THE CANADIAN MINING JOURNAL

VOL. XXXVI. TORONTO, Sept. 15, 1915. No. 18

The Canadian Mining Journal

With which is incorporated the

"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

MINES PUBLISHING CO., LIMITED

Head Office - - - 263-5 Adelaide Street, West, Toronto
Branch Office - - - - - - 600 Read Bldg., Montreal
London Office - - - Walter R. Skinner, 11-12 Clement's Lane London, E.C.

Editor

REGINALD E. HORE

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

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

CIRCULATION

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd, 1879."

CONTENTS.

IMPORTANT GOLD DISCOVERIES IN ONTARIO

Prospecting in Ontario has been recently greatly stimulated by two important discoveries. In Munro township very rich gold ore has been found in developing the Dobie-Leyson-Gamey claim. At Kowkash gold has been found in a district which had formerly received little attention.

The Munro discovery, on account of the richness of the ore, is one of the most wonderful yet made in Northern Ontario. The property had been regarded for some time as the most promising in the district east of Matheson on the Temiskaming and Northern Ontario Railway, but its actual value was not realized until recent development work proved that there is rich ore at depth.

Owners of the property have been working quietly and not advertising their success. Mr. A. G. Kirby, of the Dominion Reduction Company, a few months ago acquired the Dobie-Leyson-Gamey claims for interests identified with his company. A shaft was sunk with spectacular results. Ore of phenomenal richness was encountered. Large chunks of ore are, by weight, over twenty per cent. gold. Two thousand ounces of the picked ore obtained by the Ontario Bureau of Mines is estimated to contain over four hundred ounces of gold. Small samples of such ore have been obtained at other Ontario mines; but it is doubtful whether any large chunks as rich as these have ever before been seen in Toronto. It is stated that two small shipments of picked ore made by the company contained about $80,000. It is not surprising therefore that there is considerable activity in Munro township these days.

Another discovery, of a very different nature, has been made at Kowkash, about three hundred miles west of Cochrane, on the National Transcontinental Railway. This is near a district well known to some who have prospected the Onaman iron range; but it had previously received little attention from gold seekers. The occurrence of quartz veins had been recorded by Mr. E. V. Neelands and by Mr. W. J. Wilson in Government reports, and Mr. Neelands noted that there was a trace of gold in some specimens taken. Now it is stated that Mr. King Dodds, a prospector, has located a small outcrop of rich gold ore. Specimens said to be from this outcrop are quite rich, showing considerable coarse gold. So far practically no development work has been done. It is only known that gold occurs on one claim and in small quantity.

The Kowkash discovery has been made in a district which well deserves attention. There are areas of rocks in which gold might be expected to occur and the transportation facilities are excellent. The National

Transcontinental Railway traversing the district is now in operation. The railway authorities should do all in their power to encourage the prospector, for in no way will the country be more quickly opened up.

In this issue we reprint from Government reports some information which is likely to be useful to those who go into the Kowkash country. The maps are merely sketch maps and should not be depended on too implicitly. However, they will serve a purpose until more accurate ones are available.

The Ontario Bureau of Mines has sent a geologist to Kowkash and it is likely that a geological survey will be made. In the meantime the Bureau is preparing a map which will embody the information at present available.

It is reported that the railway officials are aiding the prospectors by providing facilities for reaching desired points on the railway other than established stopping places. Such a policy is to be commended.

PERSISTENCE OF ORE IN DEPTH

In a contribution to the discussion of a paper by Mr. T. A. Rickard presented before the Institution of Mining and Metallurgy, Mr. G. R. Mickle contends that such discussion should be based on recorded observations, and commends Mr. Rickard for so basing his contentions. But who under heaven would think of using any other basis?

Mr. Mickle contends that some commonly accepted theories have failed and that therefore other theories may be expected to fail. Of course they will. There never was a theory that covered every case.

What are theories based on, if not on recorded observations? Why is a theory accepted, if it does not help us to correlate observed facts? Why are theories discarded, if not because they fail to assist as well as some other theory in correlating facts and making predictions based on those facts?

Mr. Mickle states that because a theory based on observations of air pressure and temperature made near the surface of the earth does not adequately explain phenomena observed at an elevation of seven miles and more that therefore other theories may be expected to fail under conditions other than those in which the observations on which they were based were made. Just why Mr. Mickle chooses a particular example to show that theories have failed is not obvious. There is no more common experience in the study of natural phenomena than that theories developed from observations made under certain conditions do not adequately explain phenomena outside the limits set by those conditions.

What has all this to do with persistence of ore in depth? Frankly we do not think it has very much to do with it. Mr. Mickle has apparently introduced it to explain his dislike for "voluminous discussions of the way ore has been formed and the deductions therefrom which are so dear to the hearts of geologists." He seems to fear that someone will be deluded into believing that the persistence of an orebody in depth depends upon a theory. And as a warning to such persons he cites an example of a theory that does not explain phenomena observed by some meteorologists who sent little balloons, nicely fitted out with barometers and thermometers, several miles up into the air.

We agree with Mr. Mickle that the persistence of ore in depth does not depend upon a theory and we hasten to assure him, and our friend Professor Haultain, that geologists are not endeavoring to prove that it does. They are merely striving to interpret observed facts so that they may correlate them and be in a better position to anticipate development of new orebodies.

While Mr. Mickle's comments on theories and geologists do not favorably impress us, his comments on the recording of observations of persistence of ore in depth do. For various reasons such records are commonly not divulged by operating companies. Many companies do not even make systematic records for their own use. Quite often the information is kept simply in the memory of the underground superintendent. A plea for the recording of observations should command the support of all mining men.

Among those in a position to record observations concerning persistence of ore in depth few have such opportunities as Mr. Mickle. As Mine Assessor of Ontario he obtains pertinent information, and there is no doubt he could give to the mining fraternity some very interesting and useful records if he felt free to do so. Unfortunately the very position which enables him to gather the information does not allow him to make the information public. It is to be hoped that the data gathered will eventually be accessible to all interested in the subject.

We assume of course that Mr. Mickle's desire to exclude geological theories from the discussion of persistence of ore in depth does not mean that he would exclude a record of geological facts. It should be a comparatively easy matter to determine the average number of feet below the surface that ore deposits have been mined. But that when determined would be of little assistance. It has already been established that most deposits do not persist more than a few hundred feet. Would it greatly aid us to know that the average of those which have been extracted was 256 feet or 347 feet? It might satisfy some of our mathematical friends; but it would offer little consolation to the perplexed manager who is trying to decide on the most economical plant and the most economical method for mining an ore deposit which has been only partially developed. What he wants to know is how deep have similar deposits been found to persist. And by similar what does he mean but geologically similar? And if geologically similar orebodies have similar origin, is it not possible that a theory of origin may be of some use in classifying deposits in a way useful to the mine manager?

Theories have their uses, though they fail, as facts will fail, to give desired results when in-

correctly used. Persistence of ore in depth does not depend on any theory of origin; but it does not follow that a theory of origin based on observed facts may not be of use in predicting the extent of ore deposits.

THOSE AMAZING WELSH MINERS

"In trenches, shops, grain fields, executive offices, hospitals; on railroad trains and tracks; on bridges; guarding communications, scouting aloft—every man of France is doing every pound that is in him to do for his country where she needs him most. In the tiny corner of free Belgium left, the remnant of the devoted army that a year ago helped save the democracy of Europe fights doggedly for the country's redemption. The Russian bear, limping in retreat, turns to claw his pursuer, but desperately needs aid. In France, on Gallipoli, in half a dozen other places, Britons and their colonial kin are dying in as plucky a fight as men ever made.

"And this precise occasion 25,000 coal miners of Wales select to strike for a second time, instead of working while negotiating; possibly, if they gain recruits, to tie up communications; possibly to doom thousands of fellow-workmen in the ranks to death for lack of food, or ammunition, or reinforcements that coal alone can bring!

"It is a situation past comprehension, even though Lloyd George's arrangement may have been interfered with by others. The miners know that if that is true the Minister of Munitions and the Government and country behind him can be depended on to see that it is carried out. It is impossible to explain except upon the theory that the miners have not imagination enough to picture, even yet, the war as it affects their country! Can it be that after thirteen months of the most gigantic conflict in history there are still men in Great Britain who have not waked up to the truth? Are there 25,000 in a single trade who do not see what defeat might mean for their fellow-workmen and for themselves?"

The foregoing extract is clipped from the editorial columns of the New York "World" of the 28th August, and gives a new point to the old saying: "They do these things better in France." In Canada we also are amazed, and find it "a situation past comprehension," but our amazement is mixed with deep humiliation that two serious strikes should have been possible in a coal district of Great Britain, upon which, more than upon any other coal field, rests the burden of supplying the navy with coal. A certain extreme section of the miners are credited with a desire to have the coal mines nationalized, and their actions are partly explained by wishfulness to force the Government to take over the coal mines at once, as though the Government of Great Britain had not sufficient problems to solve at the present time without tackling the thousand and one difficulties that will arise in nationalizing so enormous a vested interest as the coal industry of the United Kingdom! The British syndicalists do not appear to realize that the very doctrine of syndicalism was born in the fertile brain of Germany's arch-spy Stieber, the man who sowed France with "fixed agents", "agents provocateurs" and every grade of spy before the Franco-Prussian war of 1870-71. The outbreak of "sabotage" and syndicalistic strikes in France at the time of the Agadir crisis was not a coincidence. The simultaneous occurrence of labor troubles in France and the United Kingdom with the periodic sabre-rattlings of Germany during the armed and irksome peace that preceded the present war was too obvious to be explained as due merely to coincidence.

There are faults on both sides in the South Wales labor troubles. Neither the masters nor the men in the South Wales coal fields have in the past been remarkable for keeping faith with each other, and the present absolute distrust between masters and men, combined with the revolt of the men against their union leaders, has its explanation in past acts of bad faith on both sides. Be this as it may, the action of the South Wales miners remains an indelible stain on the otherwise admirable and heroic record of the British miner in the present struggle. Their action is deeply resented by miners in other portions of the Empire. It is an action that will defile the memory of South Wales long after the war is over, and no men will feel the humiliation and odium that these strikes bring to those who have participated in them, more than the gallant Welsh miners who are bravely bearing the leek in the far-scattered fields where Britons are at death-grips with an, as yet, unbeaten foe.

The demand for munitions of war is making itself felt in many ways in the mining industry. Most metals are greatly in demand and the prices good. Big premiums over these prices are also obtainable for especially pure materials. It is not surprising therefore that many new metallurgical works are being established. As a result of the peculiar conditions, Canada is soon to have in operation three zinc refineries, using electrolytic methods. The treatment of zinc ores by leaching and electrolytic precipitation from sulphate solutions gives a product now much in demand. The process could not have been adopted before the war with any such promise of success. If reasonably good results are obtained the electrolytic process may prove the salvation of many Canadian zinc properties.

Porcupine continues to make new records. Hollinger and Dome mines, the largest producers, each milled over 28,000 tons in August. The joint output of the two gold mines is now about $13,000 per day. Acme, McIntyre, Porcupine Crown and Vipond mines, while not such large producers, are also making good profits.

