anybody who has anything to say can approach him; anybody who has anything to teach him will find a ready and grateful learner. This is one of the secrets of his extraordinary success and universal popularity in Egypt. Lord Kitchener was the cadi under the tree. A student Lord Kitchener began; a student he will remain to the end of his days.

There is yet another mistake about Kitchener: that grimness supposed to mean absence of all humor. His

sense of humor is never absent; he sees the humorous side of everything—even in the most serious situations. It has carried him through; without it he would have found his career and his life impossible.

The roots of Kitchener's greatness lie in intense ambition to succeed—above all, to the incessant desire to work and fill every hour with something done. He is sent as a youngster to Palestine; through peril to life, through great privation, he pursues his work until he has completed a map of all western Palestine. He learns Arabic, and, above all, the Arabic character. Kitchener found his coronet in the Arab grammar.

Choice of subordinates is one of Lord Kitchener's greatest powers. He nearly always has had the right man in the right place. And his men return his confidence because he gives them absolute confidence. This is one of the reasons why, though he works so terrifically, he never is tired, never worried.

A great soldier, but perhaps a greater organizer than anything else. This is his supreme quality, and for that quality there is necessary above all things a clear, penetrating brain. At school he was celebrated for his knowledge of mathematics. A mathematician, an engineer, a man of science, a great accountant—these things he has been in all his enterprises.

COAL MINE EXPLOSIONS CAUSED BY GAS OR DUST.

In a paper prepared for the October meeting of the American Institute of Mining Engineers, Mr. Howard N. Eavenson presents carefully tabulated statements concerning explosions in the coal mines of the United States, Canada and Mexico.

From the data gathered Mr. Eavenson concludes:

1. In North America, minor explosions, or those in which less than five fatalities occurred , happen most frequently in October, November, December, January and March, although nearly as many have happened in June as in March; those in December, January and February are above the average in fatalities, as are also those in May and July, those occurring in May having a slightly greater average fatality than even those of December.

Serious explosions, or those in which more than five lives have been lost, have happened most frequently in January, February, March, April and November. Contrary to the usual belief, the number of explosions in December has been slightly below the average, although their intensity, and the number of lives lost, have been considerably greater than those of any other month. January, February and May are also above the average in the number of fatalities per explosion, May being next to December in this respect.

For all explosions of gas or dust, January, March, November, October and December, in the order named, are above the average in number of explosions; in number of fatalities per explosion, May, December, February, January and March are above the average. For all explosions, therefore, May exceeds any of the winter months of fatalities per explosion.

2. In the coal mines of the United States, the total number of accidents and of fatalities due to explosions of gas or dust has been steadily inceasing; there has been a slight increase in the number of accidents and a more decided increase in the number of fatalities per million tons produced; the serious explosions, causing five or more fatalities each, have been steadily increasing in actual number and number of fatalities, as well as in number of accidents and of fatalities per million tons produced; the number of accidents per mine, both serious and total, also shows a steady increase. It is therefore true that we have more explosions, and more serious ones, both actually and in relation to our number of mines and production, than we had years ago.

3. In the coal mines of Great Britain, minor explosions, so far as our records show, have occurred most frequently in the months of August, October, May, March and September, while those in April, May, August, November, March and July are above the average in number of fatalities per explosion. Serious explosions have occurred most frequently in December, October, November and March, while those in June, December, July, February and May have been of more than average intensity. For all explosions, August, October, December, March, May and November are above the average in number, and December, June, July, February, are above the average in intensity. By far the largest number of fatalities has occurred in December, June being second in this respect.

4. In the coal mines of France, from 1841 to 1904, minor explosions have occurred most frequently in July, August, February, April, May and January and have been of more than average intensity in April, December, July, February, August and October. Serious explosions have been above the average in frequency in August, April, July and March, and in intensity in January, September, December, July, November and October. For all explosions, July, August, April and May are above the average in number, and December, January, November, July, March, October and September in intensity. By far the largest number of both accidents and fatalities have occurred in July.

5. In the coal mines in Belgium, 1891 to 1909, minor explosions occurred more frequently than the average in June, May and July, and in March, January, February, April and June were of more than average intensity. Serious explosions occurred most frequently in May, March and July and were of more than average intensity in March. For all explosions, May, July and June are above the average in number and March in intensity. By far the largest number of fatalities occurred in March.

AMERICAN MINING CONGRESS.

The seventeenth annual session of the American Mining Congress will be held at Phoenix, Ariz., Dec. 7, 8, 9, 10 and 11, 1914.

The same plan will be followed as that of last year; namely, all the leading papers will be printed and distributed in advance of the convention. This plan gives better opportunity for direct discussion of the papers presented and facilitates reaching intelligent conclusions. The printed pages will be distributed to members and the author given ten minutes to make any desirable supplementary statement. Two or three speakers will be asked to make ten-minute addresses and then the discussion will be open to all delegates.

Among the subjects which will be discussed are the following: Western Mining Conditions, Mine Manufacturing, Federal Investments, Safety, Federal Aid in Mining, Federal Aid to Mining Schools, Water Power Development, Conservation, Workmen's Compensation. Development of Minerals in Reservations, Right-of-Way on the Public Domain, Mine Taxation, Revision of Mining Laws and Compulsory Arbitration.

While the entertainment features will be so planned as not to interfere with the work of the convention, more time than usual will be allowed from the regular sessions. The local entertainment committee will be ready to make enjoyable every minute not occupied by the business of the Congress. President, Carl Scholz; Secretary, J. F. Callbreath.

RECLAIMING CALUMET AND HECLA TAILINGS WITH A HYDRAULIC DREDGE

For nearly forty years, the Calumet and Hecla Copper Mining Company has deposited in Torch Lake at Lake Linden, Houghton County, Michigan, an immense amount of sand, the residue from the rock crushed in the stamp mills. In the early days sand containing fully one per cent. copper was thus disposed of. During the past few years the loss in tailings has been much reduced, but only recently has a process been perfected whereby the tailings now in the lake can be reworked and the copper recovered. It is estimated that the amount to be recovered on the shores and in the lake aggregates 40,000,000 tons.

In order to accomplish this, the Calumet & Hecla Company have under construction a hydraulic dredge which is designed to dig to a depth of 100 feet below the surface of the lake, a greater depth than has ever been attempted by a hydraulic dredge before. In fact, the maximum depth dredged in this manner at the present time is attained by the sand suckers in Long Island Sound, a depth of 70 ft. The dredge was designed and built by the Bucyrus Co.

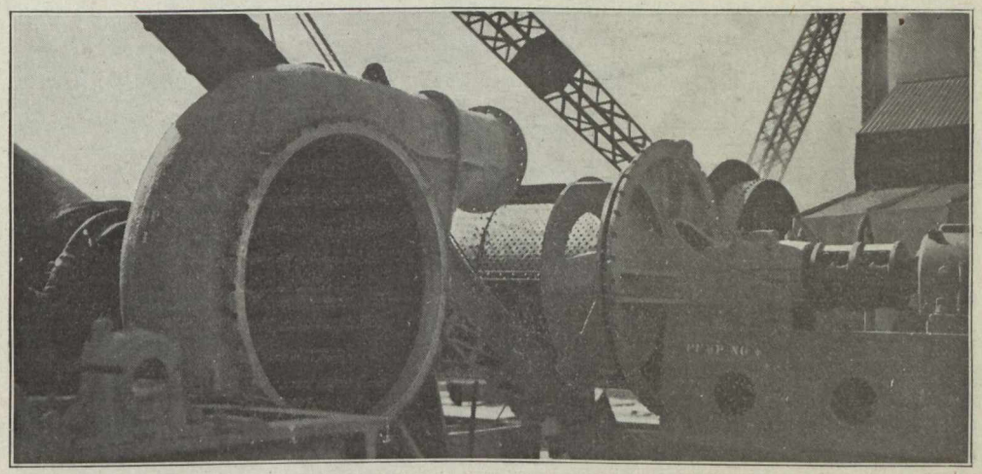
The problem encountered as far as it affects the dredge design is somewhat complex. Certain portions of the tailings piles have in the past been used as a public dump, consequently, a certain percentage of foreign matter is contained therein. It becomes necessary, therefore, to screen the material thoroughly before delivery. As, however, only a portion of it requires screening, the design of the dredge must be such that the screen may be cut out when not required. This has led to the necessity of two pumps, and a complicated control.

The dredge has a steel hull, 110 ft. long, 56 ft. wide and 9 ft. deep. The deck, however, has an 8 ft. overhang, which makes the extreme width of the hull 72 ft. The digging ladder is 136 ft. in length, requiring a ladder well 70 ft. long by 10 ft. wide. This extreme length of well has necessitated an exceedingly heavy overhead truss.

There are two centrifugal dredging pumps, each of 20 in. diameter, which for convenience will hereafter be referred to as No. 1 and No. 2. Two pumps instead of the usual one are made necessary by the screening problem mentioned before. No. 1 pump is driven by a 750 h.p. motor, and No. 2 by one of 1,250 h.p.

Pump No. 1 delivers the material directly from the lake to the screen on the dredge. When this screen is disconnected, by changing the pipe connections, it pumps ashore through a pipe line up to 800 ft. in length, with a maximum elevation of about 30 ft.

Pump No. 2 pumps ashore from the sump under the screen through a pipe 2,500 to 3,000 ft. in length, with a maximum elevation of about 10 ft. This pump is so designed that it may be connected to the suction pipe and thus take the material directly from the bottom of the lake to shore, in place of No. 1. Either pump may be used independently when the screen is not in use. The decision as to which pump should be used depends upon the length of the pipe line at the time. It is impossible of course to make one pump suffice, as the screen when in use breaks the flow.



Centrifugal Pump, Dredge No. 1. Calumet and Hecla Mining Co.

The screen is 7 ft. in diameter and about 45 ft. long. It is made of manganese plates with perforations one inch in diameter. It delivers the refuse to a scow alongside.

No cutterhead is required because of the loose character of the material, which has no binder. Hydraulic jets are provided, however, with which to break up the material if necessary. These jets are operated by an 8-in., two-stage horizontal double suction turbine pump, driven by an independent motor.

On account of the great depth of the lake and the soft nature of the material, the dredge works on head and side lines instead of spuds.

Instead of one winch, as is the custom of dredges of this type, the length of the ladder well makes it necessary to have two. Each has four drums, for the ladder hoist, two bow swing lines, two ladder swing lines, two stern swing lines, and a tail line. Each winch is driven by an independent 50 h.p. motor.

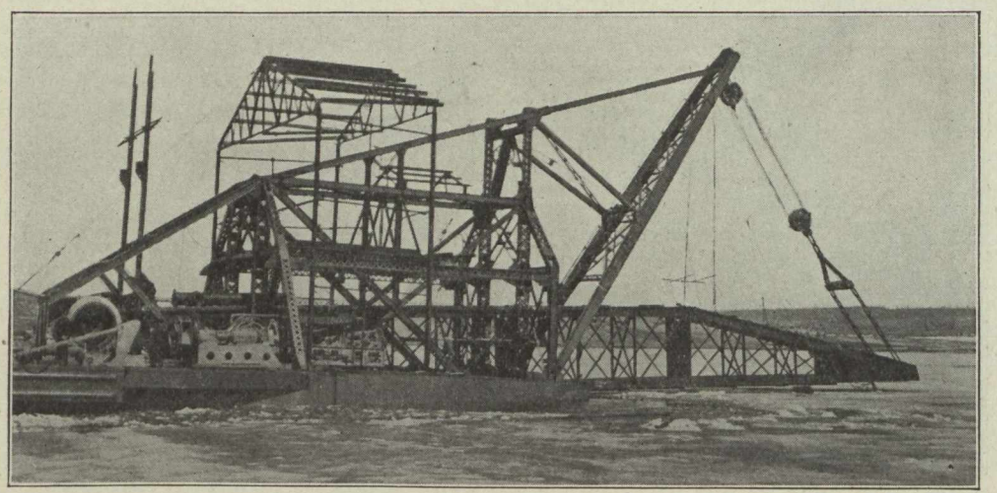
An air compressor is provided for operating the air cylinders which control the friction clutches. A 6-in. service pump of the same type as the jet pump is supplied for sealing the swivel joints in the suction pipe in order to prevent air leaks. There is also an overhead crane for serving the machinery.

As the dredge is to be worked the year round, a 75 h.p. boiler is provided for heating purposes and for driving the capstans and electric light plant when the dredge is being shifted and no electric power is available.

The two-pump feature has necessitated a number of unusual features of control. The pumps, in the first place must be balanced, so that No. 1 will not deliver more material than No. 2 can take care of. This is possible as No. 1 is working under a constant load, while the load No. 2 carries varies according to the length of the discharge pipe which is in use. This necessitates a careful adjusting of the speeds of the pumps. After thorough study a water rheostat was adopted, the first time that this has ever been tried in the United States for large motors. This device gives an infinite number of speed control points and thus great flexibility. The speed is governed by the height of the liquid in the rheostat tanks, and the flow by a pivoted overflow pipe, which is full on when in a vertical position and off when horizontal. The operator controls the position of the pipe. The liquid must be kept in circulation because of the danger of heating. It is pumped through cooling coils, and returned to a storage tank overhead, from which it flows by gravity into the rheostat tanks. The flow is controlled by a valve with an automatic solonoid control. A 3-in. centrifugal pump driven by an independent motor does the pumping.

Another interesting feature is the interlocking electrical control, in order to prevent starting and stopping the pumps in the wrong order.

The electric power used is 2,100 volts, 25 cycle, 3 phase. The dredge is about to be tested at the present time, but doubtless will not be operated to full capacity until next spring.



Dredge No. 1. Calumet and Hecla Mining Co.

HUDSON BAY MINING CO.

The annual report of the Hudson Bay Mining Co. shows a total production of 391,360 oz. of silver valued at $196,435.92 from the Cobalt property, now worked out and closed down.

The total income for the year was $198,082.50, while the expenditure was $145,521.79, leaving a balance of $52,560.71.

During the past year there was spent at the Dome Lake Mine in Porcupine, the controlling interest of which is now held by the Hudson Bay, a total of $119,375.

The end of the ore reserves at No. 1 mine in Cobalt was reached in June of this year, and the following months the mine was closed down, after a production for the fiscal year to that date of 393,360 oz. of silver, which had a value of $196,435.92.

Speaking of the Porcupine camp, the President stated that the purchase of the Dome Lake Mining Company stock was considered a very important one by the directors, and although requiring a large investment of cash surplus, the results to date in development work justified the action of the directors.

The company now holds 540,000 shares of the stock The total issue is 940,312 shares.

An option is now held by the company on the remaining shares in the treasury of the Dome Lake.

During the past year several mining claims had been examined, but none were taken up. On some claims at one time under option to the company in the Kirkland Lake section, assessment work was done, but the option was ultimately dropped.

Mr. A. H. Brown, general manager of the company, in his report to the directors, spoke in hopeful terms of both the Cobalt and Porcupine properties.

In Cobalt work is being continued at No. 2 camp, near the McKinley-Darragh, and while no favorable developments have been met with to date, there is every possibility that the thorough exploration work being carried on will result in values being proven.

At Porcupine the outlook is promising for additional ore shoots on No. 1 and 3 veins of the Dome Lake mines.

The annual report shows a total production since 1907 at the Cobalt property closed down in July last, of 5,604,168 oz. of silver. The total value of this production was $2,965,523.18, of which the greater portion has been returned to the shareholders in dividends. These dividends amounted to several hundred dollars a share.

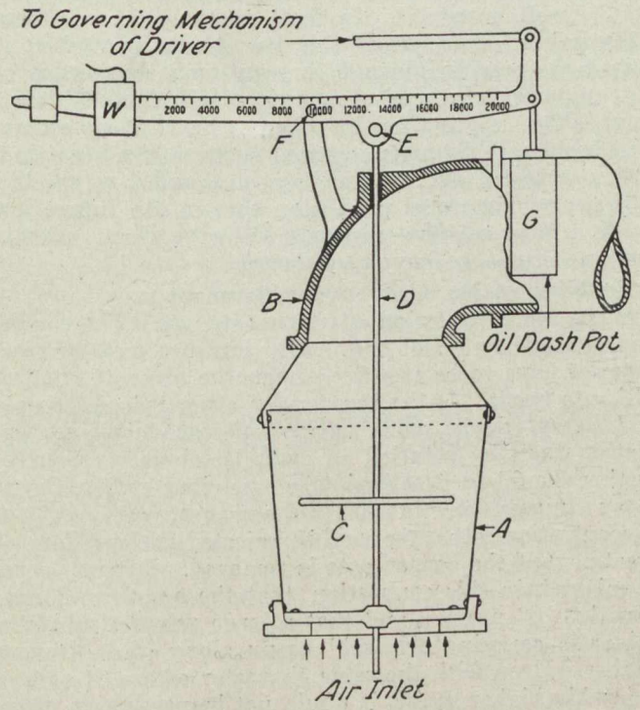
The action of the directors in purchasing control of the Dome Lake Mines was endorsed by action, and a resolution was passed advancing further money for development purposes at that property if necessary.

The old Board of Directors were elected, and at a subsequent meeting of the directors the same officers were again elected to the offices.

The Officers of the company are as follows: President, George Taylor; Vice-President, A. A. McKelvie; directors, Thomas McCamus, D. M. Ferguson, J. J. Grills and S. S. Ritchie, all of New Liskeard, and Charles L. Sherrill, of Buffalo, N. Y.

A CONSTANT VOLUME GENERATOR.

The Canadian General Electric Co. has developed a constant volume governor which can be attached to their centrifugal compressors for blast furnace work. Its principle can be understood from the diagrammatic arrangement shown in the accompanying figure. The governor is placed on the intake end of the compressor, the air being admitted through à conical pipe (a) into an elbow (b), which is direct connected to the inlet flange of the compressor. In this conical pipe is



mounted a horizontal float (c) suspended from a vertical rod (d). The latter is connected to a beam (e) which is free to move about a pin support (f). The beam is graduated to indicate the amount of air in cubic feet per minute that the compressor will deliver when the sliding weight (w) is placed at any particular graduation. An oil dashpot (g) is attached to one end of the beam to dampen any too violent oscillations. The method of operation of this governor when furnishing air to the blast furnace is as follows:

Suppose that 25,000 cu. ft. of air is to be delivered to the blast furnace: The sliding weight (w) is set at the graduation mark 25,000 cu. ft., and the float (c) will assume a definite position with relation to the conical pipe (a). Let us assume that this 25,000 cu. ft. of air is being delivered against a pressure of 15 lb. per sq. in., that is, with the driver of the centrifugal compressor running at such a speed as to produce an air pressure of 15 lb. If, at any instant, the charge in the furnace becomes more densely packed, or if the furnace is slowly beginning to get into an unhealthy condition through the formation of slag, the resistance to the flow of air through the furnace is increased. With this increased resistance the centrifugal compressor can no longer deliver 25,000 cu. ft. of air, because it would take a higher pressure than 15 lb. per sq. in. to force this quantity through the furnace, and we may say that momentarily a less quantity is delivered. Just as soon as this occurs, however, the float (c) can no longer remain in its present position, because it is not sustained by the original volume of air passing by it. As the volume of air decreases the float (c) will start to drop, whereupon the rod (d) will immediately move the beam (e) into a new position. The end of the beam arm is connected with the governing mechanism of the driver by means of suitable levers. In the case of a steam turbine drive it will admit more steam to the turbine and speed it up. This higher speed will increase the pressure delivered by the compressor until the pressure is of sufficient magnitude to force through the original quantity of air, 25,000 cu. ft. per minute. As the turbine speeds up the pressure continues to increase slowly, and therefore also the volume of air, until the constant volume governor has almost returned to its original position. The governor will then keep the turbine running at the increased speed necessary to deliver the volume of air required. The constant volume governor therefore immediately responds to any change of condition in the blast furnace, and the compressor unit will speed up or down, depending upon whether a greater or less pressure is required to force through a constant volume of air. From this it can be seen that the constant volume governor responds instantly, long before the furnace operator could notice any change, and therefore the furnace is kept in a more uniform condition. This results in a larger output of pig iron of a more constant and better quality.