Remember the Disablement Fund for disabled soldiers. Mr. E. H. Scammell, 22 Victoria Street, Ottawa, is secretary.

RESUMPTION OF CHROME ORE MINING AT BLACK LAKE, QUEBEC

By A. C. Allenson.

The little town of Black Lake, Quebec, like most mining communities, has had its ups and downs, in the course of its short corporate existence. A lumberjack's camp and river driver's headquarters in the beginning of modern things, then fireswept a quarter of a century ago, its woods destroyed, its houses with one or two exceptions in ashes, it has possessed vitality sufficient to rise superior to its misfortunes. Then the miner entered, some farm lad of more than ordinary perspicacity who seeing the silvery glint of the shining rock fibre was curious enough to examine it, pick its cottony fibre, twist it in his fingers, and perceive that it might have its uses. After the usually described difficulties of mining beginnings, which are a testimony to the romantic inclinations of the average person, perception led to enquiry, enquiry to a discovery of uses, and the plough knew the local Columbus no more. He had entered the school of magnates, where he still abides in strength and opulence.

For more than a quarter century the asbestos business steadily grew and developed in the hands of independent owners, and in the Asbestos Club Room of Black Lake are to be seen curious old photographs of men of mark who had their beginnings in a hole in the ground on the hillside facing the station, and about them linger traditions and stories that grow more and more wild and romantic as the years go by and the tales are told. Now the business is much more decorous and frilled, if less interesting and romantic, and the rough and ready mining of bygone years has led to the carefully and scientifically crushed, milled and graded article of to-day.

Then came the mergers, "Wheresoever the carcass is, there will the vultures be gathered together." The quotation may be a little harsh, but it illustrates the situation. Whether the coming indicated evolution or degeneration, social, political or personal bias decides to a great extent. At any rate, for a short, brilliant day Black Lake and Thetford Mines were very much on the map of the financial world, and plumed themselves greatly on their advent. They remain on the map to this day, but their names in connection with asbestos do not shine with the old time effulgence. Like the good seed planted in sparse earth they as quickly wilted as sprang up. Asbestos is still produced in large quantity, and prices are still good, and the two towns will one day recover from the wounding they received in the house of their friends; but the mauling was a severe one. It will take a quite new kind of financial wizardry to put through the next merger, which, we are sometimes told, will embrace the entire asbestos field and put a worthy and excellent industry where it ought to be, in the most respectable of company, and not that of the disreputable, cadging down and outs.

The war has, of course, stopped the great outflow to Germany, one of the biggest consumers of Canadian asbestos in ante-war times. Doubtless while Italy was on the fence quite a lot of asbestos filtered through via the United States, but not much gets there in these days. The States are large buyers and a considerable quantity goes to England. For the best grades the prices are as good as ever they were.

While the market for the highest qualities was never better, the demand being excellent at top figures, there is more difficulty in getting rid of the inferior grades, freight being very high, so much so as to make shipment of cheap grade stuff almost impossible. The railway to Sherbrooke makes an even split of the rate to Boston or New York. It may be that after the war the manufacturing side of the industry may be developed more locally.

Labor difficulties have clouded the Asbestos Corporation's work recently in Black Lake. The reduction of wages from $1.75 to $1 in winter and $1.25 in the summer months has brought about a shut-down of their mines and mills in Black Lake. The men quit and are not likely to resume while there is more remunerative employment within reach. It may be that wiser counsels all round may prevail during the coming weeks and a satisfactory compromise be effected. A certain amount of local grievance has been caused by the employment of alien foreigners in local pits, while the native-born are shut out. Certainly the number of Austrians employed has been considerable. Many of the men have gone west harvesting. A few have enlisted, though Black Lake has not a distinguished record in that matter, and there has come a side wind of prosperity to help over troubles that otherwise might have become acute.

The shutting of the asbestos mines and mills was a serious thing for the little town that has expended large sums in municipal improvements, but the wind has been tempered to the shorn and skinned lamb. Ten or more years ago Black Lake had another industry besides asbestos. Canadian or Black Lake chrome was then shipped in large quantities to the great steel mills of Pennsylvania and elsewhere, and besides being an essential element in steel making, was largely used in leather tanning, stove lining manufacture, dyes and colors. The industry died a natural death a decade ago, not that its local supply was exhausted, but because of the competition that rendered the business unprofitable. Turkey and Greece shipped chrome ore in ballast to American ports, and large quantities of high-grade ore came from Rhodesia. Before this competition Canadian chrome dropped from the market. With the advent of war, that ill wind blew some good to Black Lake. The Sick Man of Europe became still sicker in the Dardanelles and elsewhere. Greece with King Constantine's shifting feet, and Queen Sophia busy answering her Imperial Brother's prophecies as to the intentions of "Me und Gott," let chrome go by. In South Africa General Louis Botha was attending to the cleaning of sundry Teuton blots on the local map, and chrome was shelved there for a time. Moreover, there are not many tramp ships about the ocean now. The British are busy on Imperial business, and the German-owned boats are cultivating cobwebs in Hamburg, Hoboken and many another sheltered haven, waiting for the clouds to roll by, while the Kaiser sings mournful dirges about the freedom of the seas, Teutonic version of the same. There is no South African chrome coming to the States, so Black Lake can afford to turn away its gone-wrong-one-best-bet asbestos to something at least temporarily better.

Since the close of June over 3,000 tons of chrome has been shipped locally, and this is but the beginning of the output. Prices are high and are steadily mounting. The old discarded dumps, being of low grade stuff, reckoned valueless these many years, have been eagerly

shovelled up and shipped away at very remunerative figures. The old dead mines are all open again, and every landowner, farmer, and amateur prospector is travelling across lots in both ways to hoped-for fortune. Mr. J. M. Johnston, one of the old chrome pioneers is operating the Ross Mine. The Dominion Mining and Quarry Company, a New York and Toronto corporation, has the Montreal pits and is buying besides. The Beebee properties at Lake St. Francis and Coleraine are open again and in full blast. Mr. David Wilson, a shipper in former prosperous chrome times, is into the work again. The Black Lake Consolidated Co. is mining on its own properties. The Captain Prideaux Pit is being operated by Mr. Woolsey, and Reid's chrome pits are also being worked. Mr. P. E. Beaudoin has opened pits and is shipping largely from his Lakeside properties. Within three months every reachable chrome property has suddenly burst into redhot activity, and while the war lasts, at any rate, there will be bonanza times in Black Lake chrome. Railway sidings have been built or re-established at Black Lake Station, Lakeside, Chrome Siding, Coleraine and other places.

ZINC PRODUCTION IN BRITISH COLUMBIA.

On August 27 the Daily News, published at Nelson, British Columbia, printed the following information relative to the production of zinc in West Kootenay district of that province:

A comparative statement of the shipments of zinc ore and concentrates for the month of July, 1915, and the corresponding period of 1914 shows that there has been a considerable decrease in output this year. It is pointed out, though, that during July of last year both the Slocan Star and Standard mines made extra large shipments, the former having sent 468 tons and the latter 777 tons to Bartlesville, Oklahoma, for treatment. It is also claimed that the prevailing high price of zinc has enabled mines in the United States to so increase their output that the reduction plants have been running to capacity and contracts for Canadian concentrates have been refused.

This condition, however, it is said, has not prevented work from being continued on a large scale at the mines shown in the following list, or at other properties where zinc-bearing ores occur, and it is reported that comparatively large quantities of concentrates are being accumulated at the mines pending the closing of contracts for sale of this product. It is expected that several satisfactory contracts will soon be made, and it is estimated that afterward some record breaking shipments will be made from Kootenay district. Shipments during July of 1914 and 1915, respectively, are shown in the following comparative table:

Shipping Mine.	July, 1914.	July, 1915.
Ainsworth Mining Division—		
U. S.	40	..
Utica.	40	..
Whitewater (J. L. Retallack & Co.)	..	40
Slocan Mining Division—		
Hewitt (Silverton Mines, Ltd.)	138	..
Lucky Jim	..	100
Rambler-Cariboo.	160	..
Slocan Star	468	..
Standard.	777	..
Surprise.	..	252
Nelson Mining Division—		
H. B.	..	500

AMERICA TO GERMANY

We wait with a clenched and inheld breath
And leash on the pulse of our soul;
You've flung us your fragment sketch of death,—
We await the details of the whole!

Familiar the seascape of your art,—
Of the hull that goes shuddering down,
Of sea-field strewn in the wake of your dart
With the humans that helplessly drown.

Not novel at all,—save westward prow
Of a shell-emptied ship; and thereby
Your earlier shooting echoes now
Your excuse and your motive a lie.

Yet still with a patience grim we wait
(Who wait vain for our own to return)
Till each line of circumstance lie straight,
And each shade of your sinning we learn.

For such and so the minutiae
(And OUR heart holds the heed of the law)
Of the code that quaintly rules the sea,—
And our case shall be clean of a flaw,

Lest there be screen of law's niceties
And behind it your periscope skulk:
The wreck-strewn sea shall we scan for these
Where it tosses o'er side-shattered hulk,

And wait with a clenched and inheld breath,
And a leash on the pulse of our soul,
And look, for your rounded tale of death,
Where the strewn billows slumberous roll!

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

U. S. SPELTER PRODUCTION FOR THE FIRST SIX MONTHS OF 1915.

The production of spelter for the first six months of the year has been canvassed by C. E. Siebenthal, of the United States Geological Survey, with the following results expressed, in short tons:

The output of spelter was 207,634 tons made from domestic ores and 8,898 tons from foreign ores, a total of 216,532 tons, as compared with 177,991 tons for the preceding six months, and with 175,058 tons for the first six months of 1914. In addition there was produced by distallation from drosses and skimmings 13,546 tons of secondary spelter, as compared with 10,273 tons, the half of the 1914 output of distilled secondary spelter. No statistics were obtained of the spelter produced by re-melting skimmings, drosses, etc., but it was probably not less than 12,000 tons. The total output of spelter from both ore and skimmings was therefore about 242,000 tons, or at the rate of 484,000 tons per year. The whole number of retorts in operation in June was about 127,000, but many of these retorts had been but recently put in operation. Additional retorts to the number of over 32,000 have since been completed, are under construction, or are planned.

The apparent domestic consumption for the six months period was 160,906 tons, as against 149,762 tons in the preceding six months, and 149,306 tons in the first six months of 1914. The spelter stocks on hand at smelters were 5,884 tons, an average of about 150 tons each for the plants reporting.

The complete mid-year report giving the details of production, imports, exports, prices, and smelter capacity, will be distributed in about a week.

NEWFOUNDLAND'S IRON MINES

By P. B. McDonald.

Newfoundland has two great iron-ore mines situated off its storm-beaten east coast. They begin on Bell Island, a small island 12 miles by 2 miles in Conception Bay and extend for nearly 2 miles out under the ocean. In 1913, the two companies shipped 1,511,502 tons of ore, of which, in round numbers, one million tons went to the owners' furnaces in Nova Scotia, two hundred thousand tons went to the United States, largely through Philadelphia, two hundred tons went to Germany, passing through Rotterdam, and one hundred thousand tons went to England via Middlesboro on the east coast. A total of 13,000,000 tons has been shipped, of which over 2,000,000 tons was to the United States and 3,000,000 tons to Europe.

Bell Island is 13 miles, as the crow flies, from St. Johns, the capital of the colony, about 35 miles by water; it is conveniently situated in the North Atlantic, about midway between European and American ports. To Philadelphia from Bell Island is 1,240 miles; to Montreal, 1,075; to Liverpool, 1,966; to Rotterdam, 2,294 miles; to Sydney, Nova Scotia, 412 miles.

The ore is a non-Bessemer, red, oolitic hematite of hard, blocky appearance. Average analysis of 40 cargoes totaling 220,000 tons, shipped to Philadelphia during 1910, gave 53.71 per cent. iron, 2.31 per cent. moisture, 0.868 per cent. phosphorus. The silica runs from 7 to 15 per cent., being 7 to 9 per cent. in the "Scotia" bed and 10 to 15 per cent. in the lower bed. A typical analysis gives sulphur 0.018 per cent., manganese 0.65 per cent., alumina 3.55 per cent. Among purchasers of the ore have been Bethlehem Steel Co. and the Krupps, of Essen, Germany.

The ore seams outcrop on Bell Island and supposedly in a great elliptical basin on the bottom of the ocean. They are interstratified with fossiliferous shales and sandstone of Lower Ordovician age; like the deposits of Red Mountain, near Birmingham, Alabama, but unlike the Lake Superior deposits, the ore is thought to be a primary deposit, essentially the same as when formed. From Bell Island, the ore dips at 8 to 14 degrees out under the sea. Of the six different seams only the three uppermost are being worked; these outcrop for three miles along the northern shore of Bell Island. In the land areas, the lower or "Dominion Bed" is about 12 ft. thick, the upper about 4 ft., and the third, or Scotia bed, is 7 ft. At depth the ore beds get thicker and somewhat richer than at the outcrops.

E. C. Eckel and Edwin E. Ellis, mining engineers and authorities on the estimation of ore deposits, testified in 1913 at the Government suit against the United States Steel Corporation concerning the tonnage of iron ore at these Newfoundland mines. Averaging the aggregate ore thickness at 30 ft., they estimated 3,500,000,000 tons of ore to exist under the sea within five miles of Bell Island, while slopes from the mainland might tap an equivalent tonnage. The proportion of ore economically and safely recoverable was put at 50 per cent.

It is interesting to note that the outcrops of the ore were at first judged in the early days (without adequate examination) by reconnaissance geological surveys to be "bright, red sandstone." Fishermen used blocks of the ore as anchors and ballast for years without knowing its value, and more or less of it was used for building and miscellaneous purposes.

The first shipment was made on Christmas Day, 1895, by the Nova Scotia Steel & Coal Co., the cargo being taken to Ferrona, Nova Scotia. In 1899, this company sold a portion of its ore holdings to the Dominion Iron & Steel Co., another Canadian company which uses practically all of its ore output at its furnaces in Nova Scotia. The Nova Scotia Steel & Coal Co., controlling now 83½ square miles, uses considerable ore at its Nova Scotian furnaces, but makes a practice of selling ore in the open market.

Mining Methods of Nova Scotia Co.—Mining is by room-and-pillar system, and extraction will ultimately be about 50 per cent. The stopes in the submarine areas are carried on by back-stoping, a portion of the ore being left to stand upon, due to the thickness of the deposit; the foot-wall is at such a shallow angle that the stoping method is rendered comparatively simple. The roof, generally of sandstone, is firm, and ordinarily no timber is required in the rooms, some timber being used in slopes and main drifts. Levels are 250 feet apart.

Power rock-drills are used, and underground electric "steam-shovels" load the broken ore in the stopes very satisfactorily. Experiments proved that the regular type of steam-shovel modified for electric, underground work was best adapted for this. The shovel has an overall height above the rail of 12 ft., and is designed to turn completely around in a radius of 25 ft. A shovel of this type has loaded 350 tons in a shift.

Strange to say, those mines under the Atlantic Ocean are uncommonly dry. Only a small amount of water is pumped by six-stage, centrifugal pumps, electrically driven by direct-connected motors. The pumping is done in two lifts, storage dams being provided near the bottom of the mine and again at a point 4,200 ft. from surface.

Ventilation is by a motor-driven fan of 80,000 cu. ft. per minute capacity at 8 in. water gauge, overlying the slope.

The slopes (or shafts) are driven double, one slope being for hoisting and the other for air; a rock pillar divides them.

Underground haulage is as follows: The cars when filled are pushed by the loaders from the working face to the headway where they are lowered by an electrically-driven haulage engine and allowed to run back upon the level, where they are collected in trips. Then, still controlled by the level-engine rope, the cars are run out, a number at a time, to large storage bins over the hoisting slope. The loading of the skip is accomplished with great rapidity; a series of chutes spaced close together feed from two sides at once.

One of the hoisting engines at the "Scotia" mines is a large one, one of the largest in British America. It is first-motion, duplex, Corliss valve, built by Fraser & Chalmers, of Erith, England. It has cylinders 28 in. by 60 in., equipped with a 11-ft. drum with steam-operated post-brakes, Whitmore overwind device and space for 10,000 ft. of 1⅛-in. cable. There are two drums which lock together for hoisting in balance. The skip is of 45,000 lbs. capacity; they operate in balance. The slope track has an average grade of 16 degrees and is laid with 80-lb. rails. A hoist takes one-half minute.

Some hand picking of the ore is ordinarily done on a steel conveyor belt on surface, previous to crushing in gyratory crushers to 4½ in. size. More picking then ensues on a rubber belt 150 ft. long inclined at 17 degrees. From this picking belt the ore falls into a bin for loading into cars for transporting two miles across

Bell Island to sheltered anchorage. This surface tramway is a two-track, 2 ft. gauge, endless cable system, with 28 lb. and 18 lb. rails and 1 in. cable. The tramway is operated by a compound, condensing steam engine of 125 h.p., geared to give a cable speed of 350 ft. per minute, and situated at the pier where coal is convenient. This tramway can handle up to 4,000 tons per day; the cars are of steel, 1.8 tons, or 30 cu. ft., capacity each. At the piers there are two storage pockets constructed in natural ravines in the abrupt 200 ft. cliff, of 25,000 and 40,000 tons capacity respectively.

From the lower pocket at a point slightly above high water level, an inclined bucket conveyor takes the ore to the loading chute, feeding into a steamer's hold. There are two shipping piers, one of timber, one of steel. Steamers carrying 12,500 tons have been fully loaded in 3½ hours. Electric power for the mines is generated in a power-plant at a wharf near the piers where coal can be handily obtained from steamers.

Stockpiling in winter is accomplished at a cost of less than 1 cent per ton by a device which can handle up to 1.500 tons per day. A side-dump car is run up an inclined track of 20 degrees (where it automatically dumps) by a main-and-tail rope system. The stockpile assumes the form of a triangular pyramid. Progress ahead is achieved by moving (by the engine) from time to time the wooden frame which supports the track a couple of car lengths ahead of the pile. Shipping of the stockpile in summer is done by a drag bucket on a wire rope, rather than by steam shovels. Although perhaps not so cheap, it suits the occasional nature of the work.

Between 1.000 and 2,000 men are ordinarily employed by the two companies on Bell Island. Labor is low-priced, fairly efficient and English-speaking. Bell Island is a pleasant spot in summer; a wild, stormy place in winter.

FRENCH'S ZINC ORE REDUCTION PROCESS.

A press despatch sent out from Victoria, British Columbia, on August 16, stated that on that day Mr. R. F. Green, M.P., headed a deputation of local directors of a company formed to try and establish a smeltery at which would be used the French electrolytic process for treating zinc ores, which deputation waited on Sir Richard McBride, Premier and Minister of Mines for British Columbia, and asked for assistance from the Provincial Government. The process, it was claimed, had already been demonstrated on a small scale at the Trail smeltery and at the Standard Silver-Lead Co.'s concentrating mill at Silverton, Slocan lake, but in view of the pressing demand for zinc it is now thought timely to attempt experiments on a more comprehensive scale. It was urged upon the Government that arrangements be made so that a small unit might be erected at Nelson. The promoters have every confidence that this small unit would show that the process can be made a commercial success. The Premier promised that the request for assistance shall have careful consideration.

In this connection, the following from the Kaslo "Kootenaian" is of interest:

"The parties in Nelson, headed by J. O. Patenaude, who are pushing the French process for zinc reduction, are petitioning Sir Richard McBride for a Provincial grant of $50.000 with which to fix up the Fairview plant for the handling of zinc ores by the French process. The petitioners go on to say:

"French's Complex Ore Reduction Co., Ltd., a company duly incorporated under the laws of British Columbia for the economical production of zinc, has satisfactorily demonstrated the commercial success of the process used by the company for the production of zinc, and in so doing has expended about $40,000.

"The Government of British Columbia is the owner of a plant in Fairview, adjoining the city of Nelson to the east, which can be used by French's Complex Ore Reduction Co., Ltd., with certain alterations, for the production of zinc in commercial quantities by an initial expenditure not to exceed $50,000.

"Arrangements have already been completed in the city of Nelson for special financial assistance to enable the Reduction Company to proceed, provided the alterations necessary to the Fairview plant are first made.

"Your petitioners humbly request, therefore, that your Government will guarantee a sum not to exceed $50,000. . . . . to be used solely for the purpose of installing the requisite machinery and making the necessary alterations to the Fairview plant above referred to, etc."

The "Kootenaian" adds the following comment: "E. Dedolph, who was connected with, and took an important part in the work that was done by the French Government in attempting to solve the problem of electrical zinc smelting, the later experiments having been carried on at the Fairview plant, is not in favor of the scheme outlined above, since it means that all the apparatus that he installed at Fairview at a considerable outlay of Dominion Government money, will be torn out, and further work along the lines which he advocates, and which he claims were about successful, will be out of the question."

Result of the French Process Test.