KIRKLAND LAKE.

A prospecting plant has been installed on the property of Harry Oakes, Kirkland Lake, and sinking begun on a vein that has long been recognized as one of the most promising in the district. On Oct. 15 the shaft had reached a depth of 50 ft., revealing a vein about 2 ft. in width, heavily charged with molybdenite and sulphides, and carrying free gold and telluride. The telluride, to all appearances, is identical with that found at the Tough-Oakes mine. The presence of molybdenite and finely disseminated sulphides point to a vein of like origin. As a result of prospecting during the summer two other parallel veins have been discovered, which, though carrying low values, give evidence of enrichment in sections. Mr. Oakes owns the greater part of Kirkland lake, under which he proposes doing considerable work.—J. W. M.

McINTYRE.

The Nipissing Mining Company, of Cobalt, has officially announced the release by the company of an option held on the McIntyre mines of Porcupine. The company took up an option of 1,500,000 shares on the McIntyre some time ago, at a price said to approximate 40 cents a share, and the transaction involved cash payments of $600,000 extending over a period of months. No reasons were given by the Nipissing Company for the release of the option.

DOME.

It is understood that the Dome Mines has let a contract for 30,000 feet of diamond drilling. Ten diamond drills will be started up immediately, and will be working all this winter. The work is being undertaken with a view of getting more precise information as to the extension of ore bodies between the "golden sidewalk" and the Dome Extension boundaries.

FOLEY-O'BRIEN.

It is understood that the Foley-O'Brien gold mine at Porcupine may be opened up again soon. Operations here ceased some time in the summer when the plant was burned down. It is understood that both shafts may be operated.

CONCENTRATION IN CONNECTION WITH CYANIDE TREATMENT OF LOW GRADE ORES

In the November bulletin of the American Institute of Mining Engineers, Thomas Crowe and G. H. Clevenger discuss this subject. Mr. Crowe says:

"The interest manifested of late in the treatment of low grade ores, together with Mr. Clevenger's discussion of the mill and metallurgical practice of the Nipissing Mining Co., prompts me to add a few remarks to concentration in connection with cyanide treatment of low grade ores. Mr. Clevenger in this discussion does not condemn concentration in this connection, but, nevertheless, the tone of his remarks would lead one to believe that his conclusions are like those of many others; that concentration is often turned to as a last resort in an attempt to improve or obtain an extraction upon an ore by the recovery and sale of the refractory portion of the ore. This, I will attempt to point out, is not always the case. Concentration in connection with cyanidation often performs an entirely different function, i.e., one of saving fine grinding.

"Economy being the keynote of successful treatment of low grade ores, the problem often becomes more commercial than metallurgical, and, as there is generally a definite ratio existing between cost of operation, degree of comminution, and percentage of extraction, the grade of ore under treatment usually imposes a limit upon these factors.

"With many ores grinding is the most expensive single item in their treatment, therefore the degree of comminution is very apt to be governed by the allowable cost of operation. With most ores the degree of comminution controls to a great extent the percentage of extraction. So in the treatment of low grade ore it often becomes necessary to sacrifice extraction, through coarse grinding for the benefit of cost, in order that the greatest ultimate profit may be obtained, and it is under those conditions that it is possible for concentration to play an important part in overcoming to some extent the effect of mesh.

"The precious metals occurring in an ore are usually closely associated with the metallic portion of the ore, and as this metallic portion is generally fairly well liberated from the gangue at comparatively coarse meshes, further grinding of the ore is necessary only in order that the metallic portion may be reduced sufficiently fine that the precious metal part of it may be dissolved by cyanide solutions in a reasonable length of time.

"A concentrating table under these conditions would have the effect of removing this refractory metallic portion, it being especially efficient in removing that portion which is not sufficiently fine to be readily dissolved by cyanide solution (the coarse), putting the small amount of high grade concentrate in a separate pile where it can be dealt with by more extensive methods of treatment, it being of sufficient value per ton to justify further grinding, longer contact, and more elaborate methods, at the same time simplifying the subsequent treatment of the bulk of the ore and accomplishing the same result as though the whole mass of ore were ground to a very fine mesh.

"An exemplification of the effect of concentration in connection with cyanidation in the treatment of low grade ores may be found in the mills of the Cripple Creek district, which are treating the sulpho-telluride dump ores. Here concentration performs another function besides that of saving grinding as described above. On account of the peculiar occurrence of the values in these ores, the sulpho-tellurides occurring upon the faces and seams of the rock, when the ore is crushed to 30 mesh it is found that the sulpho-tellurides are liberated to such an extent that, after concentration and classification, the sand product of this operation is of such low value that it can be rejected as a tailing, leaving only the enriched concentrate and slime to receive further treatment.

"The low treatment costs allowable by this rejection of 50 per cent. of the ore in the form of low grade sand can be well imagined. In fact, the success of these mills in the treatment of this low grade by-product is only made possible through the continual elimination of that material which will not withstand further treatment. This is practised by other methods of concentration besides table concentration, such as hand sorting, coarse crushing and trommeling, etc., and I would like to make a long range prediction that in the future low grade milling selective methods will prevail and concentration become an important factor."

Replying to Mr. Crowe, Mr. Clevenger says:

"The whole question of ore treatment is, of course, an economic one and frequently our pet metallurgical theories have to be sacrificed upon the altar of greatest ultimate profit. If the recovery of a portion of the gold and silver can be more economically made by concentration than by solution in cyanide, obviously concentration should be practised. The case cited by Mr. Crowe is an unusual one in that his strongest argument for concentration is that the sand be rejected without further treatment if the concentrate is removed. It must be remembered, in this connection, that the ore treated runs less than $3 per ton and that a large proportion of the minerals carrying the gold occur along the cleavage planes. Even with the same character of ore, if of considerably higher grade, it would not be possible to reject the sand without incurring a serious loss. The character of many of the low grade ores of other districts would render this type of practice impossible. Lack of suitable mill sites for a large expanse of leaching tanks, together with favorable smelter contracts, are factors in the Cripple Creek district which are not without their influence.

"There are a number of possible variations of concentration in conjunction with cyanidation, the more important of which are:

1. Crushing of the ore in water concentration, either directly or following another recovery operation, as amalgamation; rejection of the tailing, and cyanidation of the concentrate. This method is most suitable for use upon very low grade ore or tailing. A good example of such practice is the Treadwell, where the tailing from the amalgamation of the very low grade ore treated could not be profitably treated directly by cyanidation; but cyanidation of the concentrate recovered from the tailing by concentration returns a handsome profit.

2. Crushing of the ore in cyanide solution; concentration, followed by cyanidation of the sand and slime. Concentrate treated by one of three methods:

(a) Shipment of the concentrate to the smelter.

(b) Special local treatment of the concentrate.

(c) Special treatment of the concentrate stream, as, for example, fine grinding or amalgamation, etc., and return of the concentrate stream to the balance of the pulp for cyanidation.

Method (a) of concentrate disposal has been very generally practised in the past, but care must be exercised in adopting this practice, for the reason, as I have previously pointed out, that one may pay the

smelter rather dearly for recovering gold and silver recoverable by cyanidation under proper conditions.

Method (b), involving chemical treatment or roasting prior to cyanidation of concentrate, has been practised and, under certain conditions, may be advantageous.

Method (c) has its adherents and, under favorable conditions, may present certain advantages. However, there is at present a tendency to revert from this method to (b), even when it is possible to obtain as high a recovery by (c), for the reason that, if the concentrate residue is kept separate, it may later become a valuable asset.

3. Crushing of the ore in water or cyanide solution and separation of the pulp into sand and slime; concentration of either one or both; rejection of either sand or slime and cyanidation of the other product. An example of this is the old Homestake practice, where, after crushing in water and amalgamation, the slime was rejected, as it was too low grade for profitable treatment until the development of the Merrill filter press. The sand in this case was treated by cyanidation without concentration. At the Portland Victor mill the sand is rejected after concentration and the slime treated by cyanidation."

THE CANADIAN CONTRIBUTION TO THE MEDICAL SERVICE IN THE GREAT EUROPEAN WAR.

By Colonel G. Sterling Ryerson, M.D., R.M.O.
President of the Canadian Red Cross Society.

It may be truly said that never in the history of the world has there been such wholesale slaughter as is now being perpetrated on the battlefields of Europe. No such colossal armies have been seen before. Let us consider what are the probable casualties based on former modern wars. The battle of Magenta was fought in 1859, the French lost 8 per cent. and the Austrians 9.2 per cent. At Solferino the figures are French 8.9 per cent., Austrians 10.3 per cent. In 1866 at Koenigratz the Prussians lost 4 per cent., the Austrians 11 per cent. In 1870 at Froeschwiller the French lost 21 per cent., the Germans 15 per cent. At So. Privat, French 11 per cent., Germans 10 per cent. At the battle of Liao Yang, Japanese 13 per cent., Russians 9 per cent. In the late Balkan war 10 per cent. was seldom passed. It may, therefore, be safely said that the average of killed and wounded will be 7 per cent. of armies engaged, of whom 2 per cent. are killed outright. Therefore, based on these statistics, there will probably be an enormous number of men killed and wounded.

Then comes the matter of sickness. Without going into detail I may say that the average disability in war is 20 per cent. This is sometimes greatly exceeded. The British invalided 73,977 during the South African war out of an army of 325,000 men. During that war there were 57,684 cases of typhoid, of which 19,454, or 33 per cent., were invalided, and 8,022, or 13.9 per cent., died. The deaths from typhoid exceeded the total number killed in action. Fortunately typhoid inoculation will make typhoid fever rare among the British in this war, but I have no information as to what percentage if any of the Germans or the Allies have been inoculated. In confirmation of my statement regarding immunity, let me say that inoculation was made compulsory in the American army of 90,000 men in 1911 and has practically abolished the disease. In 1913 there were only three cases and no deaths. Ninety-three per cent. of the British army in India has been inoculated. Formerly about 600 men were lost annually. Last year there were only twenty deaths from typhoid in this army.

Allowing 20 per cent. as an average number of sick it would mean that in the next few months there would be 400,000 sick in the armies of Europe. I do not wish to exaggerate, but this is a modest estimate.

Owing to the secrecy which is being maintained in this war, we are not in a position to say what medical arrangements have been made by the Allies to meet the urgent necessities of the sick and wounded, but I learn by the press that the German estimate of wounded has been far exceeded and that they are in difficulties in that regard.

The Canadian Government has sent 33,400 men. with them will go the following hospitals:

	Beds.
2 General Hospitals, each 520 beds	1,040
2 Stationary Hospitals, each 200 beds	400
1 Clearing Hospital, 200 beds	200
3 Field Ambulances, each 150 beds	450
Total	2,090

These hospitals are being equipped by the Government, who are also supplying the personnel of medical officers, nurses, orderlies, drivers and cooks. I estimate the number required will be about 1,100.

In addition to the regular and official supplies the Canadian Red Cross Society are supplying large additions of reserve and supplementary stores.

These stores will be under the direct control of the officers commanding the Canadian hospitals, and will be taken by them on the transports to Europe so that they may be immediately available. It will be necessary for the society to supplement these stores from time to time as occasion offers.

It is understood that the Red Cross Societies aid all sick and wounded irrespective of nationality. Once a man is wounded he becomes a non-combatant and object of charity and commiseration.

It should also be stated that the Canadian Society has already since this war began remitted to the Central British Red Cross Committee at London the sum of £10,000 for the general use of the sick and wounded.

Our object in doing this is to bring as quickly as possible, through the agency of the parent Society, which is near the front, aid to the unfortunates of the armies and to avoid the necessary delay in the transport of stores from this country. It seemed to the Committee the most effectual way of giving immediate aid.

Supplies of cocoa, chocolate, arrowroot, cornstarch, jellies, lemons, oranges, sweaters, cholera belts, sleeping caps, pyjamas, socks, coal oil stoves and many other articles were sent to the hospitals at Valcartier and Quebec.

It has been previously stated that 32,400 Canadian troops have been sent to Europe to take part in the great war. It is our duty as well as our privilege to provide for the sick and wounded of this contingent all comforts which may be possible, either directly through our own Society or indirectly through the British Red Cross Society. To accomplish this we must have first MONEY, with which to purchase the necessary articles which cannot be made at home, to contribute cash to wounded and sick soldiers and to pay the running expenses. Therefore, give as your heart dictates. The widow's mite and the millionaire's cheque are equally welcome, and will be faithfully applied.

Money and goods should be sent to the Treasurer, Canadian Red Cross Central Committee, 77 King street east, Toronto, or to the local committees of your district.

PRE-CAMBRIAN CORRELATION FROM A LAKE SUPERIOR STANDPOINT*

By C. K. Leith.

Papers presented recently have contained a bewildering variety of suggestions and contentions for revision of the nomenclature and classification of the Pre-Cambrian of Lake Superior and Ontario. When one considers the nature of Pre-Cambrian correlation, its dependence, not upon fossils, but upon lithology, sequence, conditions of deposition, metamorphism, relations to intrusion—in short on physical conditions—and especially when one considers how little is really known about problems of sedimentation, metamorphism and structure, so fundamental to correlation, it is not surprising that there should be various ideas of correlation, and that earlier classifications should be modified or replaced by new ones. The variety of suggestions which have been offered may, at first thought, give the impression that the subject is in the state of hopeless confusion. But analysis of the suggestions indicates that real progress is being made. Their very number and the insistence with which some of them are urged, are indications of the virility of the attack on the problem. It is the purpose of this paper to discuss from the Lake Superior standpoint some of the proposed changes in correlation and names, in the attempt to single out if possible the real advances from the tentative suggestions.

The several papers will be taken up seriatum and then together.

A C. Lawson—A Stand Scale for the Pre-Cambrian Rocks of North America; International Geological Congress, Toronto, 1913.

Most of the contentions of this paper are not new; they have been urged and considered for many years. This new and emphatic presentation of them by Dr. Lawson seems to call for a restatement of the position of the Lake Superior geologists who have failed to adopt his suggestions. He cites the Lake superior region as a type Pre-Cambrian region which should serve as a standard for Pre-Cambrian nomenclature and classification, and proceeds to propose such a standard, ignoring, by implication, the fact that a standard has already been established in the field and so well confirmed by the work of so many different geologists and mining explorations that most of it is beyond the hypothetical stage, and must be accepted unless disproved by equally careful and intensive work. The changes are urged on the basis of short examinations of one of the outlying Superior areas, the Rainy Lake district, which has not been mapped in great detail except along the water's edge, and is not nearly so well known as the great iron and copper districts of the Lake Superior region, which have been studied so closely for so many years. They are not based on any new evidence developed in the best known parts of the Lake Superior region—in fact, they do not take account of results of recent work in these areas.

Coutchiching.—Keewatin greenstones and greenschists, originally largely basaltic flows, with minor shreds of interlaminated sediments such as iron formation and slate, have been regarded as the base of the Pre-Cambrian succession of the Lake Superior region. Associated with the Keewatin in the Rainy Lake district is a series of micaceous and hornblendic slates and schists, some of undoubted sedimentary origin and some of which are schistose phases of the Keewatin basalts. To all of these schists Dr. Lawson gave the name Coutchiching. He regards the Coutchiching as lying beneath the Keewatin, and therefore would introduce the Coutchiching series as the lowest member of the standard Lake Superior succession.

Considering the surficial nature of the Keewatin lavas and their known interlamination with sediments, there is no improbability that sediments may somewhere be found below it, but in spite of the fact that Lawson's suggestion was made many years ago, it has not found wide acceptance among students of Lake Superior geology for the following reasons:

(1) In a schistose complex of rocks standing so nearly on edge, it is difficult to prove, in the absence of basal conglomerates, the sequence of adjacent beds. The fact that Coutchiching rocks in some places dip under Keewatin rocks cannot be accepted as conclusive, because in other places Keewatin rocks can be found to be dipping under Coutchiching rocks. In many parts of the Vermilion district there are great jasper beds interlayered with the Keewatin basalts, but mainly above them. Unconformably above both is a series of Huronian sediments in part like the Coutchiching. In certain localities one could argue for the inferior position of the jaspers or Huronian on the same kind of evidence used by Dr. Lawson in his Coutchiching problem, yet the real Vermilion sequence has been ascertained only by the most careful and detailed mapping, over wide areas, checked by mining and exploration development. Until this work is done conclusions based on summer reconnaissance trips within a limited area can be only surmises.

(2) A large part of the series which Lawson originally classed at Coutchiching, in fact one of the largest areas he has described as typical Coutchiching, he now admits is later than and unconformably upon the Keewatin. He calls it the Seine series. This part of the Coutchiching he says is unconformably above another part of the original Coutchiching series. From a detailed consideration of his field work we are doubtful whether he has succeeded in proving this unconformity. Fair consideration of his evidence must lead to the conclusion that this so-called unconformity between two parts of the original Coutchiching is largely inferred and perhaps influenced by the desire to prove such a situation.

(3) Other parts of the original Coutchiching have been found to be merely schistose phases of the Keewatin basalts and not sedimentary. These parts are now eliminated from the Coutchiching. More such parts are likely to be eliminated.

(4) After taking from the Coutchiching the rocks above mentioned, it is doubtful how much, if any, of the series is left to meet Lawson's definition of Coutchiching.

If it should prove that there is a residuum of Coutchiching sediments actually beneath the Keewatin of Rainy lake, it remains to be proved that they are below the lowest Keewatin, and that they are not interbedded sediments in the Keewatin on a somewhat larger scale perhaps than known sediments in the Keewatin in the Vermilion and other districts. In this connection, the fact should be noted that the thickness of the so-called

*A paper presented at the Toronto Session International Geological Congress, 1913.

Coutchiching sediments has not been determined, and, in the nature of the case, will not be determined for a long time, because folded and fissile slates give very little evidence of original bedding. It may not be said, therefore, on the basis of present evidence that the series is a thick one. In the event of some of the Coutchiching sediment being proved to be beneath the Keewatin of this particular locality, the most that can be said is that there are sediments conformably beneath at least a part of the Keewatin, with no evidence that they are anywhere near the bottom of the Keewatin, or that they constitute anything more than interlayered sediments.

Lawson seemed to recognize the fact that the Coutchiching series is closely related to the Keewatin, and, in fact, a part of the series, when he suggested that both the Keewatin and Coutchiching be subordinated to a general term Ontarian. From our standpoint, if it be found that the Coutchiching is really below the part of the Keewatin found in Rainy Lake, Keewatin is sufficiently general to include both. If, as we suspect, all the Coutchiching is found to be unconformably above the Keewatin, as Lawson now admits that a large part of it is, there is still more reason for retaining the term Keewatin for the basement.