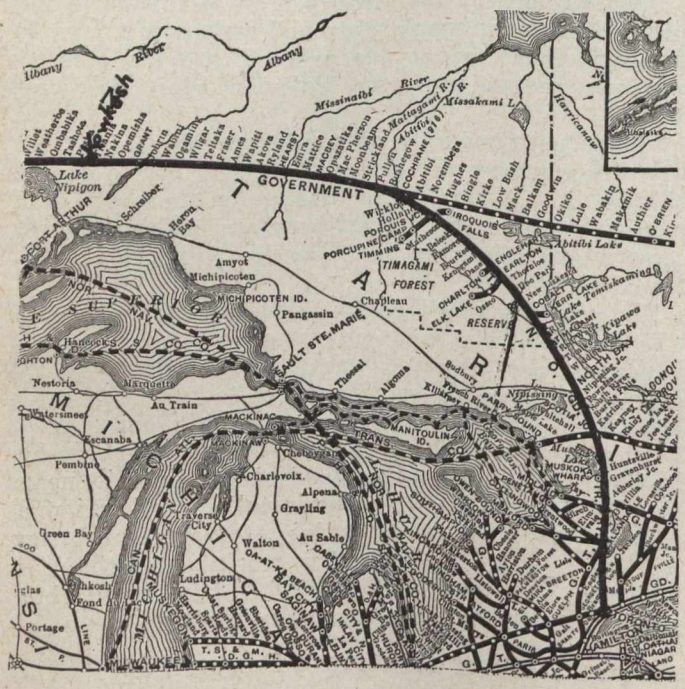
The following excerpt from the published report of the Nelson Industrial and Natural Resources Committee, presented at a meeting of the Nelson Board of Trade about two months ago, is also of interest:

"General results from the operation of the experimental plant for the treatment of zinc ores by the French process at the Standard Silver-Lead Mining Co.'s mill at Silverton, Slocan, have been announced. The ore treated was tailing from the concentrating plant, running from 25 to 35 per cent. zinc, with small value in silver and lead. The extraction made was 90 per cent. of the zinc content. The residue was 45 per cent. in weight of the original ore, so that the consequent enriching in silver and lead and the elimination of nearly all the zinc left it of sufficiently high value to be treated at a smeltery, with returns to the shippers. As the ores treated could not have been shipped to a smeltery with profit, the establishment of a plant of commercial size would apparently bring into value a large quantity of zinc ores valueless under present conditions. The committee is informed that steps are being taken to bring about the construction of such a plant, with an approximate capacity of 100 tons of zinc a day, requiring a supply of about 500 tons of ore, which the promoters estimate can easily be secured."

The recently issued Fifth Annual Report of the Canadian Branch of the St. John Ambulance Association shows that among the members of the General Council of that organization is Mr. S. S. Fowler, of Nelson, B.C. Mr. Fowler was a delegate from British Columbia to the annual meeting of the association held in Ottawa last March.

CANOE ROUTES AND GEOLOGICAL FEATURES OF KOWKASH DISTRICT, ONTARIO

A geological reconnaissance of a portion of Algoma and Thunder Bay districts, Ontario, was made in 1903-4 by Mr. W. J. Wilson, of the Geological Survey of Canada. Those who go into the Kowkash district should provide themselves with a copy of his report.



Railroad map showing the location of Kowkash on the Government Railway

Most of the area examined by Mr. W. J. Wilson is drained by tributaries of the Albany river, including the Little Current, Drowning, Kenogami, Pagwachuan, Nagagami and Kebinakagami rivers. These waterways are used as canoe routes. "The district as a whole is comparatively flat, the height-of-land being about 1,200 ft. about sea level. The watershed between the St. Lawrence and Hudson bay waters is rather a broad plateau than a sharp dividing ridge. The streams running through this plateau rise in swamps, muskegs and lakes, and are winding and sluggish, but can usually be navigated with canoes to their source. North of this plateau the country descends somewhat rapidly until the sedimentary rocks are reached, and all the rivers have many rapids and falls in this stretch, from which almost unlimited water power can be developed. As the route of the National Transcontinental Railway passes through this slope for a long distance, there is little doubt that these water powers will be utilized in the near future."

Considerable diversity prevails in the character of the rocks of this area. Laurentian granite and gneiss occupy the greater part. From McKay lake to O'Sullivan lake the continuity of the granite is broken by considerable areas of hornblende schist, biotite schist and diabase, the latter mostly in narrow dikes, though sometimes in larger masses. These rocks were formerly mapped as Huronian, but most of them probably belong to what is now called Keewatin. Northeast of the granite and gneiss, and extending to James bay, there is an immense plain underlain by dolomitic rocks lying almost flat, or dipping slightly to the northeast.

"Along the Kawashkagama river from Rupert fall to Abamisagi lake there is a considerable area of dark and greenish hornblende schist which has been assigned to the Keewatin system, and similar rocks were noted on Nagagami river and parts of O'Sullivan lake. There are probably other small areas of the same rock, but the examination was not made in sufficient detail to warrant their separation.

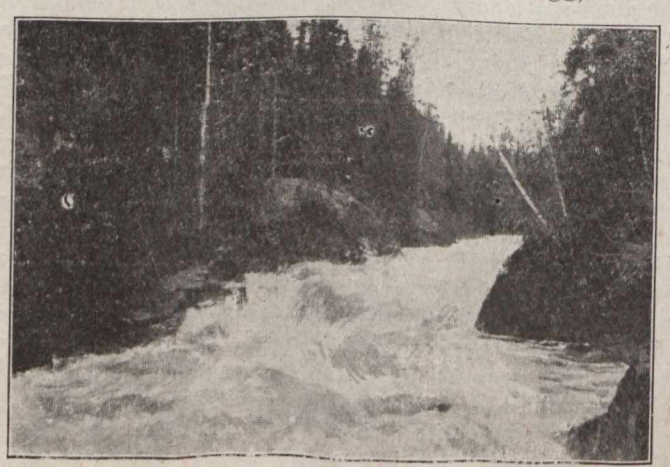
Hornblende Schists.—These rocks vary in grain from fine to almost dense, and in color from black to greenish black to dark grey. The very dark colors are due to the great abundance of hornblende occurring in tiny grains, which with the minute grains of feldspar and quartz give a speckled appearance to the hand specimens. In some instances biotite is also abundant, and the flakes, lying parallel to one another, impart a very evident foliated structure to the rock. Some of the specimens, richer in biotite, feldspar and quartz, closely resemble the finer grained types of biotite-gneiss.

Chlorite Schists.—The banks of part of the Kawashkagama river above O'Sullivan lake and the western part of the lake are occupied by very fine, slate-like biotite and chlorite schists, which may belong to the Huronian system, but it has not been thought advisable to attempt to separate them from the hornblende schists just described.

Diabase.—Dikes of diabase varying from one inch to fifty feet in width, are common both in the granites and schists, and in a few places larger masses of this rock were noted.

Description of Routes.

The Little Current is the largest branch of the Kenogami. It enters the latter fourteen miles from the Forks on the Albany river, and rises northwest of Long lake, south of 50° north latitude. It has a total length of 260 miles following the bends of the river. The upper part is named by the Indians, Kawakashkagama, which the Geographic Board has shortened to Kawashkagama. It drains Mountain, Egg, Island



Howard fall, Kawashkagama (Kowkash) river

Camp, Fleming and Kawashkagama lakes. This part of the river was examined by Dr. R. Bell, and is described in the Annual Report of the Geological Survey for 1870-1, p. 244; also by party number 5, Exploration of Northern Ontario, issued by Ontario Legislative Assembly, Department of Crown Lands, 1900,

p. 138. For two miles below Kawashkagama lake the river is broad, with slow current. At this distance a portage leads to Wawong lake. Below this portage the river is from one and a half to two chains wide, and fairly deep. Between the portage and Rupert fall—a distance of eleven miles—there are only two rapids, and these can be run with loaded canoes at ordinary water. There is a good portage at each.

At Rupert fall there is a drop of fifteen feet over much broken and disturbed ledges of dark green hornblende-schist dipping 70 deg. S.40E. Past this fall there is a five chain portage on the north bank. The river continues in a northwesterly direction for twenty-two miles and is about two chains wide. It then flows northeast for four miles, when it turns almost due north and flows in that direction to Abamisagi lake. Between Rupert fall and Amabisagi lake there are two portages, the first to pass a log jam near the bend, and Howard fall four and a half miles farther down.

Howard fall is caused by a ridge of chloritic hornblende schist through which the river cuts, making a narrow canyon-like gorge fourteen chains long. This gorge is from twenty to thirty feet deep, and the water descends in steps and slides varying from one to five feet. The fall would make a splendid water power. From Howard fall to Abamisagi lake, eleven and a half miles, there are three rapids, two of which require short portages.

The river is from two to three chains wide, with slow current. It enters Abamisagi lake from the south, and turns round, as the Indian name of the lake implies, and flows towards the south for a short distance. The distance between the entrance and the outlet is less than half a mile. The river then flows east for eight miles to O'Sullivan lake. In this distance the river is wide and deep, and there are three bad rapids which cannot be run with loaded canoes.

The main part of **Abamisagi lake** is eight miles long and two and a half broad, with regular shores and few islands. There is a narrow bay to the northeast, which I was told extends three or four miles in that direction.

O'Sullivan lake is very irregular in shape; for nine miles it lies northeast, following the course of the river. In this distance it is about a mile wide, but narrows considerably in one or two places. The larger body of the lake lies southeast from the inlet, extending in that direction five miles. This part is cut up by long peninsulas and islands, some of which are large, especially in the east. The Indian name "Sesekenaga" signifies that the lake has many islands clustered together in groups. Its shores are mostly low, but in places, especially on the northeast, the rocks rise abruptly from the water to a height of 40 feet. On the southwest the land slopes gently back from the lake to a height of 200 feet, and at a distance of about four miles there is a prominent hill which rises much higher. This hill is a conspicuous object both from Eskegenaga and Abamisagi lakes. The forest round this lake is mostly second growth.

Between O'Sullivan and Percy lakes there is a succession of lake expansions, some four miles long, connected by stretches of rapid water and falls which necessitate eight short portages. Percy lake is eight miles long and a mile and a half broad. The longer axis has an east and west direction, the Little Current entering a mile from the west end. At the extreme west end this lake receives another rapid river, which appears to be about the same size as the Little Current. From information gathered from the Indians it is inferred that this is probably the Kapikotongwa river, which forms part of the canoe route from Lake Nipigon to the Albany river. A well travelled route from near the north end of O'Sullivan lake connects, through a chain of lakes, with the Kapikotongwa river some distance west of Percy lake.

For sixteen miles below Percy lake the river is broad and deep, with sluggish current. At this distance there is a beautiful fall, 24 feet high, divided into two drops of equal height. It is also divided in the middle by an island. Below this to the contact of the Palaeozoic and Archaean rocks the river is narrower and rapids are common. In this distance there are ten portages. In some places the river runs in narrow gorges through gneiss which forms steep walls 30 to 40 feet high, the river itself being less than a chain wide. There are many excellent water powers along this stretch. A short distance below the above contact a large stream enters from the south, and is probably the river that drains Eskegenaga lake. The Indians say it forms a canoe route to Long Lake House and they describe it as very rapid with many portages. Near the mouth it is 230 feet wide and 4 feet deep, with slow current. Where this branch enters, the main river is over six chains (435 feet) wide. From

Speckled Trout, 16" to 20" long, from upper Drowning river, Kowkash country

this point to the mouth there are no portages, though there are occasional rapids or stretches of swift water where the river is wide and shallow.

Route from Kawashkagama River to Drowning River.—Two miles below Kawashkagama lake a portage of 67 chains over sandy Banksian pine ridges and spruce swamps leads to Wawong lake. This lake is two and a half miles long. The shore line is very irregular, numerous sand and gravel ridges extending into the lake, forming deep bays. In two places a portage of only 10 to 20 feet across a low neck of sand was required to pass from one bay to the other. The lake is surrounded by a rolling sandy country, covered for the most part by Banksian pine and poplar. The water, as the Indian name implies, is very clear, and of a peculiar bluish-green color. From Wawong lake the canoe route runs northeast through four small ponds and five short portages to Eskegenaga lake, a distance of a little over two miles. Most of the country along this route is similar to that round Wawong lake, with some areas of good soil well wooded. There are no rock exposures.

Eskegenaga (raw bones) lake is over twelve miles long, and averages about three miles in breadth. There are seven deep bays, and the whole shore line is irregular. The lake is full of islands, some of consider-

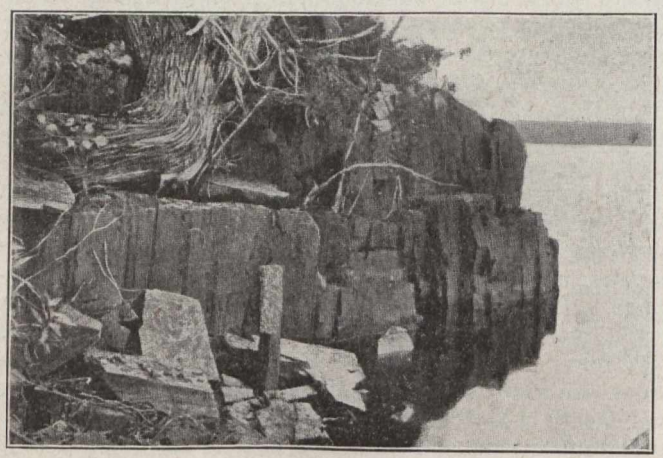
able size, especially in the eastern part. Two or three small streams enter the lake. The outlet, which flows into the Little Current river, is from the northeast arm, and at a distance of about a mile from the lake becomes rapid and shallow. Several soundings were taken in the lake, showing a maximum depth of 56 feet. Depths of between 40 and 50 feet were common near the middle. The surrounding land is generally low, but on the south an occasional hill rises 200 to 300 feet above the level of the water. Except in a few limited areas the forest growth is all small, being about thirty years old.

The portage eastward from Eskegenaga lake is from the east bay, and is half a mile long. It is chiefly through a sphagnum swamp almost muskeg in places. Groves of tall slender spruce 8 inches in diameter occur near the lake. This spruce would make good pulpwood. Tamarack and cedar also grow on this portage. A small lake and short portage come next, then follows Collins lake, which is over five miles long and less than a mile broad. It contains numerous islands and drains east, but the stream out of this lake is not followed; instead two portages and a small lake to the north are used. On these portages and lakes there are some large spruce and poplar. The next lake is one of considerable size, and the Indians say the stream flowing from it forms an excellent canoe route to the Little Current river. The lake extends eastward for a long distance and is shallow in places. The portage out of it is a mile and a quarter in length and is through a spruce swamp which at the east end is rather open muskeg. The next lake is small, and the portage from it leads into Wababimiga lake. This portage is over a steep hill, and has some excellent forest on it.

The route eastward from Wababimiga lake follows a deep bay to the south, and then a small brook running into it for a mile and a half, when a series of five portages and four lakes lead to Drowning river, a distance of seven miles. The five portages aggregate over three miles, and the lakes are all very small except the most easterly, which is two miles long. The first portage on the west is over burnt ground with scattered Banksian pine thirty years old. The other portages are mostly through sphagnum swamps, with dense forests of black spruce and tamarack.

Description of Rock Exposures.

The Little Current and Kawashkagama Rivers.—A reddish granite-gneiss and mica diorite-gneiss striking N. 40° E. appear in occasional outcrops for five miles below the Wawong lake portage. At the rapid just above Rupert fall there is a pyritous, hornblende schist, dipping 20° S. 40° E. The contact between the gneiss and schist was not seen, as the country is drift covered, and about six miles separate the two nearest exposures along the river. Between Rupert and Howard falls there are numerous exposures of hornblende and chloritic hornblende schist, the color varying from dark to light green. At the point where the river turns to the northwest there are outcrops which contain numerous stringers and veins of quartz, some of which are 12 in. wide. There are also irregular masses of quartz mixed through the rock. At Howard fall the schist strikes east and west, and is either vertical or dips south at a high angle. All these schists contain much disseminated pyrite. At the fall there are numerous quartz veins and lenticular masses, in one of which ilmenite in small quantity is found. One mile farther down, a rock similar to that at Howard fall outcrops, dipping 80° S., and also at the next short portage where it is vertical, and strikes N. 80° E. Numerous granite boulders occur in the river below this portage. In going west from the inlet along the south shore of Abamisagi lake the first rock seen is a coarse grained biotite-hornblende granite. Farther west a fine grained biotite-muscovite granite is seen. This rock is frequently cut by wide dikes of coarse pegmatite. Exposures of granite of varying texture occur along the south shore to the west end of the lake, where they form low rounded hills. Rocky cliffs were seen at the mouth of the northeast bay, but were not examined closely. On the first portage below the lake there is a knob of gneissoid granite. At the second portage the rock is finely laminated, and is a biotite schist dipping 50° N. 35° W. It contains masses of rusty quartz. At a small rapid above the last portage before reaching O'Sullivan lake there is a fine grained schist dipping 70° N. 60° W. This rock breaks off into broad thin slabs. At the last portage there is an actinolite schist. The hand specimen has a grey, slightly green color, and appears to be composed of numerous dark green grains and prism-like individuals of actinolite separated by a lighter colored material. Under the microscope the rock is seen to be composed almost altogether of actinolite in broad plates and fibrous aggregates.



An outcrop on O'Sullivan Lake

O'Sullivan Lake.—Fine grained, biotite schists occupy the northeast shore of the lake, except a small area just below the narrows, where there is an exposure of coarse grey granite. The schists strike from N. 60° E. to N. 80° E., and are usually vertical, and may belong to the Huronian group.

In following the southeast shore, in the first deep bay east of the inlet there is a massive diorite, which, in places, shows a gradation from fine grained to coarsely crystalline. In the eastern part of the lake, a grey-quartz diorite and an epidote granite are mixed with the schists. On a small island three miles southeast from the inlet, there is a band of sericite schist eight feet wide, striking N. 78° E. and vertical. Lying on the west side of this band there are about 12 inches of ochreous powder containing masses of bluish quartz mixed with the sericite schist. The surrounding rock on the island is finely schistose, and of a dark grey color. All three of the hand specimens brought from these bands effervesce somewhat freely when touched with dilute hydrochloric acid. A similar band of sericite schist occurs on another island about a mile and a half farther north. Several exposures of diabase and fine grained greenstone occur on the neartheast shore and adjacent islands. About three miles from the foot of the lake on the west side

Sketch map of Kowkash district. From W. J. Wilson's report. Keewatin rocks along canoe routes are marked xx. Dodd's discovery is near Howard fall in centre of map.

there is an outcrop of coarse muscovite gneiss containing small garnets. North of this to the end of the lake, and for some distance down the river, there are exposures of hornblende and biotite schists, followed by granite and gneiss.

For some distance below O'Sullivan lake the hornblende schist, biotite gneiss and granite are intermixed, but as the river is descended, and before Percy lake is reached, a rusty weathering, garnetiferous gneiss, interfoliated with diorite gneiss, and in places with finely banded syenite gneiss and biotite schist, is the prevailing rock, and is seen in frequent exposures. The biotite schist sometimes forms a considerable portion of the rock. These rocks are generally well foliated; they strike nearly east and west, and dip northward at an angle of from 30° to 50°. In going down the river the last large exposure of these rocks is seen at the eighty-ninth mile from the mouth, where a grey granite gneiss outcrops, dipping 65° N. 15° W. This is succeeded by four miles of fossiliferous dolomites, then a small mass of hornblende granite about ten chains wide crosses the river. Below this for a long distance cream colored fossiliferous dolomites are the only rocks seen; and these are followed by soft, argillaceous grey and brick-colored dolomites.

Mr. E. V. Neeland's Report.

In 1900 Exploration Party No. 5, in charge of W. S. Davidson, O.L.S., sent out by the Department of Crown Lands, explored a portion of the country tributary to the Kenogami river. Mr. E. V. Neelands, geologist of the party, reports on the country northwest of Long lake, including Kowkash, as follows:—

"Fleming's lake is about six miles long and two miles wide, but very irregular in shape. The banks are usually high, with sand beaches and sometimes bluffs of gneiss striking about west. The country in the vicinity of the lake is well timbered with large spruce and jack pine.

"For about two miles the upper continuation of the Kawakeshkagama river passes through level country, clay along the banks but sandy farther back, to Duck lake, which is an open body of water lying at right angles to the general course of the stream. A few bluffs of gneiss are seen along the shores. Above the lake is two miles of river to Egg lake. No rock occurs in the stretch, except the gneiss so characteristic of the district. Egg lake is about two and a half miles in length, and two rivers enter at the southwest end. On a point between these occurs a coarse-grained mica schist and some decomposed gneiss. A short distancce from the mouth of the western stream is an outcrop of fine-grained diabase and about a mile and a half above this is Bell's lake. This lake is about a mile and a half long, with sandy shores, but no rocks are seen. Above this the river was followed for about five and a half miles till canoe navigation was finally interrupted by thick alder bushes in which the river loses itself. From a tree top the country was seen to be burned for a long way in every direction.

"Ascending the southern river, about ten chains brings us to a small marshy lake, above which, with the exception of one small rapid, the river is deep and sluggish for five miles to Mountain lake. Near the outlet of the lake the shores are rocky, and inland the country is very hilly. The only rock is a fine-grained granite. The total length is about five miles. From a bay southwest of the outlet is a portage leading to a large lake, which, according to Mr. Godchere, the officer in charge of Long Lake House, flows westward to Lake Nepigon.

"Below Fleming's lake the river is rapid for about fifteen chains, and then flows quietly for about three miles to Kawakeshkagama lake. The river is deep with marshy shores generally, but in one place occurs an exposure of mica schist and gneiss striking north 65 degrees east, and dipping north 80 degrees. On Kawakeshkagama lake the course is down the left shore for about two miles. Gneiss is found on the east shore and on several islands, striking about north 55 degrees west.

"Two miles below the lake a portage leads to Wawong lake, a beautiful and very irregular sheet of water, with sand beaches but no rock exposures. From its extreme north end a portage runs to a small lake from which a short canoe route leads to Oskanaga or Bare Bones lake, which is said to be twenty-five miles long and flows north to the Albany river.

"Below the Wawong Portage the river was followed for about twenty-five miles. The country is burned, with large sandy hills covered with small jack pine, and some extensive exposures of red gneiss for about five miles. Several small rapids occur in this stretch, which terminate at Rupert's Falls. A short distance above this occurs an outcrop of Huronian chlorite schist, and similar rocks are seen as far as the river was explored. The strike of this series of rocks was about northwest, and the dip north 60 degrees. Below the falls the river is swift, with high clay banks, well timbered with large spruce, poplar, tamarac, birch, balm of Gilead, up to thirty inches in diameter. Numerous exposures of chlorite schist occur everywhere in this stretch. Some samples from small quartz veins in one extensive exposure striking north 15 degrees west, gave a trace of gold on assay.