Lake Superior geologists are influenced by another consideration, and that is the existence, in the Vermilion district and its eastern extension into Ontario, to the south-east of the Rainy Lake district, of a series of sediments demonstrated to be unconformably above the Keewatin, and similar in many respects to the Coutchiching sediments. The sequence has been proved beyond question, and is accepted by Lawson in the paper under discussion. In reconnaissance trips through Rainy lake, Lake Superior geologists see a similar series lying in the same apparent relations to the Keewatin and are naturally slow to accept a conclusion that in so short a distance the sequence of two similar series should be reversed. They are rather inclined to take the ground that the more intensive Vermilion study indicates the probable sequence and that the Rainy lake mapping is more in the nature of a tentative approximation of the situation, which may ultimately have to be superseded. There is, of course, danger of too strong a bias being carried over from the Vermilion district, but the situation certainly warrants a conservative attitude in withholding judgment as to the real position of the Coutchiching until detailed work has been done. Certainly, no evidence has thus far been presented which would warrant the introduction of the term Coutchiching into a standard Lake Superior classification, the units of which have all been proved by repeated and careful geological surveys, supplemented by a large amount of underground work.

(5) These facts were all considered by an International Committee composed of representative geologists from the United States and Canada, and this committee refused to accept the conclusion of the inferior position of the Coutchiching. The Canadian members of the committee certainly cannot be accused of any bias against Lawson's views, having adopted them more or less in Canadian publications, and the reference to this committee's report as a "triumph of diplomacy for the geologists who proposed it" is a weak answer to the statements of fact agreed to by the committee.

Algoman.—Lawson would introduce the general term Algoman, co-ordinate with Laurentian, for the batholithic acid intrusions into the Middle and Lower Huronian series of Lake Superior. If this be done, another general term should be introduced to cover the batholithic intrusions into the Animikie, and still others to cover the several periods of basic intrusion. We see no need at the present time for the introduction of so many new names. The experience with the term Laurentian has been so unfortunate, in that it has been many times applied without sufficient evidence of age, that one is slow to offer additional waste baskets in which to throw intrusives. There is no difficulty at present with the use of local names for these intrusives. In fact, it would seem that the logical course for the future, as suggested by Sederholm, may be rather to cut from the standard classification the term Laurentian, the only term applied to intrusive rocks, and to use merely local names for intrusions into the different series. However, the term Laurentian has become so intrenched in the literature and there are so many large areas for which the term Laurentian is a convenient one, that probably this logical course will not be followed for many years to come.

In passing, it may be noted that Dr. Lawson argues for the restriction of the term Laurentian to the acid intrusions in the pre-Huronic complex, implying that this is a new suggestion. This restriction is the one which for twenty-five years or more has been used by the Lake Superior geologists and which was urged on the International Committee by these geologists. Lawson's suggestion is, therefore, not for a change, but for the retention of the present standard usage of this term in the Lake Superior region. The International Committee approved this usage, but with the reservation that for present expediency it would be necessary to use the term Laurentian in a broader sense, to include acid intrusives of several ages, for parts of Canada where the term had already been applied in this broader sense and where it was not yet possible to separate the periods of granitic intrusion. From our standpoint the restriction of the term is highly desirable to make it conform to the present Lake Superior usage.

Eparchaean Interval.—The most important of Dr. Lawson's contentions and the one which has been most urgently put forth in the past, is that the greater unconformity beneath the Animikie or Upper Huronian series should be used as the principal basis for classification and regarded as the "Eparchaean interval." The importance of this unconformity is fully recognized by all geologists who have studied it. Dr. Lawson quotes from Van Hise and Leith's account of it in emphasizing its importance. Lake Superior geologists have mapped and studied this unconformity with the greatest care in connection with their detailed mapping of the Mesabi, Gunflint and Animikie districts where this unconformity is the most conspicuous. In fact these geologists have made almost the only detailed studies that have been made of these districts. Yet they have failed to put this unconformity in the centre of the picture, and are now told that their failure to do so has been a stumbling block to Lake Superior geology, and that thereby even their moral characters are under suspicion. Why is it, then, in spite of the recognition of this great unconformity, that it has not been interpreted as the great Eparchæan interval?

On the north side of Lake Superior, Animikie or Upper Huronian rests nearly flat upon a highly tilted, highly metamorphosed and much intruded complex of igneous rocks and sediments. When traced to the south into Cuyuna district, only thirty miles south of the Mesabi, the Animikie series in turn becomes in-

truded by granite and is as much folded, metamorphosed and intruded as the sediments below. The same is true of the south side of the lake. Great intrusions of northern Wisconsin are found to be post-Animikie, and even highly metmorphosed terranes like the Quinnesec schists are now regarded as probably Animikie. The soft, yielding nature of the great mass of the Animikie has, in fact, favored more intense metamorphism than in the older series. Furthermore, the principal deformation of the south shore has been post-Animikie, rather than pre-Animikie, the Animikie sediments having been laid down as nearly flatlying Middle and Lower Huronian sediments. Southward from the north shore, therefore, the Eparchæan interval is not the spectacular and easily recognizable structural discordance that is found on the north shore.

When the unconformity is considered for the entire region it becomes apparent that it is no more or less important than another unconformity, that between the Middle and Lower Huronian of the south side of the lake. For that matter, notwithstanding its conspicuous character on the north side of the lake, it is difficult to prove that this unconformity is any more important than that between the Huronian or Keweenawan rocks. All of these unconformities are overshadowed by the great one at the base of the Huronian series. It merely happens that on the north side of the lake, where Lawson and his associates have principally seen it, it has a spectacular emergence. Dr. Lawson admits that there are other unconformities in the pre-Cambrian sediments and presents no evidence to show that these are not fully as important as his so-called Eparchæan interval. When asked why he selected one of the unconformities as the principal basis of classification, and ignored the others, he failed to answer.

In the greater part of the Lake Superior region, particularly in the Marquette, Menominee, Crystal Falls, Iron River and Gogebic districts, the rocks on the two sides of the unconformity marking this so-called Eparchæan interval stand nearly parallel in attitude, with similar metamorphism, and, as a group, have Huronian aspect. It is yet not at all certain what parts of the Huronian rocks of the south shore of the lake are to be finally correlated with the two divisions of the Huronian north of Lake Huron. Also there are parts of the Lake Superior region where rocks are Huronian in their aspect, but where it has not yet been possible to subdivide them, or to correlate them with any one of the Huronian divisions. To make the pre-Animikie or pre-Upper Huronian plane the principal basis for the division of the Lake Superior Pre-Cambrian would leave sediments of identical Huronian aspect both above and below it and would be an entirely arbitrary and impracticable procedure that would not express the facts which a good classification should express.

As a corollary to his emphasis on the unconformity at the base of the Animikie, Dr. Lawson would give different group names to the sediments above and below. Those below he would call Huronian, those above Algonkian. In other words, Huronian would be restricted to the present Middle and Lower Huronian, while Algonkian would be restricted to the present Upper Huronian or Animikie and the Keweenawan. Algonkian and Huronian would be co-ordinate terms rather than Huronian being subordinate to Algonkian. Even if Dr. Lawson were right about the dominant importance of the unconformity, the retention of these two terms in this new sense would introduce great confusion into the literature. In view of the fact that his insistence upon the dominance of this unconformity is due to lack of comprehension by him of the facts of the district as a whole, and especially of the importance of other unconformities, the introduction of new terms has nothing to support it. They would fail to express the facts now expressed by the present classification. For instance, in many areas of undivided Pre-Cambrian sediments it would be necessary to call them "Algonkian or Huronian." In places where the sediments are divided, we should call part of them Huronian and another part identical lithologically, structurally, and in metamorphism, Agonkian. It would be an arbitrary division between series of like character. There would be exactly the same reason for using either of the other two planes of unconformity between Pre-Cambrian sediments as a basis for division between Algonkian and Huronian.

In the earlier days of Lake Superior mapping, several geologists thought it desirable to restrict the term Huronian to the sedimentary series below the Animikie, but as knowledge of the region widened, it appeared that such classification would be applicable to only a very limited part of the region close to the lake on the north shore, and would not be practicable anywhere away from the lake shore, either north or south, for the reason stated in preceding paragraphs.

Emphasis on the pre-Animikie unconformity as the principal basis of classification of the Pre-Cambrian sediments of Lake Superior region is not a new suggestion. Several Canadian geologists, familiar principally with this unconformity as it appears on the north side of the lake, have made suggestions of a similar sort. The difference in emphasis on this unconformity has been an unfortunate source of controversy between United States and Canadian geologists. It seems to us that this undue emphasis on the pre-Animikie unconformity has been due almost entirely to failure to look beyond the north shore of the lake and consider this unconformity in its manifestations on the south and west sides of the lake. If it were true, as has been argued repeatedly in recent years, that this unconformity everywhere separates highly metamorphosed, intruded and folded sediments and later, flatlying, little metamorphosed, folded and intruded sediments, then it would be reasonable to use it as a practical basis of field classification, but this is true only in limited parts of the Lake Superior region, and is emphatically not true when considered for the region as a whole.

W. H. Collins—A classification of the Pre-Cambrian formations in the region east of Lake Superior; International Geological Congress, Toronto, 1913.

This paper is of especial interest as summarizing the recent work of the Canadian Geological Survey in the area east of Lake Superior. Considerable advances have been made in areal connections of formations, particularly between the Sudbury and the Cobalt districts. Mr. Collins makes an effective plea for the use of local names in the present stage of mapping in order not to have the situation confused by the application of general terms from without. This is highly desirable, for while there is now substantial agreement as to local successions and names, there are a variety of opinions as to how these should be so correlated with the Huronian and other series of Lake Huron and Lake Superior. Mr. Collins' classification is as follows:

Pleistocene.		
Unconformity.		
Silurian (Niagara).		
Unconformity.		
Nipissing diabase, Sudbury norite, etc.	Keweenawan.	Huronian.
Intrusive contact.		
Whitewater series.		
Lorrain series.		
Local unconformity.		
Cobalt series.		
Great unconformity.		
Batholithic granite intrusives.		Pre-Huronian.
Intrusive contact.		
Sudbury series, Temiskaming series, Fabre series, etc.		
Unconformity.		
Granite intrusives.		
Keewatin group.		

There is in this great region a great unconformity separating little metamorphosed and folded sediments (Cobalt series, etc.) from a much more metamorphosed and folded basement (including Sudbury, Temiskaming and other sediments) intruded by great granite batholiths. This seems to Mr. Collins to mark a great dual division of the Pre-Cambrian. The rocks above he would call Huronian, those below pre-Huronian. There is likely to be little dissent from his use of local names, the sequence of rocks, and the emphasis for practical field purposes on the unconformity below the upper group of sediments, which have not been intruded by plutonic granites. His use of the general terms Huronian and pre-Huronian for the two great divisions, however, involves a correlation with the north shore of Lake Huron which is tentative.

Miller and Knight—Sudbury, Cobalt and Porcupine Geology; Engineering and Mining Journal, June 7th, 1913.

Miller and Knight have studied for the Ontario Bureau of Mines the Sudbury, Cobalt and Porcupine, and other areas which have been studied independently by the Canadian Geological Survey. Their conclusions, published at the same time as Collins', show a remarkable agreement on essential facts. Their succession follows:

Dikes of aplite, diabase, etc.
Intrusive contact.
Nipissing diabase.
Intrusive contact.
Cobalt series.
Erosion contact.
Lorrain granite.
Intrusive contact.
Temiskaming series.
Erosion contact.
Laurentian granite and gneiss.
Intrusive contact.
Grenville series.
Keewatin.

The essential difference between this table and that of Collins is that it includes the Grenville series, which is regarded as conformably superposed upon the Keewatin, in much the same manner as the Soudan iron formation of the Vermilion district, Minnesota, is superposed upon the Keewatin. They argue that the Grenville, being a much more extensive sedimentary series than the Soudan iron formations in the Vermilion district, should have a place such as that accorded to the Keewatin, Laurentian, Huronian or the Keweenawan. They do not emphasize any particular unconformity of the Pre-Cambrian and suggest general correlation only in the most tentative terms, implying that most of the Cobalt and Temiskaming series may be found represented in the original Huronian district, and therefore may be called Huronian. The assignment of the Grenville to a position below the Huronian is based on its close association with rocks of supposed Keewatin age and upon the existence of limestones beneath the Cobalt and Sudbury groups of sediments. Miller and Knight's work in the Grenville-Hastings area near Madoc, which is almost the first attempt to determine the structure and sequence of the Grenville, seems to bear out the conclusion that the Grenville series is related to a greenstone basement and is overlain by sediments of the Huronian type. The Grenville series as a whole is separated areally from the typical Huronian rocks and no place has been found where definitely recognizable type exposures of both are in juxtaposition. Until such places are found the assignment of the Grenville to a pre-Huronian period must be regarded as tentative.

A. P. Coleman—The Sudbury Series and its bearing on Pre-Cambrian Classification; International Geological Congress, Toronto, 1913.

Rocks which had in earlier work been classed generally as Huronian in the Sudbury district are now divided into a lower series of quartzites and graywackes, tilted, more or less metamorphosed and intruded by granites, lying unconformably below a flat-lying conglomerate (Ramsay Lake) which has been traced by Collins into the basal conglomerate of the Cobalt series. Unconformably above both are the little metamorphosed sediments of the Sudbury basin (Whitewater series). Coleman calls the lower series the Sudbury series. He restricts the Huronian to the Ramsay Lake conglomerate. The upper series he calls Animikie. The granite and gneisses intrusive into the Sudbury series, but older than the Huronian or Cobalt series, are called Laurentian, on the ground that intrusives of this type constitute the greater part of what has been called Laurentian in the past and that granites and gneisses unconformably below and older than the Sudbury series are in such limited amounts that the restriction of the term Laurentian to them would be a departure from past procedure. The Sudbury series is regarded as later than the Keewatin on the assumption that the relations are the same as in the Michipicoten district, where the Dore conglomerate, or the supposed equivalent of the Sudbury series, rests unconformably upon the Keewatin. The supposed Grenville rocks and the Sudbury series occur within a mile of each other near Romford. Both have been involved in the so-called Laurentian upheaval. It is possible that the supposed Grenville rocks are merely a portion of the Sudbury series sunk to greater depth in the invading Laurentian magma, but they are regarded as probably older than the Sudbury series.

Coleman agrees with Collins in emphasizing the break above the Sudbury series and in calling the Sudbury series pre-Huronian. He differs from Collins in not including in the Huronian the upper series, calling that Animikie. The discrimination of Animikie from Huronian has also been made by Lawson.

Morley E. Wilson—The Significance of Recent Developments in the Pre-Cambrian Stratigraphy of the Lake Superior-Lake Huron Region; Journal of Geology, Vol. xxi., 1913, pp. 385-98.

Wilson emphasizes the existence of a dual division of the Pre-Cambrian through the area extending from the north shore of Lake Huron north-east through the Sudbury, Cobalt, Porcupine, Larder Lake and Mistassini districts, in all of which gently golded sediments, not affected by granite batholiths, rest upon a highly metamorphosed, folded basement intruded by granite batholiths. In the first division he includes the Cobalt series, the original Huronian sediments and their equivalents. The lower series includes the Keewatin greenschists, closely associated with sedimentary rocks described under various local names—Pontiac schist, Fabre series, Timiskaming series, Sudbury series, etc., all of which are intruded by Laurentian batholiths. The emphasis on the great plane of unconformity above the series affected by batholithic intrusions and the attempt to make this a basis for correlation and nomenclature is similar to that argued by Collins, but Wilson favors an enormous extension of this idea, namely, that this great plane of unconformity is the one beneath the Animikie on the north shore of Lake Superior and that it also extends under all of the Huronian formations on the south side of Lake Superior. He bases his argument for the extension of this plane beneath the Huronian of the south side of Lake Superior upon (1) an assumed absence of batholithic intrusions in the Huronian or Animikie on the south side of Lake Superior; (2) on the possibility that in the limited areas of pre-Huronian schists of the south shore of Lake Superior there may be sediments which have thus far been overlooked, corresponding to the Lower and Middle Huronian sediments on the north shore of the lake; (3) on the lithological differences between pre-Animikie sediments on the north and south sides of the lake. In view of the fact that all of the Huronian rocks on the south side of the lake, including the Animikie, are fundamentally metamorphosed and deformed by batholithic intrusions, as shown especially in the Cuyuna, Menominee and Florence districts, and in view of the fact that no trace of sedimentary series associated with the Keewatin beneath the Huronian has been found in detail studies over many Lake Superior areas, Wilson's interesting suggestion must be regarded as only tentative, without substantial basis of evidence. The paper was written without knowledge of the recent discoveries of extensive batholiths into the Huronian rocks, which had not yet been fully discussed in literature, although they appear in accounts of the Cuyuna iron range. So far as the writer can see, there is no new evidence to warrant change in the suggestion made some years ago by Van Hise and Leith in Monograph LII. of the U.S.G.S., as follows: "It thus appears that the assignment of the rocks under discussion (Lower-Middle Huronian north of Lake Superior) to the general place of Lower Huronian and Middle Huronian is unquestioned. But as large portions of these rocks may be land formations, they cannot be exactly correlated with the aqueous deposits of the Middle and Lower Huronian to the south. The deposition of land sediments may well have begun earlier than that of the aqueous deposits or it may have continued later."

Conclusion.—The main feature that is common to three of the preceding papers is emphasis on the existence of a great plane of unconformity in parts of Ontario and the Lake Superior region, separating an upper series of unmetamorphosed and little folded sediments from a deeply eroded basement of highly folded and metamorphosed sediments intruded by granite batholiths, and the assumption, specifically stated or implied, that this unconformity is the same in age in widely separated districts.

With this essential idea as a basis, general terms are used for correlation on which the various writers show little agreement. Coleman restricts the Huronian to the lower of two series above the unconformity in the Sudbury district, using Animikie for the upper. Collins and Wilson are inclined to restrict the term Huronian to the series above this unconformity. Wilson argues that this unconformity really goes beneath the Huronian of the south side of Lake Superior. Lawson, on the other hand, carries it only beneath the Animikie. He would use the term Algonkian for the rocks above this unconformity and the term Huronian for post-Keewatin sediments below this unconformity. Miller and Knight adhere rather closely to local terms, though they suggest correlation of sediments both above and below this plane with "Huronian" sediments of the original Huronian district.

It is assumed that there is only one plane of unconformity of this sort, which is very widespread. Collins has traced an actual areal connection of this unconformity between the Cobalt and Sudbury districts, and lithological and structural similarities probably warrant its extension to certain outlying areas in Ontario and Quebec. This is a definite and satisfactory step in advance. That this plane is the same as that beneath the Huronian sediments of the original Huronian district or that beneath the Animikie of the north shore of Lake Superior, or that beneath the entire Huronian series of the south side of Lake Superior, is an assumption not based on areal connection, but projected because of certain crude similarities across wide areal gaps. So far as the Lake Superior region is concerned, there is no warrant for the use of this plane as the main basis of classification. One has only to recall the short distance of 30 miles between the Mesabi and Cuyuna districts, in which this plane of unconformity becomes tilted and folded by reason of batholithic intrusions into the series above this plane, the upper beds being fully as much metamorphosed, in some places more metamorphosed, than the beds below. Also throughout the southern central portion of the Lake Superior region, including the Gogebic, Marquette, Menominee, Crystal Falls and Iron River districts and northern Wisconsin, the simple and conspicuous elements of this unconformity are obscured by folding and later batholithic intrusions. In this part of the region there is another unconformity within the Huronian sediments, of equal magnitude so far as any one can tell. In this part of the region also, these unconformities are not more significant than the unconformity between the Keweenawan and Huronian. All are overshadowed by the great plane at the base of the Algonkian. These being the facts, anyone urging that the pre-Animikie unconformity of the type observed on the north side of Lake Superior is the Eparchaean interval, which should be used as a main basis of classification for the Lake Superior region, virtually ignores such facts.