"There are two more rapids in this part of the river where portages are necessary. The first, Driftwood Portage, is eight chains long, the trail being on the right bank, and the second, Howard Rapids, with the trail on the left bank. Here the river narrows to about ten feet and plunges through a miniature canyon for fifteen chains, forming a beautiful and picturesque series of chutes and waterfalls.

"Owing to the limited time at the disposal of the party no attempt was made to descend the river farther; but it is said by the Indians to afford a good canoe route from the Albany river, owing to its freedom from rapids.

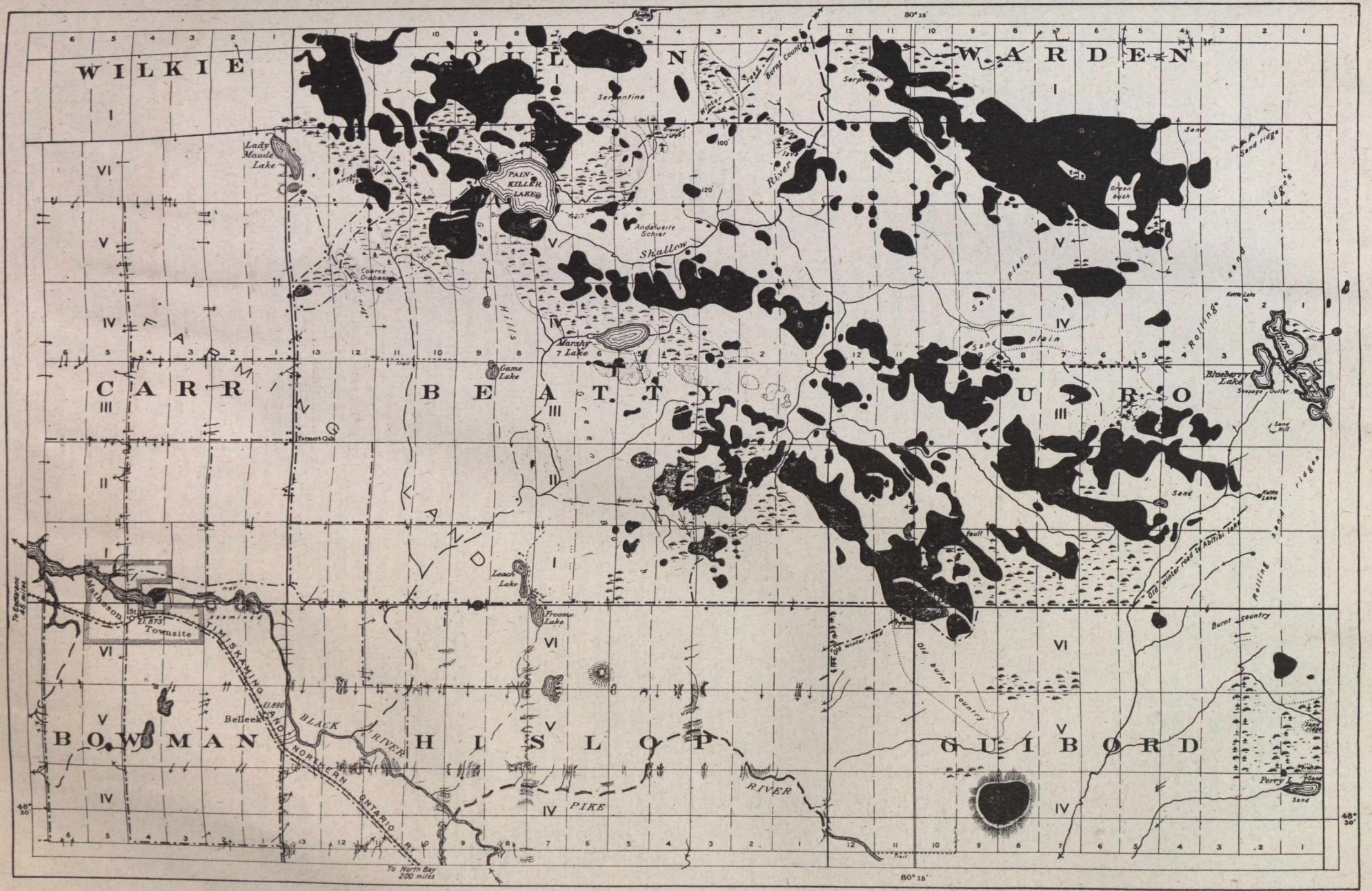
"At several points along the northeast bank of the river portages lead to Lake Oskanaga, and on the southwest is a canoe route via a tributary stream to Lake Nepigon."

THEORY AND PRACTICE OF ORE DRESSING—BOOK REVIEW.

By Edward S. Wiard. S.B.—McGraw-Hill Book Co. —Price $4.00—For sale by Book Department Canadian Mining Journal.

In a book of 420 pages Mr. Wiard treats of all phases of ore dressing as applied in western American mining districts. Stamp milling is not dwelt upon at length and amalgamation is not mentioned. The chapter headings are: Preliminary considerations relating to installation of ore dressing plants; Testing of concentrating ores; Location of mills; Crushing plant; Separating plant; General dissertation on crushing; Rolls and medium crushers; Means for raising ore; Grading; Separation; Sand and slime concentration; Miscellaneous processes.

The book has been written chiefly for mine managers and engineers in charge of mining enterprises. The information contained should be useful also to those in immediate charge of concentrating machines.



Map of Munro and neighboring townships, showing rock outcrops and road from Matheson. Dobie-Leyson claim is in N.E. corner of Lot 10, Con. 1, Munro township.—*From report of P. Hopkins, Ontario Bureau of Mines.*

HONOR ROLL

It is our intention to publish from time to time lists of employees of mining companies who have enlisted for service. The following is by no means a complete list. Our readers will confer a favor by sending us information concerning mining men who have enlisted.

Algoma Steel Corporation—

Mr. W. K. Whigham, vice-president of the Steel Corporation, is now Captain in a Territorial regiment and is somewhere in France.

Capt. D. C. Newton, was a director of the Steel Corporation, and was with the Princess Patricia Regiment. He was one of the first Canadian officers to be killed.

Mr. J. E. McLurg, a Lieutenant in the Second Battalion of the First Canadian Contingent, was wounded and taken prisoner at battle of Langemarck.

Mr. Donald McMillan, employed at the Magpie mine, was with the First Canadian Contingent and was one of the first to be killed.

Mr. R. R. Rose left to join one of the regiments in England, the Gordon Highlanders, and is now believed to be in France.

Many other employees of the Steel Corporation have enlisted, the majority of them were employed at the steel plant, and it would be very difficult to get a full and complete list of their names. At least one hundred men are now on active service.

Asbestos Corporation of Canada, Ltd.—

D. Douville, Canadian Ordnance Corps, C.O.C.E. E.F., Ashford, Kent, England; Joseph Martineau, private 41st Regiment, A Company, Squad 5, Valcartier; Emil Lessard, private 8th R.R.R., Camp Lauzon, Levis; C. H. Hayes, private, 6th Royal Army Medical Corps, Shorncliffe Camp, England.

The British Columbia Copper Co., Ltd.—

R. G. Hargreaves, now First Lieutenant with the Second Ammunition Corps, stationed at Dibgate Camp, Shorncliffe, Kent, and O. R. Matthews, Sergeant-Major in the 54th Battalion, now stationed at Vernon, B.C.

In addition to these men, a number of minor employees have enlisted. Their names are not at present available.

Canadian Copper Co.—

Herbert V. Knowles, tapper; Thomas Burn, brakeman; Sidney Simmons, brakeman; F. A. Lake, trammer; J. Wood, blacksmith; Bert Millen, steam shovel foreman; Sidney Rhodes, watchman; Milton Hanlon, tapper; Wyman Hanlon, brakeman; Ernest Hanlon, scale clerk; James Phillips, trammer; C. H. Lewis, timekeeper; C. Austin Bell, mines maintenance engineer; G. E. Chittleburg, fitter; James Ault, laborer; Wm. Campbell, hoistman; Wm. Russell, trammer; Sidney Smith, fitter.

Canadian Mining and Finance Co.—

H. Garner, G. H. F. Adams, C. E. Barnett, G. D. Kelly, T. Cotton, L. G. Smith, Bafreau LeFevre, J. M. Bowery, A. H. McKay, J. Head, V. M. Valenza, D. James, J. Adamson, H. Tippett, J. Haldane.

Canadian Sulphur Ore Co., Ltd.—

Newell Broad and Charles Wilds in the First Contingent; Fred Lapalm, Nelson Lapalm and Martin Lapalm in the Second contingent.

Canmore Coal Co., Ltd.—

A. J. Briggs, Sr., 12th M.R., Calgary; Harold Musgrove, 12th M.R., Calgary; Wm. Rappel, 13th M.R., Calgary; Thos. Rappel, 13th M.R., Calgary; Wm. Monkton, 13th M.R., Calgary; Gideon Broderick, R.A.M.C., Calgary; F. J. Pierce, R.A.M.C., Calgary; A. J. Briggs, Jr., R.A.M.C., Calgary; Matt Briggs, 50th Batt., Calgary; Robt. Nicholson, 50th Batt., Calgary; Jos. Grainger, 50th Batt., Calgary; Alfred Hatfield, 50th Batt., Calgary; J. H. Campbell, 50th Batt., Calgary; Robt. Towers, 50th Batt., Calgary; H. A. Maxey, 56th Batt., Calgary; Dan Thomas, 20th Battery, R.F. A.; H. S. Baker, 5th Co., Field Engineers.

Coniagas Mines, Ltd., and Coniagas Reduction Co., Ltd.—

Chas. Briscoe, private, Army Vet. Corps, C. E. F.; John Briscoe, lieutenant, 76th Batt., C.E.F.; Arthur L. Bishop, lieutenant, 2nd Middlesex Regiment (wounded at Fromelles, mentioned in despatches May 31st, 1915); James Bishop, Sergeant Cook, 37th Batt., C .E. F.; Leonard Bishop, 2nd lieutenant, 4th Mounted Rifles, C.E.F.; Ernest Bowler, corporal, Princess Patricias, C.E.F.; Harry Branigan, gunner, 10th Field Battery, C. E. F. H. E. Cowley, gunner, 10th Field Battery, C. E. F.; (promoted—Lieut. 9th Battery); Arthur E. Clough, sergeant-major, 12th Royal Welsh Fusiliers; F. Coullecutt, joined force in England; De La Courneuve, Q. M. sergeant, 37th Batt., C.E.F.; Fred Drunnel, private, Grenadier Guards; E. N. T. Griffith, pioneer sergeant, 37th Batt., C.E.F.; Wm. Nicholson, gunner, 10th Field Battery, C.E.F.; R. P. Rogers, captain and adjutant, 37th Batt., C.E.F.; John Rose, captain, Northumberland Fusiliers; Leonard Singleton, gunner, Borden's Armored Battery; John Sumbler, private, 37th Batt., C.E.F.; J. Truscott, joined force in England; Amos Welham, gunner, 10th Field Battery, C.E.F.; R. F. Baker, driver, 10th Field Battery, C.E.F. (awarded D.C.M. and Lieut. 11th Battery); Geo. Begy, captain, 4th Batt., C.E.F. (wounded at Ypres); John Doyle, gunner, 10th Field Battery, C.E.F.; Robt. Haylock, enlisted in England; W. B. King, major, 10th Field Battery, C.E.F. (awarded D.S.O.); John Mackney, gunner, 10th Field Battery, C.E.F. (died at Salisbury); Richard W. Raynor, gunner, 10th Field Battery, C.E.F.; Arthur Turnbull, Q. M. sergeant, 14th Field Battery, C.E.F.; Guiseppe Bettio, 88th Regiment, Fonteria; Vittorio Casagrande, 57th Regiment, Fonteria; Angelo Zappi, 8th Regiment, Fortress Artillery; J. Brown, Royal Navy; J. Bastable, 44th Regiment; Wm. Barkley, 10th Field Battery; R. Bocock, 44th Regiment; J. Briggs, H.M.C.S. Niobe; W. Catterall, sergeant, 44th Regiment; J. Ellis, 19th Regiment; E. Farnworth, 19th Regiment; A. Gray, 19th Regiment; W. E. Holland, captain, 36th Regiment; W. Hunt, 19th Regiment; W. Morris, 44th Regiment; J. Morris, 44th Regiment; E. Riding, 44th Regiment; W. Ryder, 44th Regiment; Adamo Lorenzetto, 5th Bersaglieri; Domenico De Marchi, 68th Reggimento, Fanteria; Luigi De Marchi, 55th Reggimento, Fanteria; Angelo Modesto, 68th Reggimento, Fanteria; Isidor Bandera, 68th Reggimento, Fanteria; Girolamo De Marchi, 55th Reggimento, Fanteria; Ettore Zago, Artiglieria di Campagna; Tiso Zago, 68th Reggimento, Fanteria; Gesue Cararo, R. R. Carabiniere; Carlo Bartelli, R. R. Carabiniere, Sante Bosco, 55th Reggimento Fanteria; Ruggero Visentin, Artigliera di Montagna; Constante Visentin, R. R. Carabiniere; Amedo Visentin, Cavalleria; Pietro Ferlan, 55th Reggimento, Fanteria; Giovanni Vanin, Suscistenza; Arcangelo Vanin, Cavalleria (Lancieri); Ettore Bellio, 5th Bersagliere; Mose Bellio, 55th Reggimento, Fanteria; D. Ambrosi, Pio, Cavalleria (Lancieri); Francesco Severin, R.R. Carabiniere; Antonio Boscoe, Cavalleria; Antonio Favero, 55th Reggimento, Fanteria.

The Consolidated Mining and Smelting Co. of Canada, Ltd.—

Lieut. A. J. L. Evans, 3rd Batt. (mentioned in despatches for distinguished services); Lieut. Angus Ward Davis, 177th Co., Royal Engineers; Lieut. R. G. Macfarlane, 171st Co., Royal Engineers; Capt. K. B. Carruthers, 26th Battery, 7th Brigade; Corp. A. B. Ritchie, 1st Brigade Artillery (Distinguished Service Medal); Pte. Robt. Walker, 34th Div., Signal Co., Royal Engineers; Graham Cruickshank, Vancouver, Officers Training Corps; Frank A. Fortier, Instructing Recruits; Lance-Corp. H. St. C. Marlatt, 3rd Field Co., Can. Engineers.

The above were members of the company's staff. The list of other employees is not yet available.

The Dome Mines Co., Ltd.—

F. C. Andrews, J. Meiklejohn, Chas. Berger, James Hogg, J. Taylor, W. A. Montgomery, John Brennen, R. E. Binns, J. J. Rutherford, Alex. Kinnard, A. McEachern, B. Curtis, F. Groves, Geo. Scott.

Dominion Coal Co., Ltd.—

Regarding the furnishing of names of employees who have enlisted, Mr. F. W. Gray says: "I fear this will be impossible so far as the Dominion Coal Co. is concerned, as over 1,000 of our men have gone, practically all of them as private soldiers."

Huronian Belt Co., Ltd.—

The first man to leave this company's employ for the front was Mr. Beresford Lees, a graduate of the Cambourne School of Mines and of the University of Manchester. Mr. Lees was an assistant on the staff of the Huronian Belt Co. last summer, but left for England in October, where he obtained a commission in the 3rd Northamptonshires. Unfortunately he was killed at Neuve Chapelle.

Mr. Reginald Montague, secretary, went to England in November and has now a commission in the Public School Battalion of the Royal Fusiliers.

Mr. J. W. Cashman, who was clerk of the North Thompson mine, is with the 20th Batt. of the 2nd Canadian Expeditionary Force.

Mr. Peter Clarke, assistant manager of the Huronian Belt Co., has a commission in the Wiltshires, while Mr. G. G. Gibbins has a commission in the Royal Engineers.

Dr. J. Mackintosh Bell has a commission in the 5th Royal Highlanders of Montreal and is going to the front with the 73rd Batt., that is the 3rd Expeditionary Battalion which the Highlanders have sent to the front.

Jasper Park Collieries, Ltd.—

S. McDermid, M. J. Cranston, W. Inman, D. Davies, F. E. O'Neal, D. Montgomery, C. F. Harvey, D. Stene, J. Turnbull, T. Dawson, H. R. Simpson, J. Barclay, E. Davis, D. Gauvin, S. Deigle, C. McPherson, A. Shaw, E. Jaumbe, D. Harris, J. Davis and R. H. Sheffield.

Leitch Collieries, Ltd.—

Harry Parsons, Ernest Houghton, Harold Houghton, Nat. Evans, Louis Zeiderman, Geo. Redman, Thos. Knowles, James Shenfield, Sam Grontage.

McIntyre-Porcupine Mines, Ltd.—

Lieut. Ernest N. Holland, Borden's Armored Battery; Q. M. Sergt. H. Holland, Borden's Armored Battery; Pte. Digby Salkeld, Borden's Armored Battery; Pte. B. A. Brady, Borden's Armored Battery; Pte. Jas. E. Sullivan, Borden's Armored Battery; Pte. William Ramsey, R.A.M.C.; Pte. John Ramsey, R.A.M.C.

The Mond Nickel Co., Ltd.—

The following young engineers from the staff have entered the service: C. H. Webb, M. Baker, D. L. McLeod, W. Goodwin, E. J. Pilcher, V. C. Elderkin.

V. C. Elderkin was killed in action.

From among the Mond Nickel Co.'s other employees the following have enlisted: Osman Griffiths, John Fletcher, Maik Yankowich, Peter Zlatar, Chas. Murphy, John Smith, H. Rigby, W. Clement, H. Stevens, W. Crossby, M. Ugorm, R. White, W. Tuddenham, R. G. Spurles and John L. May.

Moose Mountain, Ltd.—

Sergeant R. C. MacKenzie, No. 25966, Royal Montreal Regiment, 14th Canadian Battalion, British Expeditionary Force, France.

O'Brien Mine—

Pte. Duncan McLeod, machinist, enlisted with the First Contingent, 48th Highlanders. Was in hospital from gas after battle of St. Julien. Is again on active service; Pte. Sullivan, miner, enlisted with McLeod; Pte. George Edwards, miner, British reservist, was one of the first to respond to the call, has been wounded and in hospital, but is again on active service; Pte. Chas. Garde, cook's helper, enlisted with the Second Contingent, but was drafted amongst reinforcements for First Contingent, 48th Highlanders.

Nipissing Mining Co., Ltd.—

Farr.-Sergt. John Mackney, 10th Battery, C.F.A. (died at Salisbury, cerebro disease); Sergeant Percy Dunbar, 15th Batt., 1st Cont. (prisoner of war); Pte. Lyman Ramey, 15th Batt., 1st Cont. (prisoner of war, wounded); Pte. Robt. Hendry, 15th Batt., 1st Cont.; *Pte. Wm. Strickland, 15th Batt., 1st Cont.; *Pte. Ellard Bigelow, 15th Batt., 1st Cont.; Pte. George Hendry, 20th Batt., 2nd Contingent; Lieutenant Fred McPhun, 35th Batt., 3rd Cont.; Bugler Geo. Ritchie, 37th Batt., 3rd Cont.; Archie Hamilton, enlisted in his home regiment in Scotland.

*Messrs. Strickland and Bigelow formerly worked for this company, and it is altogether likely they will be found on some other list.

Penn-Canadian Mines, Ltd.—

Morley Cox and Richard Marshall left with the 3rd Contingent, 97th Algonquin Rifles, for Niagara. On June 9th they were included in a squad of 50 men who were sent across to England, and latest word from them is that they are now in the 17th Canadian Reserve Battalion, No. 2 Co.

Peterson Lake Silver Cobalt Mining Co., Ltd.—

G. F. Morrison left his position as secretary of this company to enlist for active service.

Temiskaming Mining Co., Ltd.—

Ben Bick.

The development of copper mining properties on Vancouver Island, British Columbia, is more active now than at any previous time since the closing of Tyee mine at Mt. Sicker several years ago. Copper ore of good grade is being mined at Sooke, southwest of Victoria, and is being shipped to the smeltery at Tacoma, Puget Sound, Washington. One shipment of 200 tons is reported to have yielded copper at the rate of 10 per cent., with small value in the precious metals as well. Work has been in progress both this year and last on the group of mineral claims in the northern part of the island bonded by Mr. Maurice W. Bacon, general manager of the Stewart Mining Co., operating in the Coeur d'Alene district, Idaho, and associates. A recent announcement was to the effect that Mr. Fred. J. Rollands, of Spokane, Washington, was arranging to do some exploratory work on the Eureka property, Quatsino, on which nothing has been done for a number of years. Several other lode properties are also being prospected.

RULES AND REGULATIONS FOR METAL MINES.

A publication of considerable interest to the metal mining districts of the United States has just been issued by the Bureau of Mines, under the title, "Rules and Regulations for Metal Mines." It is to be known as Bulletin 75, and the authors are W. R. Ingalls, J. Parke Channing, James Douglas, James R. Finlay, and John Hays Hammond. The committee was originally appointed at a meeting of the American Mining Congress at Denver, Colorado, in November, 1906, and its object was the drafting of a modern law governing quarrying and metalliferous mining which could be recommended to the several States for adoption, in the hope that the passage of such a uniform law by the mining States would tend to lower the number of fatal and serious accidents.

When the committee took up its work, it found that Colorado, Missouri, Montana, and New York were the only states that had enacted mining laws of broad scope applicable to other than coal mines. California, Arizona, Idaho, Kansas, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, South Dakota, Tennessee, Utah, Washington, and Wyoming, were found to have statutes pertaining to metalliferous mining, but with few and incomplete safety provisions.

This committee of the American Mining Congress did considerable work along this line and made a number of reports. In April, 1911, Dr. Joseph A. Holmes, Director of the Bureau of Mines, invited the committee to serve as a committee of that bureau with the idea of preparing a final draft of a law, and this was accepted.