If it is impossible to use such an unconformity as the main basis for classification and correlation between near-lying districts within the Lake Superior region, it is clear that any attempt to extend it across greater unknown areas to the original Huronian and Sudbury districts is only a guess affording a very doubtful basis for correlation. The distances are much larger than those in Lake Superior district in which remarkable changes in this plane are known. Considering the complete change in the aspect of the "Eparchaean" unconformity within short distances in the Lake Superior region, which has been proved again and again by detailed study, it seems desirable in the

present state of knowledge that the use of such a plane for purpose of correlation in Ontario should be tentative. It is entirely conceivable and probable that some of the highly folded and metamorphosed sediments in one area may turn out to be equivalent to the little folded and nearly flat-lying sediments in another, the difference being due to batholithic intrusions. Considering the widespread distribution of batholithic intrusions of at least three great periods in the pre-Cambrian, now definitely recognized, it would indeed be surprising if this situation should not be found in many parts of Ontario, and so far as it is found, the use of an unconformity rendered conspicuous by batholithic intrusions in the lower series is not conclusive as a basis of classification and general correlation.

Emphasis on lithology alone as a basis for correlation is now regarded by all as dangerous. The emphasis in the papers above referred to is not only on lithology, but on structural and metamorphic characteristics and relations to intrusions. The basis has been broadened, but it is still not final.

We conclude, then, that in each of the pre-Cambrian districts above referred to, the general sequence and structure are fairly well agreed to and there is little opportunity for dispute as long as local names are used. A probable exception to this is the assignment of the Coutchiching to a position below the Keewatin of Rainy Lake. In the Lake Superior region it has been possible with reasonable certainty, to group the various formations and series into general divisions for the region as a whole. Within the Lake Superior region correlation still presents many problems, but as a whole it has been substantially checked by the work of so many men and organizations, through so many years, that it is past the hypothetical stage. Correlation of certain Ontario districts which are not far separated has also reached a sound basis. When the attempt is made to correlate the Lake Superior formations with those of the several Ontario districts, or those of widely separated districts in Ontario, such correlations in the present state of knowledge must be regarded as largely preliminary and tentative, and certainly not sufficient to warrant sweeping changes in general nomenclature in any district. There seems to be a tendency to place too much confidence in the maintenance of the uniformity of a plane of unconformity and the assumption that planes of this type found in different parts of the same region are necessarily one and the same plane. As a working hypothesis for near-lying areas, it is extremely useful. When this assumption of uniformity of such a plane, found in certain areas of Ontario, is carried over to the Lake Superior region, it runs squarely against a vast body of ascertained facts. It furnishes an insufficient basis or warrant for any drastic revision of the division or correlation of the Lake Superior rocks. This classification has grown by a process of evolution during many years of laborious study of the area. However, it may fit elsewhere, it certainly expresses the facts essentially for the Lake Superior region. If it be discarded or seriously modified it will be as a result of studies of the Lake Superior region itself. Inferences drawn from distant areas may be helpful and welcome, but not in themselves decisive.

(To be Continued).

GRANBY CONSOLIDATED.

Granby has divided its properties into four operating units—Southeastern British Columbia, British Columbia Coast, Southwest Alaska, from Skagway west, and Southern Alaska. Each district will have a local superintendent.

The Anyox smelter, the new plant at Hidden Creek, should be able to produce 2,400,000 pounds of copper monthly, according to management plans, or at the rate of 28,800,000 pounds a year. This statement was made by President Nichols to stockholders at their annual meeting Tuesday in New York.

There has been spent on new construction about $3,000,000 and while this work has about ended, a reverberatory furnace may be added to the Anyox smelter. The existing units may eventually be enlarged to handle a greater tonnage of ore than now planned for.

The policy of expansion, adopted several years ago, will be continued. In addition to acquisition of the Midas, Mamie and Dean mines and the working option on the It mine, near the Dean, the company has other properties under examination, some of which are expected to develop satisfactorily.

The Midas and Mamie mines could have been prepared for shipments by Oct. 1, but work was suspended pending improved copper market conditions.

The Anyox investment now stands at $2,888,737 against $2,038,186 on June 30, 1913. The mines lately purchased and now under development cost the company $468,135.

ACCIDENTS IN METAL MINES IN U. S.

"It is gratifying to note that the fatality rate in the metal mines of the United States was lower in 1913 than in 1912," says Albert H. Fay, engineer of the Bureau of Mines, in a technical paper just issued.

"The number of men employed during 1913 was 193,088, as compared with 169,199 for 1912. The fatality rate was therefore 3.54 per 1,000 men employed as against 3.91 per 1,000 for the year 1912, and 4.19 for 1911.

"While the total number of persons killed in the metal mines during 1913 was slightly more than in 1912, there were about 24,000 more men employed, so that the rate is reduced to 3.54 per 1,000 employed during 1913, as compared with 3.91 for 1912. A number of the states show a slight increase, but a majority of the principal mining states show marked decreases as follows:

"The important mining states showing a continuous reduction of fatality rates during 1911, 1912 and 1913 are Idaho, Michigan, Montana, Nevada, New Jersey, South Dakota and Utah, representing in 1913, 38 per cent. of the mining industry. Of the states showing a decreased fatality rate during 1913 as compared with 1912 only, may be mentioned Alaska, Alabama, Colorado, New York, Oklahoma, Tennessee, Wisconsin and Wyoming.

"This gradual reduction is to be accounted for largely by the introduction of safety appliances, better supervision and a more strict enforcement of rules and regulations of the mining companies, and a closer observance of the State laws. Practically all of the larger companies, and many of the smaller ones, have done much in safeguarding their employees. They have inaugurated the 'safety first' movement with the results above mentioned. By first-aid treatment many slight injures have been cared for, pain relieved, and a cure effected in a short time, so that many of these injuries have been of short duration and kept out of the 'serious injury' or 'fatality' class."

THE COMPOSITION OF NATURAL GAS*

By G. R. Mickle.

For convenience we may consider that there are three broad classes of natural gas, viz: (1) The "dry" commercial gases, that is, those that are found in such quantities that they are capable of utilization and are not intimately associated with oil; (2) The "wet" gases found in oil wells; (3) Those that are of no value, due either to lack of sufficient combustible constituents or their occurrence in insignificant quantities. It is the "dry" commercial gas with which we are concerned in Ontario, there being no evidence at present of the existence of "wet" gases in any important quantity.

Before proceeding further it may be as well to explain briefly the nature of the most important constituents, viz: the various hydrocarbons belonging to what are called the paraffin series or the saturated hydrocarbons which have the general formula $C_n H_{2n+2}$; e.g. where n=1, formula is $C H_{2+2}=C H_4$ and so on.

The only ones found in the dry Ontario gases are: Methane ($C H_4$) with heating power of 1067 B.T.U.; Ethane (C_2H_6) with heating power of 1865 B.T.U.; Propane (C_3H_8) with heating power of 2665 B.T.U. B.T.U. standing for British Thermal Units per cubic foot of gas.

The only other constituent in natural gas having any heating value is hydrogen sulphide with 689 B.T.U.

Taking all the reliable information available at present regarding the composition of the "dry" commercial gases, and it must be remembered that it is necessarily incomplete as it is not conceivable that all the variations and peculiarities in gas which may exist are known at the present time, we find that methane is the chief constituent. In some rare cases, perhaps, it is the only one, but usually with it are other hydro-carbon compounds, e.g. ethane or propane, and also, nitrogen, carbon dioxide and sometimes hydrogen sulphide. Many analyses published will show oxygen, carbon monoxide, olefines or illuminants, but the most reliable evidence points to the probability that these constituents never exist in natural gas. None of these were found in any of the gases examined from Ontario. At the present as far as the writer can ascertain the maximum amount of the various constituents other than methane which are known to exist in "dry" commercial gases are as follows: Ethane, 27 per cent.; propane, 6 per cent.; nitrogen, 46 per cent.; hydrogen-sulphide, 0.8 per cent.; carbon dioxide, 6 per cent.; helium, 1.5 per cent.

These limits as stated before are certain to be extended by the analyses of gas discovered in the future. Extensions of these limits it will be seen can only increase the number of gases which may exist and therefore make the reasoning employed later on more forcible.

It is clear that "dry" commercial gas is not a chemical compound, but is a mixture of the above mentioned different gases, the relative proportions of which are not regulated by any chemical laws, but any one of the constituents mentioned, ethane, nitrogen, etc., may vary from zero to the maximum given above for each. The resultant natural gas is a combination of certain different gases and the number of combinations or the number of different natural gases which might exist is, therefore, capable of calculation by the ordinary mathematical laws, just as the combinations of any other kind of things.

The following are analyses of natural gas from Ontario wells:

Analyses Ontario Natural Gases.

By Prof. W. H. Ellis, J. W. Bain, E. G. R. Ardagh, Chemists.

County and Well.	H_2S	CO_2	O	CH_4	C_2H_6	C_3H_8	N	Condensate.	lbs. on well.
Kent No. 1	†	0.1	*	76.1	18.0	*	5.8	....	565
Kent No. 2	0.3	*	*	84.4	10.8	*	4.5	10.6	522
Essex No. 1	0.3	*	*	87.6	7.3	*	4.8	....	50
Kent No. 3	0.6	0.1	*	86.0	8.5	*	4.8	....	436
Kent No. 4	0.5	0.05	*	86.8	7.9	*	4.8	....	400
Kent No. 5	0.4	0.3	*	83.4	10.6	*	5.3	....	450
Kent No. 6	0.8	*	†	78.2	15.7	*	6.1	....	418
Kent No. 7	0.8	?	*	84.1	8.5	*	5.8	....	519
Kent "Surface" Tp. Howard	*	*	*	83.0	*	*	17.0	....	50?
aKent "Surface" Tp. Ranleigh	*	0.1	0.3	92.9	*	*	6.7	....	?
Lambton No. 1	*	*	*	68.3	12.5	3.4	15.8	11.6	830
Lambton No. 2	*	*	*	69.0	15.7	1.8	13.5	9.1	830?
Lambton No. 3	*	*	*	80.2	11.7	*?	8.1	....	?
Elgin No. 1	*	*	*	84.1	10.8	*	5.1	....	350
Norfolk No. 1	*	*	*	84.4	6.8	*	8.8	....	400
Norfolk No. 2	*	*	*	83.8	7.7	*	8.5	....	545
Norfolk No. 3	*	*	*	75.8	14.2	*	10.0	....	?
Haldimand No. 1	*	*	*	67.8	16.0	3.5	12.7	17.6	275
Haldimand No. 2	*	*	*	79.7	11.4	*	8.9	10.8	300
Haldimand No. 3	*	*	*	76.7	14.6	*	8.7	....	10
Haldimand No. 4	*	*	*	81.4	11.7	*	6.9	....	140
Haldimand No. 5	*	*	*	79.4	14.3	*	6.3	....	225
Haldimand No. 6	*	*	*	81.8	11.8	*	6.4	....	250
Haldimand No. 7	*	*	*	76.6	16.3	*	7.1	10.8	285
Haldimand No. 8	*	*	*	76.3	15.4	*	8.3	....	250
Haldimand No. 9	*	*	*	84.9	8.3	*	6.8	....	87
Haldimand No. 10	*	*	*	77.6	15.4	*	7.0	....	100
Haldimand No. 11	*	*	*	77.8	14.7	*	7.5	....	100
Haldimand No. 12	*	*	*	80.0	11.4	*	8.6	....	?
Wentworth No. 1	*	*	*	80.2	13.1	*	6.7	....	186
bBrant No. 1	*	*	0.1	76.9	8.0	1.2	13.8	7.8	20
Brant No. 2	*	*	*	68.6	19.0	*	12.4	14.7	?
Brant No. 3	*	*	0.05	74.6	15.4	*	10.0	....	?
Welland No. 1	*	*	*	74.8	17.3	*	7.9	15.6	50
cWelland No. 2	*	*	0.2	80.0	12.9	*	7.1	....	100
Welland No. 3	*	*	*	82.1	13.5	*	4.4	....	100
Welland No. 4	*	0.05	0.05	83.6	12.0	*	4.3	....	120
Welland No. 5	*	0.15	0.05	93.7	3.3	*	2.8	....	50
Welland No. 6	*	*	*	75.6	15.5	*	8.9	....	185
Welland No. 7	*	*	*	85.9	8.7	*	5.4	....	6
York No. 1	Result given separately below								
York Scarboro Tp. "Surface"	*	1.65	*	85.15	0.0	*	13.2	....	5

*None. †Trace. (a) As this gas was probably in contact with water and might have taken oxygen from that, we cannot assume the O was due to sampling; no correction is, therefore, made. The sample was taken by displacing water. (b) This is the highest O in any sample taken with water. The rubber tubing was blown off during operation; no correction made (c) Corrected to air free sample. Taken "dry."

Analysis of York No. 1 by Prof. E. G. R. Ardagh.

Carbon dioxide	0.1
Carbon monoxide	1.2
Ethane	3.1
Hydrogen	none
Hydrogen sulphide	none
Methane	86.0
Olefines	1.3
Oxygen	none
Nitrogen	8.3

Note.—The carbon monoxide and olefines appear in the analysit at the expense of the methane and ethane, but the relative proportions in which this took place are not known.

*Extract from Annual Report Ontario Bureau of Mines, 1914.

Influence of Geological Formation.

The analyses as far as the evidence goes do not appear to show that the geological formation in which the gas is found has any influence on the composition. In taking the samples from Welland County a special effort was made to ascertain this. Gas is found in four different rocks in that county, viz.: the Clinton, average depth about 700 ft., Red Medina 765 ft., White Medina 810 ft., and Trenton. As many wells derive their gas from two or more of these sands, the drilling records were examined carefully to select wells which yielded gas in only one formation. Accordingly 1 and 2 were taken to represent the White Medina and 3 and 4 the Clinton, and 5 the Trenton. Red Medina was left for Haldimand county. But it is seen that No. 2 is similar to 3 and 4 and different from 1. Afterwards two more samples were taken in Welland—No. 6 in White Medina and 7 a mixture of Clinton and White Medina gas. If we conclude that the White Medina gas is higher in ethane than the Clinton basing that on 1 and 6, then the results of 2 are inconsistent with this. Moreover, No. 7 is lower in ethane than either of the other Clinton or White Medina gases, although it is a mixture of the two. No. 5 is from the only well in the Trenton consequently we cannot say whether the low ethane and nitrogen is due to the influence of the rock or its position. Coming into Haldimand, No. 1, the highest ethane, is in White Medina; 7 and 8 are the next highest and are in Red and White Medina respectively. The lowest ethane in Haldimand is No. 9 in Red Medina, and so on—no definite differences.

In the western fields the gas is all obtained from one formation in the same field.

Influence of Declining Pressure on the Composition.

In the old field of Welland-Haldimand, etc., a number of wells which are almost exhausted were sampled purposely to see if there was any difference between the low and high pressure wells. The viscosity of a gas, or the measure of the difficulty with which it flows through an orifice of any kind, is supposed to vary directly with the square of the specific gravity, that is, the one with the higher density would find its way less readily through the pores and consequently we should expect the low specific gravity constituents to escape first, and, therefore, there would be a concentration of the higher density gases in wells that are nearly exhausted. Taking the specific gravities of the gases constituting natural gas, and it will be sufficient to use approximations, we have 0.6 for methane, 1.0 for ethane, 1.0 for nitrogen, and 1.5 for carbon dioxide; then the square of methane density is .36 and carbon dioxide 2.25 or methane should escape about six times as readily as carbon dioxide. Hence there should be a concentration of carbon dioxide in an old well. Unfortunately this latter gas which would be our best indicator is practically absent in the Ontario gases. Welland No. 5 is the only one in the eastern part showing more than a trace. Since this well has experienced the greatest drop in pressure of all—from 1,000 lbs. to less than 100—we should expect to see it higher in carbon dioxide, as indeed, it is, and also, higher in ethane and nitrogen. Actually it is lower in these latter two than any other of the gases in that vicinity. A careful scrutiny of the list of analyses of gas from Haldimand will show that there is no apparent concentration of ethane and nitrogen in the nearly exhausted wells. Of course we have no proof that all of them are not higher in these two gases than they were originally.

Uniformity of Composition of Natural Gas in Ontario.

The most striking feature in the whole set of analyses is the wonderful uniformity of the gas derived from widely separated, and as far as the information from drilling goes, totally disconnected areas. For instance, the sample from the small field in Elgin which is 80 miles from the Kent field is almost identical with the normal gas from the latter area, the ethane being only 1.5 per cent. higher than the mean of normal Kent gas, and the nitrogen agreeing within .1 per cent. If a dash of hydrogen sulphide were added to this gas it would agree exactly with the Kent product, or conversely remove that fraction of one per cent. from the Kent and Essex gas and all these three would agree. Yet Kent is separated from Essex by twenty miles and Elgin from Kent by eighty. By the addition or subtraction of a very few per cent. of one or more constituents most of the apparently quite separate areas would be yielding the same gas. The almost complete absence of carbon dioxide in the Ontario gases is peculiar, only one sample in all the 27 examined from Elgin eastwards showing the small quantity of .15 per cent. and one a few hundredths of a per cent. An examination of the analyses quoted from other territories shows that carbon dioxide is more often present than not. When we consider that there are more than a hundred ways in which two dry commercial gases can differ and only one in which they can agree, this uniformity is surprising. It seems to be incompatible with a local and separate origin for each field. We can understand why the oxygen and nitrogen of the atmosphere are found in constant proportions in all parts of the world. There is only one atmosphere. Those who have theories to defend may be left to adjust them to the observed facts.

Surface Gas.

The occurrence of gas in the drift in many places in Ontario is of both economic and scientific interest. Analyses are given of this kind of gas from two different localities in Kent county and one in York. In one place as explained above, this gas has been in use for 21 years in several houses and shows no manifest sign of diminution. To form some idea of the quantity this involves the writer secured through the kindness of the Union Natural Gas Company which has a number of pipe lines traversing the County of Kent, an estimate of the average amount of gas consumed by a household in the territory they serve. Twenty farm houses were taken at random and the average amount of gas they use per year was ascertained. The price paid there is 15 cents per thousand feet and the average consumption is 220,000 ft. per year per household. In the County of Welland similar figures were obtained from the Provincial Natural Gas and Fuel Company, the average consumption per household came to 102,000 cu. ft. per year, the price of gas being 30 cents per thousand. There is no climatic or other reason except the price why the consumption should be higher in one place than the other. It is certain that households using gas which costs nothing will not consume less. The quantity is more likely to be 300,000 ft. per year or more, so that the total amount consumed by one of these houses in 21 years is probably six million feet or more.

All these gases examined contained over 80 per cent. methane and therefore probably have a calorific value of over 800 B.T.U. per cubic foot, methane having over 1000. The cheapest artificial gas sold in Ontario is in Toronto, where the price is 70 cents per thousand for a gas with a heat value of about 600 B.T.U. If one were buying this natural gas on the same basis,

the price should be about 90 cents per thousand. It would no doubt be considered a boon in many houses if it could be delivered into the country at that price. A value of 50 cents per thousand could reasonably be put on this natural gas. This is equivalent to $500 per million, so that the value to the households of the six million feet used is not less than $3,000. As explained already, several farms in Howard township have used this gas. There are also some in other parts of Kent county. The probabilities must be strong that there are a number of places in Scarboro township also where a supply of gas could be obtained from the drift for years sufficient for individual houses provided reasonable economy is employed.

Effect of Water on Natural Gas.

As natural gas might come in contact with water in the drift, the possible effect of this on the composition should be considered. The facts given below are taken from Landolt u. Boernstein's Tabellen 4ten Auflage, and show the solubility of the various constituents of natural gas in water at various temperatures from 0 to 20 deg C. or 32 to 68 deg. F. The amounts given are the number of volumes of the different gases soluble in one volume of water at different temperatures.

	0 deg.	5 deg.	10 deg.	20 deg.
Oxygen.	.0489	.0428	.038	.031
Nitrogen.	.0239	.0215	.019	.016
Carbon dioxide . . .	1.713	1.424	1.194	0.878
Methane.	.055	.048	.042	.033
Ethane.	.099	.080	.066	.047
Hydrogen sulphide	4.686	4.063	3.520	2.672

It is seen at once that carbon dioxide and hydrogen sulphide are vastly more soluble than the other constituents of natural gas, which do not differ greatly in this respect and consequently water could not change their relative proportions materially. Water saturated with carbon dioxide at a temperature just above zero should release some of this in percolating downwards owing to rise of temperature. Consequently if drift gas comes in contact with water we must expect carbon dioxide.

Oxygen in Water and Natural Gas.

The behavior of oxygen in water may throw some light on the absence of this constituent in natural gas. Thorpe's Dictionary of Applied Chemistry under "Water" gives the amounts of nitrogen, oxygen and carbon dioxide present in rain water as 1.308, 0.637 and 0.128 per cent. respectively, and in discussing drinking waters it is said: "The gases present in ordinary drinking waters are those of the atmosphere, oxygen, nitrogen and carbonic anhydride (carbon dioxide). Their quantitative determination is rarely made as they are of little or no significance in connection with the quality of water for drinking, excepting that through the absence of the dissolved gases a water has the flat taste of that which has been recently boiled. It is sometimes supposed that the absence of a due proportion of dissolved oxygen in water is an indication of the presence of decomposing organic substances, but this can only be the case with surface waters, as the very purest subterranean waters are almost destitute of it." The purest waters are those that have percolated most, the oxygen being so active attacks different compounds in the soil and is eliminated. If it is thus removed from water it seems likely that even if there were oxygen in gas when it is formed it would be removed in the same way.

Relation of Surface Gas to the Deep Rock Gas.

Whether this "surface" gas has escaped from below or been formed in the drift, its composition is worth investigation. If it comes from below, unless it can be shown that the composition could be altered in some way there should be an agreement. As pointed out already in the discussion of the deep rock gases, there does not appear to be any reason why we should believe that the differences in specific gravity of the various constituents of natural gas have caused a concentration of the higher density ones. As has been explained already, evidence on this point is not complete and definite. An effort was made by the writer to secure samples of "surface" gas over known gas producing rock, but unsuccessfully. According to the drillers, gas is found in the drift frequently in drilling in the Kent field, possibly something like one-third of the wells showing it. At the time the samples were being collected none was available.

RHEIMS.

It is now proposed that any offerings for the restoration of the cathedral at Rheims should be devoted to the rebuilding of homes in northern France and that the cathedral remain a monument, as they say in Paris, "to German vandalism."

One familiar with the history of the Catholic Church and art, writes the Boston News Bureau:

"The devastation of our Lady of Rheims will live in history as a monumental crime. No more sacred shrine than Rheims exists in the Frankish or Teutonic world. It was at Rheims that Clovis was crowned and it was in that sacred sanctuary the kings of France were crowned for a thousand years. The present church dates back to the Crusades when France out of gratitude for its deliverance from Mohammedanism undertook to rear aloft a temple of religion worthy of France and of Our Lady.

"A holy guild of workers was formed and for fully two hundred years they labored incessantly building and beautifying this incomparable creation of genius and piety. It was not only a magnificent temple of worship; it was also a peerless temple of art. Its windows were incomparably beautiful. No ruby, sapphire or emerald ever surpassed in loveliness the light that streamed through those exquisite creations of mediaeval art. Priceless masters were everywhere, paintings by masters long since dead whose inspiration came from visions of angels. Tapestries that the world can never duplicate all blended into one great harmonious whole. All through the Dark Ages Goth and Hun and Vandal spread havoc and ruin through this fair land, but they knelt in awe at the shrine of Rheims. The sacred oil was poured upon the first Gothic Christian king at Rheims and even the 'Scourge of God,' Attila, did not dare to ravage this temple. Nearly five hundred years ago Joan of Arc, clad in complete armor, led Charles VII. up the exquisite nave of this cathedral. She had come from her village home to liberate France and to crown its king at Rheims. Loud hosannas resounded through those lofty aisles and that day marked the accomplishment of the heavenly mission of the Matchless Maid.

"In front of the great church in complete armor is the equestrian statue of Joan of Arc. Saxon and Norman and Dane and Hun and Vandal had come to that shrine to scoff and remained to pray, but at last German culture and German science and German civilization and German morality came in sight of this inestimable monument of the piety, the art and the glory of mediaeval Europe, and these twentieth century savages treated it as if it were only 'a scrap of paper.'"

COMMERCIAL USES FOR PEAT*

By Arthur J. Forward

Peat is still looked upon by many people in this country as something valueless, and to be got rid of in the easiest way possible. The method usually employed is to burn off the surface peat, laying the land beneath open to the operations of the agriculturist. In a recent case in Ontario on an appeal from a Court of Revision as to assessment of peat lands, a professor in an agricultural college is reported to have testified that the lands in question were absolutely worthless for agriculture unless the water was drained out down to the clay. If the property was drained down to the clay the peat could be burned off, leaving land suitable for agriculture.

There can be no quarrel with the decision of the Court lowering the assessment, nor with the statement as to drainage. But serious exception can and ought to be taken to the suggestion of burning off the peat to get rid of it.

Because the peat bogs cannot at the present moment be turned to practical account, it is assumed that their destruction is of no significance.

The economic results which can be obtained through intelligent development of our great peat areas are however important. Assuming that a given area of 100 acres is covered to an average depth of 5 ft. with peat adapted to the manufacture of fuel, this would yield about 100,000 tons of fuel, worth at $3.00 per ton, $300,000. It would furnish sufficient fuel to supply 100 families for 50 years, allowing 20 tons per annum to each family, or if burned in gas producers would supply a power plant of 400 h.p. with fuel for 50 years of 300 ten hour days per annum. And if proper methods were observed, there would be left at the close of the operations, 100 acres of highly valuable agricultural lands in place of a barren moor of the same extent. Large areas of the best lands in Holland have been created by reclamation of the moors.

By burning off the peat as suggested it is true that some fertilizing effect might be obtained from the deposit of peat ash on the clay. But apart altogether from any value the peat itself may have, the valuable results obtained by mechanical admixture of a layer of peat with the top clay soil, as practised so successfully in Holland and elsewhere is entirely lost. The result obtained by such method is the addition of a few acres of heavy and hard working soil to the farming area, where by proper treatment soil of the highest fertility and physical qualities would be secured. The value of saving a part of the peat to enrich and enlighten the heavy underlying clays is so well appreciated in Holland and elsewhere in Europe that laws have been framed requiring the operators of fuel plants to leave a foot or more of peat on the bottom of the bog.

Canada has 37,000 square miles (23,680,000 acres) of known peat bogs, but these form probably but a small fraction of the total, constituting a potential national asset of enormous value.

Where do we stand at the present time in relation to any extensive development of our peat bogs? Have we not reached a point where it is desirable that there should be some kind of a stocktaking of our peat resources, and of the means at our disposal of utilizing them to economic advantage?

The outstanding fact in relation to the industry is that what is known as "machine made peat fuel," is now being made commercially in large quantities in Europe, and a commencement has been made on this continent.

The great drawback is the shortness of the working season. But even this handicap has not prevented successful operation in Europe, and it may be definitely accepted at the present time that no economical method of overcoming the difficulty has yet been devised, or is even in sight. We will reach definite results soonest and with least outlay and loss by facing this fact.

A further development which may be regarded as having fairly reached the commercial stage is the application of peat fuel manufactured by the "open air" process to use in gas producers for the production of power, either with or without recovery of by-products.

The results obtained at the government fuel testing station in Ottawa afford a conclusive demonstration that provided a sufficient supply of peat fuel is available at a cost not to exceed say $2.00 a ton at the plant, a very efficient and cheap production of power is obtainable.

At Pontedera, Italy, with the production and sale of electric power from peat gas there is being combined the manufacture of sulphate of ammonia as a by-product. This is a product for which the market is practically unlimited, and always increasing, with prices in the vicinity of $60 to $70 a ton. Some of the American bogs are rich in nitrogen and apparently well adapted for production of sulphate of ammonia.

Then we have the production of moss litter which is in Holland especially an important business in a stable position. Given a suitable bog, and the right conditions as to market, transportation, etc., there seems no reason why this business should not materially increase on this continent. The use of peat in connection with the manufacture of chemical fertilizers, as a filler, is an established fact.

Last but not least there is the agricultural development of peat lands. It is a matter which must become of great interest in Canada, and is already attracting much attention in the United States. In the Canadian Northwest are enormous areas of bog land which from insufficient depth or character of the peat are unsuitable for production of fuel or moss litter. With proper drainage and intelligent treatment these waste areas will become garden spots of high fertility and productiveness. The utilization of the vast peat areas will eventually not only serve to populate the country, but is likely to have a directly beneficial climatic effect.

Outside of the field of activity thus outlined there is a debatable ground of various operations for the utilization of peat which is still in the realm of theory and speculation.

The attempts to express the water from peat mechanically, to dry it by artificial heat, to make peat briquettes which shall have a density and a fuel value approaching that of good coal, to produce peat coke, etc., have absorbed millions of dollars of capital without practical commercial results.

Paper making from peat fibre has not yet proven of value, and so long as we possess enormous quantities of available spruce and other timbers, does not appear likely to make much headway in this country.

We have then as practical avenues of immediate commercial development:

(1) The manufacture of "machine peat fuel" made by the "open air" method with adoption of mechanical appliances superior to those in use in Europe.

(2) The production of power from peat burned in gas producers.

(3) Manufacture of sulphate of ammonia and incidental by-products.

(4) Manufacture of moss litter.

*From Journal Canadian Peat Society.

(5) Utilization of peat in the production of chemical fertilizers.

(6) Agricultural development of peat lands; and probably a number of applications of peat of minor importance.

The development and improvement of the machinery necessary for all these purposes, as well as the carrying on of actual operations, affords ample scope for the legitimate investment of private capital, but there is absolutely no room in the peat industry for the professional promoter.

It is only by concerted and intelligent effort directed to the special development best adapted to each particular bog that the best results for the public can be obtained from exploitation of peat bogs, and for the people who invest their money in the work of development as well.

Much has been heard in recent years as to the depletion of the coal areas of the continent. Wood is fast disappearing as a fuel. The intelligent development of the fuel and other resources latent in our vast peat bogs may therefore be regarded as a measure of practical conservation, provided the methods of development followed are such as to secure the highest economic return from every bog utilized taking into account its particular character and situation.

ENTER THE CANADIANS.

The "Times," London, had the following in its editorial column, October 16, 1914:

On Wednesday the great fleet of liners carrying the Canadians arrived at Plymouth. This is the first answer given in Europe to Germany's egregious delusion that the Dominions would not rally to England in this war. But it is only the first. Canada has already taken steps to raise 60,000 men for the front. And Canada does not stand alone in her conviction that this war is hers as well as ours, and that she is fighting for her own rights and liberties as truly as ourselves. With one accord the Dominions have grasped the same fact, each for itself. One and all they have seen instinctively the real meaning of this conflict to us and to them. They know what the triumph of German militarism would signify to the cause of freedom and of progress, whose traditions are in their bones and in their blood. By a long exercise of perfidy and corruption while they feigned to be at peace with us, the Germans have contrived to give the forces of the South African Union occupation for the present at home. But the alacrity with which the Dutch people and their chosen leaders, temporal and spiritual, have rallied to the Government in the work of suppressing rebellion, must have disappointed German hopes as bitterly as would the dispatch of a contingent to fight in Europe. The Australians and the New Zealanders have already drawn the sword in the good cause, and have added to the Empire territories where Germany had planted her flag. The Australians have offered three contingents for European service, and New Zealand has shown herself equally anxious to see her sons at the front. That, as a leading Australian paper has said, is the refutation they give the German slander that the British Dominions "dread the yoke." They tell the German diplomatists and statesmen that this yoke has been evolved from the Teutonic imagination, but that they know of another yoke which all lovers of liberty abhor. It is to be seen in the colonial rule of Germany, and it has served as a sufficient illustration of German political methods to them. There are plenty of good citizens with German blood in the Dominions, and the peoples of those great free nations have no ill-feeling against the race, from which this valuable element in their populations has come. Colonel Hughes made that point in his stirring address to the men who have now reached our shores. "Your aim," he said, "is to overthrow tyranny and aggrandizement." When free men from the Dominions stand side by side with the British troops "the Prussian autocracy will realize the gigantic power of liberty."

The thousands of these free men who have come amongst us, and the thousands more who are to follow them, have abandoned their homes and their businesses to teach "Prussian autocracy" that lesson. All England, all the Empire, shares the Canadian Minister's confidence that the soldiers of the "old Dominion" will give "a splendid account of themselves for King and country." We have known them before, and we know that they indeed "come from the right breed." If they did not, they would not have flocked of their own free will to the flag, as they have done, and as they are still doing with unabated ardor. We remember their work and the work of their brothers from Australia and from New Zealand in South Africa. There, for the first time, the troops of the daughter nations proved their valor and their skill in a common Imperial enterprise. Now they are about to prove their soldiership for the first time in a great European war. We welcome their assistance with gratitude and with pride. We welcome it for the addition which it brings to our numbers in the field, and for the exceptionally fine quality of the troops which it gives us. We are deeply sensible of its high military worth. But we welcome it far more for the incalculable moral support which it lends us in this great struggle of principles that conflict and that cannot be reconciled. The immediate answer, not only of the Governments of the Dominions, but of the masses of their peoples, to the call to arms is a supreme proof of the moral unity of the British Empire—that unity which German statesmen and German thinkers had been rash enough and ignorant enough to disbelieve and to deny. Our enemies thought that a war would divide us. They have been foolish enough to utter their thoughts and even to base their calculations upon these vain imaginings. All of us, whether at home or beyond the seas, knew that nothing would do so much as war to reveal our real unity and to foster it. We have been right, as we were sure we would be right. The coming of the Colonial troops is the proof that the peoples of this Empire understand each other better than all the spies and investigators whom Germany has sent out to study them.

The troops from Canada and the other Dominions are as fine material as any soldier in the world could wish to lead. The mere fact that they have volunteered for the cause is convincing evidence of their spirit. They are for the most part men of superior intelligence and education. They are used to the hard life of the settler and they are masters of all the arts with which he carries on his daily struggle with nature. They can shoot and ride. They can care for their horses and cook for themselves. They have the initiative, the quickness, and the decision which belong to the dwellers in the wilderness, and at the same time they love and trust their officers. They are particularly pleased to serve under Sir John French, who won their admiration in the Boer War. We well believe that they are the kind of men who, with such a leader, will go anywhere and do anything. But it is not only men who are needed in so great a contest, and it is not only men that the Dominions are sending us. Canada is dispatching her soldiers armed and equipped at her cost. She is supply-

ing us with a million bags of flour—a truly munificent gift. Alberta tenders us some 9,000 tons of oats. Mr. Ames, the chairman of the Montreal branch of the National Patriotic Fund, reports that the Western Provinces, Manitoba, Saskatchewan, Alberta and British Columbia, may be expected to contribute a million dollars for patriotic purposes and another million for the relief of unemployment and distress. These are but examples of the contributions in kind and in money which we hear of from the Dominions for the common cause. We are deeply grateful for them—grateful for their intrinsic value, but grateful most of all for the splendid spirit of Imperial Union, of loyalty, unshaken and unshakable, to the common King, the common flag, to those traditions and the ideals of a thousand years of which King and flag are the honored symbols and defenders.

HEDLEY GOLD MINING COMPANY'S NEW POWER SYSTEM.

On June 1 of the current year the Journal included in its special correspondence the following information relating to progress at Hedley, in Similkameen district, British Columbia:

"The dam across Similkameen River in connection with the Hedley Gold Mining Company's new hydro-electric power system, for which the directors some time ago made an appropriation of $200,000, is now nearly completed. The erection of this dam was commenced late last autumn, and now all that remains to be done is a small portion of the upstream aprons, which work must be deferred until the spring freshets in the river shall have passed. The ditch and flume line are now having attention, and the work on these is well advanced, both in clearing and grading the line, and in preparing timbers for the flume. Meanwhile production of ore at the mine, and its reduction in the company's 40-stamp mill are being continued as usual."

Recently the "Hedley Gazette" published the following report of progress and particulars of the new power plant:

"After discussing the subject of the recently declared quarterly dividend, the manager of the company, Mr. Gomer P. Jones, pointed out that not only was the plant running at full capacity, but also the company's policy of expansion, including the mine workings, the stamp-mill, and the power plant, was being steadily pursued, and it would be carried to its completion irrespective of financial conditions outside this district.

"Construction and equipment of the new power system and plant are being pushed forward on similar steady, cautious lines as those which have always characterized the company's activities in the past. Since last April construction work on the flume has been carried on without interruption, in spite of much difficulty experienced in getting prompt delivery of lumber, and Mr. Jones is authority for the statement that this work will be completed by the end of October. The transmission line is practically complete now, and, while the power house has yet to be built, and the machinery installed, the new plant will be running by the end of the year.

"The length of the flume from dam to forebay is 15,000 ft. The forebay is a large tank—60 by 20 by 25 ft.—and its purpose is to regulate the flow of water under variable conditions. From the forebay the water will flow into the power house, which will be equipped with S. Morgan Smith twin turbines, operating in a Morgan Smith penstock and connected to a Canadian Westinghouse generator capable of generating 1,800 h.p. normally and running up to a maximum of 2,100 h.p. or more. From the generator the current will be transmitted over a line of No. 2-0 B. & S. 7-strand copper cable about two miles to the power house at the mill, where it will operate the two 400 h.p. motors running the compressors. The old compressor will be run by a step ring motor, installed by the Canadian General Electric Co., while the engine will be direct driven by a synchronous motor from the same company. The new compressor, for which excavations are being made, is an Ingersoll-Rand 150 r.p.m., 2,000 ft. capacity, machine. This, together with the old compressor will give a total effective air supply of 4,000 cu. ft. per min., which will be ample for all present needs and probably for those of some time to come."

It may be added that in 1912 the Hedley Co. mined and crushed 70,455 tons of ore of an average assay value of $11.19 a ton. The value of the gold recovered was $748,133.14, and the net profits for the year $385,880. For the calendar year 1913 the corresponding figures were: Tons of ore milled, 70,796; average assay value, $12.03 a ton; total value of gold recovered, $802,330.40; net profits for year, 405,254.89. The manager reported that the reserve tonnage of ore that can be mined and milled at a profit was estimated to be 413 000 tons; estimated average value, $10 a ton. He added: "We hope, however, to make about the same earnings per ton in 1914 as in 1913, through cheaper power and possibly a slight increase in tonnage. There is also the chance that drifting and stoping may show the ore to be equal in value to the average run of the mine, which has been about $12 a ton."

UNDERGROUND TRANSPORTATION.

Mr. O. P. Hood in a paper prepared for the October meeting of the American Institute of Mining Engineers says:

"None of the methods now in use for the transportation of materials underground is entirely free from more or less serious objection. The great flexibility, ease of control and economy of operation of electric tramming are accompanied by the serious menace of a trolley wire distributing system.

"As the gasoline locomotive has even greater flexibility of application and requires no similar dangerous distributing system, it might be considered a safety device which would make possible the elimination of the dangerous trolley system were it not possessed of other objectionable qualities peculiar to itself. It is found that the exhaust gases from the engine may be injurious to the health of those breathing the air in which the locomotive has been operating. While electric shock may kill the individual who makes contact with uninsulated parts, the gasoline engine may be detrimental to the health of all those who have to work within the atmosphere corrupted by exhaust gases. The degree of pollution measures the magnitude of the menace. This may be negligible at times, but with careless operation it becomes serious. The exhaust gases from an engine are composed of nitrogen, a little free oxygen, hydrocarbons, hydrogen, carbon monoxide and carbon dioxide, the last two being considered dangerous."

THE PEAT-MAKING INDUSTRY OF NORTHERN HOLLAND

According to a U. S. Consular report peat fuel is made in Holland from two sorts of ground, the Sphagnum peat beds being found on the moorlands, while the sedge and grass peat beds are situated in marshy bogs. The peat of the country is formed from decayed vegetable matter, such as mosses, grass, heather and various other sorts of plants. The grass peat bogs extend to a depth so far beneath the normal ground water level that it is necessary to drain the water off by ditches. The Sphagnum bogs are above the normal water level of the canals.

It is quite certain that the earliest inhabitants of the country from remote times had to burn peat, especially in some sections of the country. The peat industry here, therefore, dates from many centuries ago. In the neighborhood of cities and villages, the industry grew more rapidly than in country districts on account of the greater demand and small cost of transportation. Later, waterways were made to reach the more distant peat beds.

Out of the peat bogs short peat was obtained, also known as "sponturf." The process of excavating the peat is about as follows: A small stretch of ground on which to spread the peat so that it will dry is leveled off and a layer of straw spread over it. The digger with a spade forms the loose, wet peat into square, flat pieces. When the peat is well mixed, it is taken out of the basin and laid on the straw-covered ground, which absorbs the superfluous water. The sheet, when sufficiently dried, is cut with a knife or spade into blocks about the size of an ordinary brick. When sufficiently sun-dried, the blocks are stacked into piles. Later the blocks are piled into larger stacks. In this manner the peat is changed around till that which was at the bottom of the original piles is on top of the stack. The stacking of peat is done usually by women. The wet peat is laid in long rows flat on the ground, so that in a short time the sun has sufficiently dried it to form a hard crust on the upper side. Then another row is laid on top of the first, and when this is dried, another, and so on, till 11 rows have been laid. It is so piled up that the wind circulates freely around each piece.

The time for digging the peat is from March 25th till the end of June. The lighter sorts are made during the whole year. The owners of peat fields erect houses which are rented to the workmen and their families. In many instances a plot of ground goes with each house, which enables the workman to dig and dry his own peat free of cost. The wages of workmen who cut the peat range from 2 to 3 guldens (80c. to $1.20) per day, while the women are paid the equivalent of 25 to 32 cents per day. During the cutting season many workmen from neighboring districts are employed.

Machines are very little used in the preparation of short peat. In the peat bogs of North Holland machines are here and there used for pulping and kneading. In some parts of the country the peat bogs are often rented to the workmen or contractors. When this is the case, the owner retains possession of the land after the peat has been removed. These peat fields can not be worked without first obtaining a concession from the Government. A certain sum must also be paid for the building and maintenance of the dikes around the polders. In Friesland the owners of ground, where short peat is produced, are obliged to make a deposit in money. After the peat has been removed and the ground brought under cultivation the amount of the deposit is returned to the owner.

Besides what is consumed for household purposes, the amount used in factories is not unimportant. In brick factories situated along rivers large quantities are used as fuel. In strawboard and potato-flour factories, especially those situated in the northern part of the country, it is used in great quantities. Large quantities of heavy peat are also shipped from Drente to Friesland and the northern cities. Light peat is also shipped in great quantities to Amsterdam and The Hague, where it is extensively used for lighting fires.

In some peat fields, the upper layer of peat to a depth of one-half to one and a half yards, is of a light brown color. This peat is very porous and light in weight. Seen from the outside it looks like great square sponges. From this sort of peat, known as "bolsterturf," peat dust, which is shipped to all parts of the world, is produced. After being ground, it is packed in 200-lb. bales. Peat dust is much used for bedding in stables. When used for that purpose its absorbing qualities are such that it makes an excellent fertilizer. It is also extensively used in nurseries. Peat dust factories are to be found in Klazinaveen, Hoogeveen, Beilen, Dedemsvaart, Friezenveen and Bergentheim.

The yearly production of peat dust in Holland amounts to 200,000 tons. In Germany the railways allow a discount of 30 per cent. on the transportation charges, but as this does not apply to shipments from Holland, the Dutch shippers are unable to compete with Germany in that country.

On the border of the Province of Groningen the use of peat-making machines is rapidly growing. In the neighborhood of Emmercompascuum some 50 machines have been introduced. These are used only for macerating the peat. The wet mass is spread out on the field and worked the same as "short turf." In Hoogeveen and Vroomshoop there are factories where machinery is also used.

The undeveloped districts in which peat is found occupy but a small portion of the waste land of the whole country. There are yet about 35,250 hectares which are still undeveloped. In the Province of Drente alone there still remain about 21,340 hectares (hectare equals 2.47 acres) which have not been touched. It must not be forgotten either that each year there are about 10,000 families who find employment in the peat fields. Thousands of workmen also find employment in sanding the land and preparing it for cultivation after the peat has been removed.

By the judicious use of artificial fertilizers such ground is soon brought into a high state of cultivation. The excavations caused by the removal of the peat are called valleys and are very fertile. As soon as these valleys are ready to be worked they are taken possession of by the farmers.

As soon as the growing of grain and the raising of potatoes is sufficiently developed, factories for the manufacture of strawboard and potato flour spring up where formerly all was waste land. Many prosperous towns and cities, such as Veendam, Wildervank, Oude and Nieuwe Pekela, Nieuw-Buinen, Stadskanaal, Emmercompascuum, Klazinaveen, Erica, Nieuw Amsterdam, Dedemsvaart, Hoogeveen, etc., owe their existence and prosperity to the peat industry.

By using the canals for the transportation of peat, hundreds of boatmen and their families find a means of livelihood. Aside from a certain amount of freight which is shipped by rail, there are yearly between 5,000,000 and 6,000,000 cubic meters (cubic meter equals 35.314 cubic ft.) of boat space necessary. When one takes into consideration the fact that these boats have a capacity of from 50 to 250 cubic meters, some idea of the extent of the industry may be formed when it is stated that about 48,000 boatloads are shipped yearly.

FATAL ACCIDENTS IN BRITISH COLUMBIA MINES

The statement of the coal and metal mine fatalities in British Columbia during the third quarter of the current calendar year has been issued by the Provincial Department of Mines. It has been compiled by the Chief Inspector of Mines, Mr. Thomas Graham. The following is a summary of the return:

Coal Mine Fatalities.

There were five men killed during the third quarter of 1914, against four during the corresponding period of 1913. The figures for the expired months of this year and the corresponding months of last year are: Killed during January-September, 1914, 13; during the same months of 1913, as under:

	1914.	1913.
January	1	2
February	4	1
March	2	4
April	1	9
May	..	2
June	..	1
July	1	4
August	3	..
September	1	..
Totals	13	23

The collieries at which the fatalities occurred in 1914 were: At C.P.R. Co.'s colliery, Hosmer, Crow's Nest Pass, 3; at Crow's Nest Pass Coal Co.'s colliery, Michel, 1; at Canadian Collieries (Dunsmuir) Ltd.'s colliery, Cumberland, V.I., 5; at Western Fuel Co.'s colliery, Nanaimo, V.I., 4; total 13.

Ten of the fatalities are placed under the heading "Killed underground," two under "Killed in shafts," and one under "Killed on surface." The causes of death underground were: By falls of roof and rock, 2; falls of coal, 1; mine cars and haulage, 2; suffocation in fine coal, 2; returning on unexploded shot, 2; electricity, 1. Of those in shafts, one was "by cage" and the other "by falling off bucket." That on the surface was "by coke-oven larry."

Metal Mine Fatalities.

There were five men killed in and about the metal mines of the Province during the third quarter of this year as compared with three in the corresponding period of 1913. For the nine months—January-September—of the two years the numbers are 19 for this year, against 10 for last year, as under:

	1914.	1913.
January	1	1
February	..	..
March	4	2
April	1	..
May	3	1
June	5	..
July	5	3
August	..	3
September	..	..
Totals	19	10

The mines at which the fatalities occurred in 1914 were: Rambler-Cariboo, Slocan, 1; Golden Horn, Ymir, 1; Centre Star-War Eagle, Rossland, 2; Granby, Phoenix, 5; Rawhide, Phoenix, 2; Jewel, near Greenwood, 2; Nickel Plate, Hedley, 1; Britannia, Vancouver, 2; Hidden Creek, Granby Bay, 3; total, 19.

The causes of death were: Underground—Picking or drilling into unexplored powder, 1; premature blasts, 5; gassing or suffocation from powder fumes, 3; falling down winze, 1; falls of ground, 3; mine cars and haulage, 1; returning on unexploded shot, 1; total, 15. On surface—Slide of rock off quarry face, 3; aerial tramway, 1; total, 4. Grand total for 1914, 19.

BRYCE ON GERMAN METHODS.

Viscount James Bryce says in the New York Times:

"The present war has had some unexpected consequences. It has called the attention of the world outside of Germany to some amazing doctrines proclaimed there, which will strike at the root of all international morality as well as of all international law, and which threaten a return to primitive savagery, when every tribe was wont to plunder and massacre its neighbors.

"These doctrines may be found set forth in the widely circulated book of Gen. von Bernhardi, entitled "Germany and the Next War," published in 1911, and professing to be mainly based on the teachings of the famous professor of history, Heinrich van Treitschke. To readers in other countries, and I trust to most readers in Germany also, they will appear to be an outburst of militarism run mad, a product of a brain intoxicated by love of war and by superheated national self-consciousness.

"They would have deserved little notice, much less refutation, but for one deplorable fact, viz., that action has recently been taken by the Government of a great nation (though, as we hope and trust, without the approval of that nation) which is consonant with them and seems to imply belief in their soundness.

"This fact is the conduct of the German Imperial Government in the violation of the neutrality of Belgium, which Prussia, as well as Great Britain and France, had solemnly guaranteed by treaty (made in 1839 and renewed in 1870); in invading Belgium when she refused to allow her armies to pass, although France, the other belligerent, had explicitly promised not to enter Belgium; and in treating Belgian cities and people against whom she had no cause of quarrel with a harshness unprecedented in the history of modern European warfare.

"What are these doctrines? I do not for a moment attribute them to the learned class in Germany, for whom I have profound respect, recognizing their immense services to science and learning; nor to the bulk of the civil administration, a body whose capacity and uprightness are known to all the world, and least of all to the German people generally. That the latter hold no such views appears from Bernhardi's own words, for he repeatedly complains of and deplores the pacific tendencies of his fellow-countrymen.

"Nevertheless, the fact that the action referred to, which these doctrines seem to have prompted, and which cannot be defended except by them, has been actually taken and has thus brought into this war Great Britain, whose interests and feelings made her desire peace, renders it proper to call attention to them and to all that they involve."

MICROSCOPIC TESTS ON OPAQUE MINERALS*

By Everend L. Bruce.

The determination of opaque minerals when occurring as small grains in rocks, or when in intimate association in ores, is one of the difficult and uncertain problems of mineralogy. The translucent and transparent minerals yield to well known microscopic methods, but thus far few such tests have been devised for the opaque minerals. Considerable work has been done by different investigators, largely, however, with the purpose of ascertaining the paragenesis of known minerals rather than determining unknown ones. It is the purpose of this paper to combine the various tests devised by those who have worked along this line with a few additional methods that seem applicable to the problem, in an attempt to construct at least a partial determinative scheme.

Among the early articles on the subject is one by William Campbell (Economic Geology, Vol. 2, pp. 350-366) giving distinguishing characteristics for the minerals magnetite, chalcopyrite, pentlandite, pyrite and pyrrhotite.

Campbell and Knight used the method of polishing and etching on various Cobalt ores, but no definite determinative tests are recorded.

Bastin, in his paper on metasomatism in sulphide enrichment, records the fact that polybasite with strong HNO_3 is not etched so readily as chalcocite, but slowly exhibits a yellowish brown color with a slight iridescence in places. Chalcopyrite similarly treated shows a faint peacock tarnish.

The most detailed work on the identification of opaque minerals is that of F. C. Lincoln. He has examined the gold ores and constructed a scheme for the determination of most of the several gold minerals.

Etching by means of an electric current produced by a small platinum triangle has been tried by Beijerinck with the following results: Cassiterite, deposit of black metallic tin; chalcopyrite, becomes black; pyrite and pyrrhotite, not affected.

In constructing a scheme from these tests and from others that were devised, the object aimed at was the determination of minute grains of mineral. This was not always successfully done. Some of the results depend on chemical reactions which it is as yet impossible to localize, and to that extent the results obtained are uncertain. A brief statement of the methods of preparation of the specimens and of obtaining the special results will be followed by a summary in schematic form.

Preparation of the Specimen.—The polishing of the mineral is fully described by Campbell in Economic Geology, Vol. 1, p. 751, but for completeness, a brief summary is given here. A fairly flat specimen is chosen if possible, and this is ground to a plane surface on a horizontally rotating iron lap, armed with medium-grade carborundum. After a thorough washing, the specimen is treated on a copper lap with No. 100 emery until the grooves of the coarse grinding are erased. This is followed by No. 200 emery, until the scratches of the No. 100 powder disappear. In all cases the specimen is rotated to prevent unequal effect. After washing and drying, the surface is polished on three grades of polishing paper, Nos. 0, 00, 000, mounted either on boards, the motion being produced by hand, or on wooden laps rotated as before. The grinding in each case is continued until the scratches from the previous treatment are removed. The orientation of the specimen in each succeeding treatment should be at right angles to that in the previous one, so that the scratches of the finer paper will be across those of the coarser. After polishing with the finest paper, a lap covered with broadcloth saturated with rouge and water is used for the finishing process. By this means a high polish can be obtained.

Instruments—The microscope used for this investigation was one with which both inclined and vertical illumination could be obtained. Inclined illumination was secured by a small parabolic mirror attached to the objective; vertical illumination by a movable glass disc in the barrel of the microscope. The source of light for ordinary work was a Welsbach lamp, the light being focussed by a plano-convex lens. For some minerals the light was filtered through a flask of copper sulphate solution, replacing the lens; by this means, light containing no yellow rays can be obtained. For applying chemicals to the polished surface small glass tubes drawn to a fine point are useful. For physical tests, any small fine-pointed instrument can be used.

Methods.—The mineral, prepared as above described, was first examined for color and appearance. For this purpose obliquely incident light gives the best results. Following this, one large specimen was broken into several smaller ones, some of which were treated further, while one was kept for reference. Etching was first tried with strong cold HCl, at half-minute intervals, or less, if much action took place. If unattacked after a reasonable time, strong cold nitric acid was substituted for the hydrochloric. Finally, aquaregia was used with substances that resisted both single acids.

In the case of minerals that behaved in the same manner under etching special chemical or physical tests were tried. In chemical tests, the grain to be tested was brought into focus under a fairly low-power objective with an acid capable of etching it. After the action had continued for a short time, a drop of a reagent producing characteristic reactions was added. Under the microscope only very small quantities are necessary, and, with care, rather small grains, can be thus tested. The chief reactions employed are the following:

1. Iron. The grain touched with freshly prepared mixture of potassium ferrocyanide and acid becomes deep blue if iron be present.

2. Nickel. The mineral is treated with a mixture of HNO_3 and tartaric acids. After evaporation, when touched with a solution of dimethylgloxime freshly made ammoniacal, a brilliant red is obtained from minerals carrying nickel.

3. Copper. In the presence of copper, a mixture of HNO_3 and potassium ferrocyanide solution gives a deep red. If iron also be present, this is followed by green.

4. Manganese. Most manganese minerals are attacked by HCl with production of a deep brown solution which becomes colorless on addition of hydrogen peroxide.

5. Silver. The mineral is treated with nitric acid. Addition of hydrochloric produces a white precipitate. Also true of lead and mercury minerals.

*Extracts from article published in School of Mines Quarterly, Vol. xxxv., No. 3, 1914.

6. Bismuth. The mineral is touched with nitric acid followed, after drying, by hydrochloric. A little water will then produce a white precipitate.

Physical Tests.—In a few cases, streak and hardness are useful. These tests can be made with a needle point.

Besides the above, a few other tests were tried. Deposition of silver from weak silver sulphate solutions by certain minerals may possibly be useful as a criterion. An experiment was tried with marcasite and pyrite in a ten per cent. solution. What seemed to be a dendritic growth of silver formed on the marcasite after long immersion, while the pyrite remained bright and unchanged. Further tests with variation of temperature and concentration are necessary, however. The rate of attack in the process of etching is also sometimes a valuable aid in identification.

Table for Determination of Minerals.

The scheme outlined below depends for its major division on the color of the polished mineral. In each color division, subdivisions are made by etching tests. Special behavior of different minerals makes further differentiation possible in many cases.

1. Mineral by Inclined Illumination is Yellow.

A. Etched by HCl.
- Pyrrhotite. Bronze yellow. Surface rough. Reacts for Fe.

B. Etched by HNO_3, not by HCl.
- (a) Without noticeable tarnish or deposit.
  - Pyrite. Pale yellow. Slightly rough. Reacts for Fe.
  - Marcasite. Pale yellow. Slightly rough. Reacts for Fe. Precipitates Ag(?).
  - Millerite. Slightly rough. Reacts for Ni.
- (b) With tarnish.
  - Chalcopyrite. Deep yellow. Rough. Reacts for Fe and Cu. Iridescent tarnish.

C. Not attacked by single acids.
- Gold. Deep yellow. Smooth. Amalgamates with Hg.

II. Mineral is White.

A. Etched by HCl.

B. Etched by HNO_3.
- (a) With no tarnish or deposit.
  - Smaltite. Rough with bright facets. Gives Ni test.
  - Arsenopyrite. Rough with bright facets. Becomes gray with reddish spots. Reacts for Fe, not for Ni.
  - Leucopyrite. White. Very rough. Reacts for Fe.
  - Silver. Smooth. Reacts for Ag.
  - Bismuth. Smooth. Reacts for Bi.
- (b) With deposit.
  - Arsenic. Chalky white deposit.
  - Antimony. Chalky white deposit.

C. Unattacked by single cold acids.
- Cobaltite. Slightly rough. Etched by HNO_3.
- Niccolite. Slightly rough with reddish tinge. Treated with aqua regia reacts for Ni.

III. Mineral is Black or Grayish Black.

A. Etched by HCl.
- Magnetite. Shows interesting parting planes. Etches easily. Fe reaction.
- Franklinite. Fairly smooth. Etches less readily than magnetite.
- Ilmenite. Fairly smooth. Etches very slowly.
- Hematite. Steel gray. Smooth. Red streak.
- Manganite. Dull black. Brown solution.
- Psilomelane. Brown and black areas. Brown solution.
- Braunite. Black. Etches to bluish black. Brown solution.
- Alabandite. Smooth grayish black. Very easily attacked (40 sec.).
- Pyrolusite. Black fibrous surface. Soft. Brown solution.

B. Etched by HNO_3, not by HCl.
- (a) Without tarnish.
  - Enargite. Dull grayish black. Etches to fibrous structure. Cu test.
  - Argentite. Smooth dull black. Ag test. Sectile.
  - Stephanite. Smooth dull black. Ag test.
- (b) With a tarnish.
  - Chalcocite. Smooth black. Etched to a bluish tarnish, later becoming peacock colors.
  - Bornite. Pitted. Purple color. Etches to a peacock tarnish. Reacts for both Fe and Cu.
- (c) With a deposit.
  - Galena. Smooth black. Etches easily, with a yellow deposit.
  - Bournonite. Smooth dull black. Etches easily, with yellowish opalescent deposit. Cu test.
  - Sibnite. Smooth dull black. Etches fairly slowly to a fibrous structure with a chalky deposit.
  - Tetrahedrite. Smooth. Bluish black. Etches with an opalescent deposit. Reacts for Cu.

C. Unattacked by single acids.
- Molybdenite.
- Chromite.
- Cassiterite. Black deposit by electric etching.
- Columbite.

The table as presented is by no means complete, and some of the minerals treated cannot be absolutely determined by the tests recorded, but it is believed that the compilation of what is known will be of distinct advantage.

BAILEY COBALT.

According to statements given to the press, Bailey Cobalt Mines, Limited, will have another chance to develop its property and pay off its debts. For some time the affairs of the company have been out of the hands of the management, but now a scheme for reorganization is under way.

The plan submitted to the shareholders of the company is that a new company be formed with a capital of $600,000.

The total debts of the company amount to $93,179, of which all but about $2,390 are owed to E. A. Benson. Mr. Benson, who was former president of the company, had advanced $90,789 and because of this the company was forced into liquidation.

The reports state that the committee appointed for investigation reports that there is 400,000 ounces of silver in the mine, worth roughly $200,000, the net profit on which is estimated at $150,000. The outstanding stock of the Bailey is $5,250,000, and the committee propose that a new company, with a capital of $600,000, take over the property and give Benson a mortgage for the full amount of his claim. Bailey shareholders will get one share of stock in the new company for every ten of old, which will account for $425,000 of the proposed $600,000 capital. The remaining $175,000 will be sold to provide working capital.

BOOK REVIEWS

IRON ORES, THEIR OCCURRENCE, VALUATION AND CONTROL—By Edwin C. Eckel—McGraw Hill Book Co., New York—For sale by Canadian Mining Journal, Book Department—Price $4.00.

In this volume of 426 pages the author discusses the geological and technical relations of iron ores, and their more general relations to industrial conditions. Beginning with some consideration of the natural abundance and wide distribution of iron, the manner in which this disseminated iron is concentrated into workable ore deposits is discussed in considerable detail. The second section of the volume is devoted to discussion of the various factors affecting the value of iron ores, and the valuation of ore deposits.

The chapter headings are: The Industrial Status of Iron, Geological and Chemical Relations of Iron, Iron Minerals and their Relationships, Formations of Iron Ore Deposits, Sedimentary or Bedded Deposits, Replacements and Cavity Fillings, Alteration Deposits, Igneous Iron Deposits, Basal Factors in Ore Valuation, Prospecting and Tonnage Determinations, Mining Conditions and Costs, Furnace and Mill Requirements, Composition and Concentration of Iron Ores, Ore Prices, Profits and Markets, The Effect of Time on Valuation, Iron Ores of United States, The Lake Superior District, The Southern United States, Northeastern United States, Western United States, Newfoundland and Canada, West Indies, Mexico and Central America, South America, Europe, Asia, Africa, and Australia, The Extent of American Ore Reserves, Probable Duration of American Reserves, Ownership and Control of American Reserves, Iron Ore Reserves of the World, World competition in Iron and Steel, Questions of Public Policy, Questions of Private Policy.

As indicated by these chapter headings, Mr. Eckel has gathered together a great deal of matter pertaining to the iron ore industry.

THE MINERAL INDUSTRY, ITS STATISTICS, TECHNOLOGY, AND TRADE DURING 1913—Edited by G. A. Roush, published by McGraw Hill Book Co., New York—For sale by Canadian Mining Journal, Book Department.

This volume, the twenty-second of a series founded by Richard P. Rothwell, brings up to date the record of progress in mining and metallurgical industries. Production statistics have been used extensively.

The author has aimed, however, to make the volume not merely a record of productions, but also of progress. With this in view, the attempt has been made to combine the more important statistics from whatever source they may be gleaned, with such extracts from the current literature that have an important bearing on the subject in question, and sufficient discussion of the prevailing commercial conditions to show the trend of the financial side of the industry.

Mineral Industry long ago took its place as a standard reference annual. The present volume is up to standard.

MODERN TUNNELING, WITH SPECIAL REFERENCE TO MINE AND WATER SUPPLY TUNNELS—By D. W. Brunton and J. A. Davis—John Wiley & Sons, New York—For sale by Book Department, Canadian Mining Journal.

In this book the authors present up-to-date information concerning tunnel methods. The book is intended to supply useful data on methods and equipment that are proving safe, efficient and economical, and to make suggestions that may result in a saving to the mining industry of life, energy and capital. Methods are not merely described, they are analyzed. Emphasis placed upon good points of equipment, and criticism of a constructive rather than a destructive nature is made.

The book is confined chiefly to tunnels and adits for mining purposes, such as drainage, transportation or development, but includes those which are used to carry water for power, irrigation or domestic use, in which the essential features are practically identical with mine tunnels.

The chapter headings are: Introduction, History of Tunnels, Modern Mining and Water Tunnels, Choice of Power for Tunnel Work, Air Compressors, Ventilation, Surface Equipment, Rock Drilling Machines, Haulage, Incidental Underground Equipment, Drilling Methods, Blasting, Methods of Mucking, Timbering, Safety, Cost, Bibliography Outline of Tunnel Data.

UNIT CONSTRUCTION COSTS FROM THE NEW SMELTER OF THE ARIZONA COPPER CO., LTD.—By E. Horton Jones—McGraw Hill Book Co.—For sale by Book Department, Canadian Mining Journal—Price $2.00.

This is a work of a very unusual character, containing as it does the unit construction costs derived from the building of a large modern smelter recently completed.

The chapter headings are: Unit Costs, Comparative Costs, Composite Costs, Wage Scale, Raw Material Prices, and Description of Costs.

The paper was presented at the Salt Lake City meeting of the American Institute of Mining Engineers in 1914, and has been republished by special arrangement.

HOLLINGER.

The statement of the Hollinger Gold Mines, Limited, for the four weeks' period ending October 7 shows gross profits of $149,798, which is a smaller return from the working of the property than was reported in either of the two previous months, but still some $50,000 in excess of the dividend requirements for that period. The Hollinger surplus is now in excess of $1,100. The average value of the ore treated during the four weeks' period ending October 7 was $13.54, which is a shade above the average for the present year. Owing to changes in the mill the tonnage treated fell slightly below the previous month. The failure in the power supply and other causes contributed to a temporary shutdown. Working costs during the month showed an increase because of the smaller tonnage treated. The general manager states in the report that the mine continues to yield satisfactory results.

No. 10 vein has been cut on the 200 ft. level, and No. 2 vein, south extension, has been reached by crosscut upon the 300 ft level.

No. 1 vein upon the 550 ft. level has been yielding high grade ore in the south drift.

The following statement shows in comparative form the result of Hollinger operations for the past 3 twenty-eight day periods:

	Oct. 7.	Sept. 9.	Aug. 12.
Gross profits	$149.798.25	$152,821.38	$171.975
Current assets ...	601,477.78	555,099.65	514,221
Gold assets	103,737.65	190,425.23	309,297
Surplus.	1,100,755.00	1,043,957.01	981,135
Working cost	79,932.28	76,659.00	68,578
do per ton milled	4,408	3,866.00	4,167
Running time of, possible.	89%	96%	96%
Average value ...	$13.54	$12.41	$15.46
Approx. extract ..	.....	93.01%	94.04%
Ore treated tons..	18,132	19,828	16,456

NOVA SCOTIA STEEL CO.

In an interview Mr. Thomas Cantley, general manager of the Nova Scotia Steel and Coal Co., explained the new work undertaken for the Militia Department. He said: "We have undertaken to produce for the Militia Department 200,000 shells for fifteen and eighteen pound field guns. All the steel which is being used in the manufacture of these shells will be furnished by the Nova Scotia Steel and Coal Co. The reason for this is that the Scotia company is the only plant in Canada which has a fluid compressor plant.

"At this plant we are forging the shell bodies and the steel discs which go inside of them. The finishing the shells has been split up into different contracts between ten different engineering firms. Three concerns in Montreal, two in Sherbrooke, one in Galt, one in Dundas, three in Toronto, and one in Kingston.

"These shells must be completed before the end of March, and we have guaranteed to turn out a certain number per month; our output at the present time is from 1,500 to 2,000 shell bodies per day.

"I think this but marks the initial stages of the work, for 200,000 shells would only mean enough ammunition for the British army for about one day."

Asked about business conditions, he said that he found them a little better. So far as the Scotia company was concerned there were some prospects of additional work, but the great bulk of the orders were at present pending, "but I think it will come out all right in a short time; just now, you know, it is a question of money," he added.

"The committee is now directly in communication with the War Office in London. We have here to-day with us a gentleman who was formerly superintendent of the Woolwich Arsenal. This gentleman, Mr. Carnegie, was taken from there by Hadfield's, the big armor plate people, at the time of the installation of their ordnance department for the making of shells, and he was responsible for their entire equipment.

"After getting through with them he engaged in private enterprise, and came out to this country three weeks ago, and almost by accident we learned that he was on his way out. Owing to his experience we asked authority to engage him as ordnance inspector to the committee, and we received the authority, and later engaged him. He is now doing some inspection work and will visit all these firms that hold contracts for the finishing of the shells periodically and give them pointers and suggest the most approved methods of doing the work, and we feel that his services will be well nigh invaluable and he has been engaged for three months on the authority of the Minister.

"He is going to spend two days at this plant looking over the forging of the shells here. I expect to remain here a portion of this week, after which I will go back again and take up the work. The Dominion Arsenal of Montreal is at present working day and night, Sundays and holidays, in order to keep up with the work."

THE INTERCOLONIAL RAILWAY.

"Railroad men have so many knocks that I want to throw one bouquet. The Intercolonial is operating an excellent service between St. John and Montreal, and no doubt other portions of the line are equally well served. You have the best class of sleeping and parlor car conductors it has been my good fortune to meet, and your dining car employees' food and service leave nothing to be desired."

An officer of the Canadian Government Railways received the above from a much traveled official of one of the most important railways across the border.

U. S. COPPER SHIPPERS PROTEST.

American copper shippers are protesting vigorously to Secretary of State Bryan against seizure of copper cargoes from the United States consigned to Italy.

The following telegram, signed jointly by American Smelting and Refining Co., American Metal Co., United Metals Selling Co. and Consolidated Metals Co., was despatched Oct. 28, to Secretary Bryan:

New York, Oct. 28, 1914.

To the Honorable, The Secretary of State,
Washington, D.C.:

The undersigned, representing nearly 90 per cent. of the copper export trade of this country, have the honor to lay before you the following facts:

We learned yesterday by cable that the Italian steamers San Giovanni and Regina d'Italia have been seized by British authorities at Gibraltar because part of cargoes consist of copper shipped from this country. The San Giovanni has 450 tons belonging to American Smelting and Refining Co. and consigned in conformity with universal practice in the trade to order of that company at Genoa. The Regina d'Italia has 1,160 tons, of which 150 belong to the American Smelting and Refining Co., 200 to the American Metal Co., 410 to the Consolidated Metals Co. and 400 to the United Metals Selling Co., practically all being consigned in the usual course in the same way.

We are further advised this morning by shipping agents that the American line steamer Kroonland, flying the American flag and having on board 800 tons of copper belonging to the American Smelting and Refining Co., and 500 to the United Metals Selling Co., has also been seized and is detained at Gibraltar, the copper being consigned in usual course as in the other cases.

Moreover, we have just been notified by the New York agents of the Sicilian-American line that, for reasons which cannot be explained, it absolutely declines to ship any copper by its steamer San Giorgio, and this morning the Lloyd Sabaudo line has given notice of its refusal of a shipment of copper and cancellation of contract unless the name of an Italian consignee shall be given, together with a guarantee that the copper shall not be re-exported from Italy, which guarantee it is manifestly impossible for the American exporter to give.

These measures of interference with our commerce threaten to stop altogether the exportation of copper from the United States to Europe, and this means practically the stopping of the entire export business in that metal, except to England and France, since there is no demand for the American product outside of Europe. The stopping of the export trade would affect disastrously the copper mining industry throughout the West.

We beg leave respectfully to ask consideration of the facts above set forth and such representations and action by our Government as it may deem appropriate for the relief of the critical situation in which the industry we represent is now placed, and we shall be very grateful to be acquainted of the action taken by the department to that end.

(Signed)

American Smelting & Refining Co.
The American Metal Co., Limited.
United Metals Selling Co.
Consolidated Metals Co.

RIGHT OF WAY.

A dividend of one per cent. on the paid up capital stock of the Right of Way Mines, Ltd., has been declared and is payable Nov. 16, 1914, on which date cheques will be mailed to shareholders of record Nov. 10, 1914.

PERSONAL AND GENERAL

A meeting of the Toronto branch of the Canadian Mining Institute was held at the Engineers' Club, Saturday, Oct. 31. The following officers were elected for the ensuing year: Chairman, A. J. Young; secretary, R. E. Hore; executive committee, F. C. Loring, Dr. W. G. Miller, C. E. Smith, D. A. Dunlap, Jas. McEvoy, H. E. T. Haultain and J. P. MacGregor. The next meeting will be held Nov. 21.

Mr. Adolph Lewisohn has been elected president of the Kerr Lake Mining Co.

Mr. Cyril Knight, assistant Provincial Geologist of Ontario, has returned to Toronto after spending the season mapping pre-Cambrian areas north of Lake Huron.

Mr. A. G. Burrows, of the Ontario Bureau of Mines, has returned to Toronto after several months in field work in the Porcupine gold district.

Mr. W. G. Trethewey, discoverer of the Trethewey and Coniagas silver properties at Cobalt, has joined the airmen's corps for service in the British expeditionary force. Mr. Trethewey has been a liberal subscriber to war relief funds and has placed his yacht, on which he was cruising in the Mediterranean when the war broke out, at the disposal of the Admiralty.

Major R. W. Leonard, president of Coniagas Mines, Ltd., has contributed a further sum of $6,000 to the Red Cross fund. He had previously contributed $5,000.

Mr. C. A. Foster, of Haileybury, is going to the front from London, having obtained a lieutenant's commission.

Mr. Thomas Cantley, of the Nova Scotia Steel Co., has been gazetted an honorary colonel.

Mr. Neil R. MacDonald is in England with the Canadian contingent.

Mr. W. H. Aldridge, of New York City, formerly managing director of the Consolidated Mining and Smelting Company of Canada, Ltd., with headquarters at Trail, B.C., was recently appointed a member of the executive of the American Mine Safety Association.

Mr. T. Walter Beam, who had during the seasons of 1913 and 1914 been in charge of the exploratory work with diamond drills of the New York Syndicate No. 2 at Hedley, Similkameen, B.C., was presented with an engraved gold-mounted cigar case before leaving Hedley last month to spend the winter at his home in Denver, Colorado.

Mr. W. B. Bishop, superintendent of the Granby Consolidated Co.'s copper smelting works at Grand Forks, Boundary district, B.C., has gone to the company's new smeltery at Anyox, Observatory inlet, to take charge of copper smelting operations there during the absence for a time of Mr. T. Wakely A. Williams, who has had arduous duties to perform throughout the construction period and since the commencement of smelting about nine months ago.

Mr. Alfred H. Brooks, of Washington, D.C., in charge of Alaskan Mineral Resources for the United States Geological Survey, was in Dawson, Yukon Territory, a short time ago.

Mr. G. J. A. Buisson, for several years on the engineering staff of the Consolidated Mining and Smelting Co. at its Centre Star group of mines, Rossland, B.C., was recently presented by his office colleagues with a gold locket on the occasion of his leaving Rossland for a trip to Salt Lake City, Los Angeles and New York, en route to his old home in Grand Mere, near Three Rivers, Quebec.

Mr. W. B. DeWitt, for several years foreman at the Queen stamp mill, Sheep creek, B.C., has leased the Ore Hill and Summit gold properties, situated in the mountains a few miles above Sheep creek.

Mr. J. D. Galloway, assistant to the Provincial Mineralogist for British Columbia, has returned to Victoria after having spent the greater part of the field season of this year investigating mining conditions in country through which the Grand Trunk Pacific Railway passes from New Hazelton east to the Rocky mountains. He visited Cariboo district on his way back to the coast.

Two of the officers of the 16th Battalion of the First Canadian Expedition Force, now in England, are Lieut.-Colonel R. G. Edwards Leckie and Major J. E. Leckie, latterly of Vancouver, B.C., but both also well known in Ontario.

"Mr. Herbert S. Hersey, General Manager of the C. O. Bartlett & Snow Co., of Canada, Limited, is reported as improving daily following an optical operation on October 20th.

Mr. Dudley Michel, instructor in First Aid to the Injured for the British Columbia Department of Mines, who since last May has been engaged in his duties among metal miners at a number of mines in West Kootenay and Boundary districts, recently went from Rossland to Kimberley, East Kootenay, to give first-aid instruction to miners at the Consolidated Mining and Smelting Co.'s Sullivan group mines in that neighborhood.

Mr. F. S. Pilling, for two years secretary of the Vancouver, B.C., Chamber of Mines, prior to his departure for England, via the Panama canal, about the middle of October, was presented with a gold watch by members of the Chamber as a token of appreciation of his services in that capacity.

LA ROSE.

The La Rose Consolidated Mines Company on October 1 had a cash surplus of $1,244,453. A circular to shareholders tells of the present position at the mines. On October 1 ore in transit and at smelters, as well as ore sacked ready for shipment, was valued at $172,166.

The dividend disbursement totalled $187,500, which, the circular stated, was being paid from accumulated surplus as it was not earned for the three months just closed. The total earnings for eight months of this year are given as only $154,000.

Depletion of ore reserves and money spent in looking for new ore bodies are stated to be the causes for the decrease in profits.

Acting on the joint report of Mr. P. A. Robbins, manager of the Hollinger Mines, and General Manager Watson, the directors have decided to inaugurate a plan of exploration. Particulars of the plan are as follows:

1. A new shaft will be sunk on the La Rose Extension, to the west of the railroad, to explore a large tract of conglomerate 300 ft. to 400 ft. thick. This territory is covered by a swamp and has not been prospected on the surface or underground.

2. The high ground on the eastern side of the main La Rose claim will be cleared of soil in hopes of finding surface veins not disclosed by underground prospecting.

3. After the present ore in the Princess claim is exhausted the underground work will be discontinued.

4. In addition to other prospecting on the Lawson, a crosscut will be run to explore the southern portion of the Lawson claim, under the diabase. A limited amount of prospecting will also be done on the University ground from the Lawson workings.

5. The Fisher Eplett property will be closed down.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA

The following information relative to the use of Canadian lead—which means British Columbia lead—was contained in a press despatch sent out from Victoria toward the end of October: "Hon. J. D. Hazen, acting Minister of Militia, has telegraphed Hon. W. J. Bowser, acting Premier of British Columbia, that hereafter Canadian lead will be used in the manufacture of bullets for use by the Canadian troops. The decision follows representations made to the Federal authorities by Mr. R. F. Green, M.P., who represents Kootenay district in the House of Commons, and it is expected to provide for a market for a considerable quantity of the chief metallic product of the lead and silver-lead mines of southern British Columbia. Some days previously Hon. Mr. Bowser had received from the Consolidated Mining and Smelting Company of Canada, Trail, a telegram which read: 'In respect to the matter of purchasing American lead for the manufacture of bullets, we have had conferences with Mr. R. F. Green. Would it be possible to have specified that such bullets be made of Canadian lead?' The message was sent on to Hon. Mr. Hazen, who promptly replied that a favorable decision had been reached and the Government had instructed its inspectors to see that hereafter only Canadian lead shall be used for this purpose. Speaking of the matter, Mr. Green said: 'This decision is very satisfactory and will tend to steady mining conditions in the Kootenay districts. I hope it will be the forerunner of a business development in respect to the products of the lead mines that will ultimately place the lead mining industry on a firm basis.'"

While this development is encouraging, it appears that the way is not yet clear to a resumption of production of lead bearing ores in similar quantity to that reached before the interruption that resulted from the demoralization of the metal markets following the recent commencement of war in Europe. The press despatch above quoted was dated October 28; on October 24 the Rossland Miner published the following comment: "The proposals of the Consolidated Mining and Smelting Company, Ltd., for settlement of purchases of silver-lead ores have not met with acceptance of Slocan mine owners, with the result that none of the Slocan mines appear on the list of shippers at present. The change to New York quotations for settlement of lead content of ores is not considered so favorable as the London quotations formerly in use, and objection is taken to the additional 4 per cent. deduction for such lead content. No doubt an effort will be made to arrange these points of contention to enable the silver-lead mines to resume shipment of ores." It may be added that since the Consolidated Co. obtains by far the larger part of its lead bearing ores from its own mines, it is hardly to be expected that it will go out of its way to benefit owners of other mines, especially under the condition that to all intents and purposes it has a monopoly of lead smelting operations in British Columbia, and can virtually dictate terms to those who find themselves compelled to either send their lead ores to its smelting works or cease production of ores, the chief saleable content of which is lead."

In connection with this subject of production of lead, it is of interest to note that in his Preliminary Report on the Mineral Production of Canada during the calendar year 1913, the Chief of the Division of Mineral Resources and Statistics, Mines Branch, Department of Mines, Ottawa, gave information relative to the production of lead, of which the following notes are a part:

"The total smelter production of lead in 1913 was 39,468,729 lb., but this includes lead from American ores and lead contained in scrap, etc., re-smelted, the recovery from Canadian ores having been 37,662,703 lb., valued at $1,754,705, an average of 4.659 cents a lb., the average wholesale or producer's price in Montreal for the year. In 1912 the production was 35,753,476 lb., valued at $1,597,554. The shipments in 1913 were practically all from British Columbia mines, though a small production is reported from Ontario and Yukon Territory. The mines of British Columbia were very active during the year, and the total lead content in ores shipped is estimated at slightly in excess of 54,000,000 lb. Allowing for 'lag' and the losses due to smelting the increased difference between ore content and smelter recovery would indicate that a considerable amount of lead ore was in stock at the close of the year."

West Kootenay.

Ainsworth.—The only mine in Ainsworth mining division from which ore was received at Trail during four weeks ended October 28 was the J. L. Retallack & Co. property at Whitewater.

From the Kaslo "Kootenaian" it is learned that at the Cork-Province group, on the south fork of Kaslo creek, the saw mill is being worked, the electric plant is running, and the overhauling of the concentration mill sufficiently advanced to allow of parts of the machinery being given trial runs. Several miners have been sent up from Kaslo. It is expected that both mine and mill will be in operation shortly.

Slocan.—The Ivanhoe concentrator, at Sandon, has been leased by J. P. Keane, who has been developing the Wonderful mine for more than a year and has opened some shoots of ore.

Ore shipments from Slocan and Slocan City mining divisions were comparatively small in October. During four weeks ended October 28 receipts at Trail from Slocan mines totalled only 448 tons, of which 14 tons was from the Eastmont, on Ten-mile creek, Slocan City division, and the remainder from mines in Slocan division, as follows: Rambler-Cariboo, 221 tons; Ruth, 83 tons; Silverton Mines, Ltd. (Hewitt-Lorna Doone group), 130 tons. Some high grade silver ore has been packed down to Sandon from the Mountain Con mine, estimated to be worth $10,000 to $12,000, but shipment to a smeltery is being deferred until metal market conditions shall be less unfavorable than at present.

Nelson.—Small shipments of gold concentrate continue to be made to Trail from mines in Nelson division—the Queen on Sheep creek and the Second Relief at Erie having both been on the shipping list in October. The California, a few miles from the city of Nelson, shipped one small lot of gold ore. Three lead mines situated within a radius of ten miles from Salmo, together shipped 289 tons of lead ore during the month; of this 154 tons was from the H. B. mine, 94 tons from the Emerald and 41 tons from the Zincton. Work is being done on several gold properties, in addition to the Queen, in Sheep Creek camp, and as ore of fairly high value is known to occur on two or three of these it is expected that returns will be profitable. Both silver-lead and copper mines in the northern part

of this division, with the exception of the Pingree, are still idle.

Rossland.—Figures showing the quantity of ore shipped from Rossland mines during four weeks ended October 29 are now available. As compared with the four week period ended October 1, there was a decrease of 449 tons. For purposes of comparison over the last three months the following figures are given here: Quantity received at the smeltery at Trail during five weeks ended September 3, 33,209 tons, or an average of 6,642 tons a week; during four weeks ended October 1, 29,286 tons, or an average of 7,321 tons a week; during four weeks ended October 29, 27,488 tons, or an average of 6,872 tons a week. The total for the three months was 89,983 tons, giving an average of 6,922 tons a week over that period. Nearly all this ore was from the Consolidated Co.'s own mines—53,625 tons from the Centre Star-War Eagle group and 32,636 tons from the Le Roi; the remainder was from the Josie group of the Le Roi No. 2, Ltd. So far as mining news from Rossland camp is concerned, it is restricted almost altogether to information relating to the ore production of the several mining properties above mentioned. Less important items are that the 22 drill compressor has been removed from the Columbia-Kootenay Co.'s power house to the head works of the Josie mine, and that the Phoenix mine, in the south belt of Rossland camp, has again been leased.

Boundary.

The big copper mines in the neighborhood of Phoenix and Greenwood, respectively, remain closed, as also do the smelting works of both the Granby Consolidated and British Columbia Copper Co. In Franklin camp, up the north fork of Kettle river, work has been resumed at the Union, and a small quantity of ore shipped to Trail, while prospecting and development work on other claims in that camp is being done as well. In Long Lake camp, the Jewel gold mine and 15 stamp mill are being operated without interruption, work in the mine including development on the 500 ft. level. Up the west fork of Kettle river men are working on the Carmi, and the mill on that property has been overhauled.

In Similkameen the gold mining and milling operations of the Hedley Gold Mining Co. continue to be by far the most important in the district. Diamond drilling by the New York Syndicate No. 2 on mineral claims adjacent to the Hedley Co.'s Nickel Plate group, have been stopped for this year, the near approach of cold weather, which affects the long air and water lines, necessitating a suspension of drilling.

The mill at the Dome Lake is now running on a regular basis, though to date it is being used rather as a sampling plant than with an idea of regular practice. The tonnage treated is now about 40 tons a day, but it is expected to raise this to 70 tons without much delay. In the meantime all the ore that is going to the mill has not been picked, and a considerable percentage of waste is being treated. A rock house is now being built, where a bumping table is being installed, and when it is in operation a more even grade of mill rocks can be obtained. Cleanups are being made every twenty-four hours.

Negotiations for the amalgamation of the Porcupine Crown and the North Thompson properties are proceeding. The engineers of both properties have finished their examinations and the principals are now endeavoring to arrange some basis of settlement. Nothing definite has been done yet, however.

In the meantime the Huronian Belt Co. has made the final payment on the North Thompson, and is now in full possession of that property.

Operations at the Vipond are satisfactory to the management. For the most part the ore being put through the mill is coming from the dump now until a refinery has been completed. When it has been built more drills will be put on working underground, and the ore milled will come from below.

COBALT, GOWGANDA, SOUTH LORRAINE

As the result of the hydraulicking operation of the Nipissing near Peterson Lake two veins have recently been uncovered. They may be said to be extensions of the vein found in a trench in the early days, but as this lead was never followed up they may be classed as additions to the reserve. The veins have patches of high grade ore in place 5 in. wide, and they have been uncovered for about 150 ft. An open cut will be started upon them at once.

During the month of October the Nipissing Mining Co. mined ore of an estimated net value of $200,384, and shipped bullion from Nipissing and customs ores of an estimated net value of $324,796.

This company, being by far the largest shipper of bullion from Canada, the camp has been effected by the recent low price of silver. In consequence of the confident belief that the price will soon advance, the bullion for the past two or three weeks has been stored.

The workings from the Fourth of July have now assumed such an extensive character that it has been deemed economical to sink a new shaft at the eastern end of the property 1,200 ft. away. The new shaft will not only be the means of developing the eastern end of vein 98, but it is probable that some exploration work will be done from it as a base. The work will be carried out by sinking from the surface and raising from below.

There is nothing new to report from the work at the 900 ft. level of 64 shaft. Here a drift has been pushed for 330 ft., but the assays are so low as to make the mining of ore unprofitable. However, sinking will continue, and a winze has already been commenced.

The hydraulicking was successful in uncovering five veins altogether during the month, the best of which has already been described. The other four all contain short shoots of good ore.

The high grade mill treated 171 tons and shipped 630,846 oz. The low grade mill treated 7,009 tons.

The production was almost equally divided between low and high grade ore; $106,363 from high grade and $94,021 from low grade.

The Timiskaming and Hudson Bay has made what will probably be the final dividend disbursement, at least until such time as the Dome Lake is producing regularly, for some time. The last dividend paid was on Nov. 10th, and was the usual 300 per cent. This company has now paid altogether since its creation 25,000 per cent., or $1,940,250.

The Right of Way has disbursed a valedictory dividend of one per cent. A month or so ago the company made the final cleanup of their properties at both ends of Cobalt lake.

The Beaver has now cut its station at the 900 ft. level, and shares with the Nipissing the distinction of having the deepest level in camp. The Beaver is intending to sink at once to the 1,000 ft. level, as is also the Nipissing.

The Huronian Belt Company of Canada has taken an option on the Murray Mogridge claims near Wolf Lake. These claims were under option to a Montreal syndicate until recently, and considerable work has been done upon them. The veins are wide but of low grade content.

Considerable difficulty has arisen with regard to the stoppage of Farr creek owing to the large tonnage of tailings that has been pouring into it from half a dozen Cobalt mills for the last three or four years. The township of Coleman has taken the matter up and has had a conference with the Mine Managers' Association and the mines particularly concerned. Farr creek is the outlet of Cross lake, and in the past there has been some lumbering activity, which the stoppage of the crek has interfered with. A basis of settlement is now being sought.

The McKinley Darragh continues to mine very remarkable ore from its new vein to the east. The winze which is being put down continues in fine ore.

PORCUPINE, SWASTIKA, KIRKLAND LAKE

Porcupine is more than maintaining its position as one of the sections of the country where there is absolutely no industrial depression as evidenced by the fact that there are several hundred more men at work to-day than at the beginning of the war.

At the Dome Mr. Keading is obtaining a new and more thorough revaluation of the property by diamond drilling. A contract for six drills has been let and five of these have been set up on the surface and one underground. These drills will systematically work over the whole known orebody, 1,700 by 400 ft., this area being divided off into hundred feet blocks and vertical holes being sunk. The management desires to discover as closely as possible at this stage the approximate amount of ore they may expect to obtain, so that a larger mill may be planned for and costs per ton run down at once instead of waiting until data have been obtained by the relatively slow process of opening up level after level by means of drift and crosscut. By systematic diamond drilling it is proposed to get an approximate outline of the tonnage and grade, sufficient at least to found a larger scheme of development upon. There is already six years' ore reserves blocked out, these reserves being computed at the present capacity of the mill, which last month treated over 22,000 tons. The various economies introduced in mine and mill are rapidly having their effect. Costs per ton have been cut to $2.64 and there is every probability that they will be reduced to $2.50 before the new year is far advanced.

Production is being maintained at just short of a hundred thousand dollars a month.

The October statement of the Hollinger mines shows a slight diminution in gross profits, but the surplus is now $1,100,755. Both the milling and mining costs per ton were higher than for the previous months, but so was the average value per ton. It is only to be expected that the mining costs will show an increase for some time, since the completion of the new plant will enable the management to put a large number of drills upon development. To date the demands of the mill have made it imperative to keep most of the drills actually on ore and to cut down barren work to the minimum.

Both of the new compressors in the power house on Gillies lake are running very smoothly indeed. The second Nordberg is on the ground and is being rapidly installed. Before the end of the year the whole of the new plant should be complete and running. To date eighty drills are being run by the new plant, twelve or fourteen of which are on the Acme, which will now be much more vigorously developed.

Good progress is also being made with the forty stamp addition to the mill. By January they should be dropping on ore and the Hollinger should be treating between 1,100 and 1,200 tons of Hollinger and Acme ore. Twenty of the stamps have been reserved for the Acme.

The vein has been cut in the winze at 800 ft. and shows the same grade and width as on other levels. No. 10 vein has been cut on the 220 ft. level, and No. 2 vein extension has been reached by a crosscut upon the 300 ft. level.

In the new shaft excellent progress is being made and the long crosscut which is to make connection with the Miller Middleton is well commenced.

Plans for a 150 ton mill are being prepared by Mr. Joe Houston, manager of the Schumacher Gold Mines. The treatment will be by cyanide and efforts are being made to include the latest improvements as exemplified in the practice of the camp. In the meantime with the small number of drills running excellent footage is being obtained.

COPPER.

Boston, Nov. 3, 1914.

A serious predicament confronts the copper producers of the United States. As a sequel to the interception off Gibraltar by British war vessels of neutral boats carrying copper and other commodities in their cargoes for neutral ports and the subsequent protest to the state department at Washington by four selling agencies, there has developed the refusal of steamship companies to carry copper to Italy so long as there exists the possibility of detention on the high seas.

Thus there has been put strongly up to the producers of this country the possibility of losing in the near future a large part of the foreign market left for their output following the elimination of Austria and Germany as takers of the metal. England has been taking larger amounts than usual of American copper, but producers do not have the unanimous opinion that England can continue to take large quantities.

When the American producers decided to curtail production 50 per cent. they had in mind the fact that somewhat more than one-half of the country's copper went abroad. Domestic demand has been very quiet for several months, so that in order to "break even" under the restricted output schedule the producers depended upon a reasonable maintenance of the foreign market.

Under the existing extraordinary conditions the exports have been going to Europe at a rate quite comparable with the preceding few months.

England and France have been using large quantities of copper in the manufacture of ammunition. In fact one plant in France has been commandeered by the government to work full time on army orders. Italy has always taken a fair amount of American copper for its own consumption. It also manufactures "bug poison" from bessemerized copper from which comes sulphate of copper. This product is bought by the vine growers of Italy as well as of France.

Crown Reserve has issued notice of the payment of a dividend of 2 per cent. for October. The cheques will be mailed on the 14th and are payable on the 17th of November.

MARKETS

STANDARD EXCHANGE.

The minimum scale fixed by the Exchange, and below which no sales are premitted, is as follows:

Cobalts—

Beaver	.17
Buffalo	.75
Chambers-Ferland	.10
Canadian	.05
City of Cobalt	.30
Cobalt Lake	.30
Coniagas	6.00
Crown Reserve	1.00
Great Northern	.04
Hudson Bay	30.00
Kerr Lake	4.00
La Rose	.70
McKinley-Darragh	.40
Nipissing	4.75
Peterson Lake	.23
Seneca Superior	2.00
Timiskaming	.07
Trethewey	.12
Wettlaufer	.04½
York, Ont.	.07

Porcupines—

Dome Extension	.05
Dome Lake	.30
Dome Mines	6.50
Foley O'Brien	.20
Hollinger	16.00
Homestake M. F.	.20
Jupiter	.04
McIntyre	.27
Pearl Lake	.02
Porcupine Crown	.75
Porcupine Peterson	.25
Porcupine Vipond	.17
Rea Consolidated	.10
Teck Hughes	.07
West Dome	.05

STANDARD STOCK EXCHANGE.

Nov. 4, 1914.

	Ask.	Bid
Cobalts—		
Bailey	.01¼	.01
Beaver C.	20½	...
Buffalo	.80	...
Coniagas	6.20	...
Crown Reserve	1.01	...
Foster	.05	...
Kerr Lake	4.50	4.00
La Rose	.77	.70
Nipissing	5.05	4.90
Peterson Lake	.23¼	...
Right of Way	.05	...
Timiskaming	.10	.08½
Trethewey	...	.12
Porcupines—		
Dome Extension	.05¼	.05
Dome Lake	...	.31
Dome Mines	6.51	...
Foley	...	.20
Gold Reef	...	.01½
Homestake	.20¼	...
Hollinger	18.50	18.40
Jupiter	.07½	.07
McIntyre	.26	...
Pearl Lake	.02¼	...
Porcupine Imperial	.01	...

TORONTO MARKETS.

Nov. 11—(Quotations from Canada Metal Co., Toronto)—
Spelter, 5½ cents per lb.
Lead, 4½ cents per lb.
Tin, 36 cents per lb.
Antimony, 16 cents per lb.
Copper, casting, 12½ cents per lb.
Electrolytic, 12½ cents per lb.
Ingot brass, yellow, 10c per lb., red, 12 cents per lb.

Nov. 11—Coal—(Quotations from Elias Rogers Co., Toronto)—
Anthracite, $7.75 per ton.
Bituminous, lump, $5.25 per ton.

GENERAL MARKETS.

Nov. 9—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $1.60 per ton.
Foundry coke, prompt, $2.10 to $2.50 per ton.

Nov. 9—Tin, straits, 34.25 cents.
Copper, Prime Lake, 11.30 to 11.40 cents.
Electrolytic copper, 11.10 to 11.20 cents.
Copper wire, 12.50 to 12.75 cents.
Lead, 3.50 to 3.55 cents.
Spelter, 4.95 to 5.00 cents.
Sheet zinc (f.o.b. smelter), 8.00 cents.
Antimony, Cookson's, 17.00 to 18.00 cents.
Aluminum, 18.50 to 19.00 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, soft, $48.00 to $50.00 per ounce.
Platinum, hard, 10 per cent., $51.00 to $52.00 per ounce.
Bismuth, $2.75 to $3.00 per pound.
Quicksilver, $50.00 to $55.00 per 75 pound flask.

SILVER PRICES.

	New York. cents	London. pence
October—		
24	49⅛	22½
26	48⅞	22½
27	48¾	22½
28	48½	22⅜
29	48½	22⅜
30	48½	22⅜
31	48⅛	22 3/16
November—		
2	48⅛	22 3/16
3	....	22½
4	49⅛	22 11/16
5	49⅞	23
6	49⅞	23
7	49⅞	23
9	49⅝	22⅞