Starting with a composite of existing laws, the committee by successive stages endeavored to work out a general law that would embody the best mining thought of the day, be in accord with approved modern mining practices, and yet at the same time be effective and practical in operation, and not merely a collection of rules and regulations to be disregarded or enforced at will.

The committee in discussing its report says: "We have found that a great deal of interest and attention among mine operators has been awakened by our advocacy of improved means for promoting safety in mining. However, we are under no illusion that our recommendations will be immediately and generally adopted. We consider our work to be especially of educational character rather than anything else. It will be useful in three main ways, we think, as follows:

1. As a basis for State legislation;
2. As a basis for private systems of inspection;
3. As a collection of simple rules for the guidance of everybody engaged in mining.

Since the publication of our first report several States have adopted new mining laws and amended their old ones. In this connection our code has served some purpose; for example, in the drafting of the laws that now stand on the books of the States of Nevada and Arizona. We do not expect that any State will at once adopt all of our recommendations, especially those that are essentially of legal character. We offer them as what we think ought to be and hope some day will be.

Since our first publication, furthermore, most of the mining companies of consequence have adopted inspection systems or have at least framed codes of safety rules, which have been based to a large extent on our code, notably so in the case of the Cleveland-Cliffs Iron Company. This tendency, in fact, has become one of the most important phases in the national movement for "Safety First." This is the gratifying consummation that we had in mind. Unquestionably, also, the widespread adoption of State laws providing compensation for injured workmen has helped the safety movement by making accident prevention worth while.

We consider, however, that the chief usefulness of the code of rules that we have formulated will be to small operators, who frequently engage in unsafe practices without knowing that they are unsafe or without thinking about the matter at all. There is a reasonable hope that our report will be of educational value to all mining operators.

The act that we have drafted may be regarded from two angles—from the legal and from the technical. With respect to the latter we have had in mind the conditions and practice of mining existing and prevailing in the several parts of the United States. In our treatment of the matter from the legal standpoint, in which we have had the advice of good lawyers, we have refused to clothe the inspector of mines with the optional powers that are given to him under the laws of many of the British colonies, and, also, we have refused to convey to him the sweeping power that is given to health inspectors in some of our own States.

The code of mining rules that has been finally drafted by the committee is the co-ordination of the experiences, opinions, and suggestions of a great many men who have assisted the committee in an advisory capacity and as directly employed aids. The former have included many engineers actively engaged in practice, members of professional societies, and members of the bar; the latter have included members of the regular staff of the Bureau of Mines and of the personal staffs of members of the committee. The committee has sought to obtain many points of view and to summarize many experiences. The draft that has been prepared is not offered as the last word upon this subject. There are many phases of this subject with which the committee has been unable to deal thoroughly. Thus the committee confesses its inability to formulate at the present time adequate rules covering the important subject of ventilation of mines. Similarly there are many practices in open-cut mining, by steam shovels, etc., regarding which the committee has felt unable to formulate rules. We feel, however, that the rules so far as prescribed may advantageously be applied to open mining whether it be simple quarrying or the extraction of metalliferous mineral, as well as to underground mining.

ANTIMONY.

One of the picturesque features of the war has been the unusual mining profits which it has created. Among the beneficiaries have been the Chinese and Japanese owners of the world's largest antimony mines, which are located in those two countries. We hear of one Chinese mine owner who has been making profits of 700 per cent., due to the remarkable rise in antimony prices.

Before the war started, antimony had been sluggish for two years, the price hanging around 5 to 6 cents per lb. The present quotation is 40 cents per lb. So sensational has been the rise that one of the largest commercial users of antimony in the United States has recently sold a considerable tonnage at a very handsome profit.

What has put the price of antimony up has been the same influence that has stimulated spelter's advance. Antimony is used in the shot or bullets in shrapnel. Some 10 to 12 per cent. of the weight of these bullets is antimony. England at one time put an embargo on every ton of antimony in the tight little island kingdom, but relaxed it later.

EPOCHS IN SCIENCE*

By Lucien Ira Blake.

It is a commonplace to say, this is the age of Science; this is the age of invention. Our minds are lifted up at thought of the telephone, the wireless, the automobile, the aerial and submarine craft. We exult that we live in an Age of Wonders, and we hold our breath at thought of the future. We even cry out to each other—What next in Science? and some are emboldened to even hazard a prediction. Every invention is heralded as destined to revolutionize something. We assume it as surely self-evident that the past records of Science can never claim such progress as the present. All this exultation and confidence is perhaps well grounded, but it reveals nothing as to Science itself.

Might it not be well to pause a bit and ask why has this become an age of Science and invention; whence and how has it come? What has made it such? Has there been a sudden or a gradual evolution toward it? Can we find the forces which have made for its growth? Can we lay down the conditions for its future advancement? Can we pick the winners of its future successes?

It is passing strange, but our age of Science and invention has not been reached by any gradual growth. It has hitched along, sometimes set back for years; sometimes, with a sudden leap, enormously advanced. It has come to us in epochs; each epoch built up around a discovery; each discovery originating in some master mind. So the growth of every branch of Science might be traced by plotting a succession of its epochs. It would show a curve of master minds.

Let us think of mathematics. Napier in England invented logarithms. Descartes in France, analytical geometry; Leibnitz, in Germany, differential calculus. These three great discoveries, which put three sharpest tools into the kit of the mathematician, came approximately a generation apart, and came from three different nations highest in the learning of that century—England, France and Germany.

Leibnitz was a self-taught mathematician, though at eight he could read Latin and at fifteen had entered the university. Descartes and Napier were both of parentage high in rank and intellect. They all were master minds and the science of mathematics leaped forward in three brilliant epochs. There were hundreds of lesser mathematicians, who worked over details, but their inspiration came from the masters, and their results rounded out the epochs.

It is remarkable, but concurrent with Leibnitz' invention in Germany, there appeared in England "The Book of Fluxions," by Sir Isaac Newton, which proved to be an independent invention of the calculus. Thus two master minds of different nationalities and in wide separated countries evolved the same discovery and almost simultaneously, and this is not an infrequent occurrence in the history of science.

The sensitive temper of the times toward science was well stirred by this advent of "The Book of Fluxions," which seemed to intrude upon the faith of the day. Bishop Berkeley expressed it by "A discourse addressed to an infidel mathematician." He wrote: "It is presumptuous to assert that the opinions of mathematicians in matters of faith are likely to be more trustworthy than those of divines, because in the much vaunted fluxional calculus there are mysteries which are accepted unquestionably by the mathematicians, but which are incapable of logical demonstrations."

The rebuff and suspicion of the day seems only to have extended the new knowledge which the epoch had brought to mathematicians.

Let us turn to astronomy. Galileo was practically the inventor of the telescope. Doubtless he had heard of Lippershay, the spectacle maker in Holland, who had put lenses together which brought remote objects near, but Galileo constructed instruments of magnification such that by them he discovered for the first time that Jupiter had satellites; that Venus had phases; that mountains, craters, lava, scarred the pale face of the moon; that spots blemished the bright surface of the sun and by their motions proved its rotation upon an axis, and thereby set forever at rest the epicycle theories of Ptolmey and made real the belief of Copernicus, of an hundred years earlier that the sun—not our tiny earth—was the centre of our solar system.

Thus began the first great epoch of astronomy, originating in the master mind of Galileo, the Italian.

A generation before, Tycho Brahe, the Dane, began recording the relative motions of the stars. For thirty years patiently and laboriously be collected a tangled mass of data, apparently unconnected by law or order.

Then appeared the broad, speculative mind of Johann Keppler. Keppler was of premature birth, and, when a mere child of four, was stricken with smallox. It left him crippled in his hands and almost blinded in his eyes. He proved helpless for the work of the farm and was sent away to study for the ministry. It is marvelous that, with a dislike for astronomy, unskilled in observation and in manipulation because of his childhood infirmity, yet he sorted and classified and interpreted the accumulated observations of Brahe's thirty years and gave to the world the three great mathematical laws of motion —Keppler's Laws—which rule the heavenly bodies.

Thus appeared, almost contemporaneously with the Galilean epoch, another era in science, originating in the master mind of Keppler, the German.

Then, a little over a generation later, Sir Isaac Newton, in England, studying the thirty years' data of Brahe and the three laws of Keppler, read into them the thought that one simple force could explain all of them—gravitation—and the fourth great epoch in astronomy appeared, originating in that master mind of Newton, the Englishman.

To-day it is proved that Newton's force of gravitation rules to the remotest limits of the heavens. It lifts the tides; it draws down the raindrops, and it makes revolve about each other twin stars which are so remote that in the most powerful telescopes of to-day they appear as only minute single points of light. The mind which discovered this force, and which invented the calculus, was that of a farmer's boy who stood low in his class in the Grammar School. One day a boy above him bullied the timid Newton. Finally, Newton aroused, turned, and thrashed the boy above him. This trivial incident seemed to change Newton completely. It seemed to inspire him with courage and ambition, and he became the head boy of the school. At fifteen Newton was taken from school to become a farmer. His mother's brother, a rector and graduate of Trinity College, however, persuaded the

*Commencement Address, Colorado School of Mines, May 28, 1915.

mother to enter him at Trinity. Soon thereafter, at a county fair he bought a book on astrology, but because he, though nineteen years of age, did not understand trigonometry, he could not interpret even the figures of the heavens. So he bought an English edition of Euclid's geometry, but he soon put it aside as "a trifling book," as he expressed it, and because the propositions were "self-evident." Finally be became possessed of Descartes' geometry, and this inspired him to his first introduction to higher mathematics. Newton's life is full of proofs that trivial incidents seem often to be influential in the evolution of master minds.

Let us glance back over biology. Its first great epoch came with the discovery of the circulation of the blood by William Harvey, the Englishman, in 1619. Before his day mystery and superstition surrounded all the phenomena of life. Then two centuries went by and biology knew no progress, until with the perfecting of the microscope it came to learn that all its problems were cell problems. Thus its second great epoch appeared and the names of the Germans—Schleiden and Schwann, of Max Schultze and Virchow—stand out together about the middle of last century. Then came its third great epoch, bearing the imprints of the name of Pasteur, the Frenchman. It is the epoch of the present. Pasteur's discovery that live organisms are the causes of fermentation is the basis of the modern germ theory of disease, and around this theory is the progressive work of to-day.

Pasteur was of humble birth, the son of a tanner. In his school life he was but an ordinary scholar. First upon hearing a lecture by Dumas at the Sarbonne was he aroused to serious study of chemistry. But this simple incident determined his development, and finally he was inaugurated Dean of the Faculty at Lille. In his inaugural he spoke these memorable words: "In the field of observation chance favors only those who are prepared." It is now twenty-seven years since Pasteur delivered that inaugural, but the close of his address seems now almost prophetic. He said:

"Two opposing laws seem to me now in contest. The one a law of blood and death, opening out each day new modes of destruction, forces nations to be always ready for battle. The other, a law of peace, work and health, whose only aim is to deliver man from the calamities which beset him. The one seeks violent conquests, the other the relief of mankind. The one places a single life above all victories, the other sacrifices hundreds of thousands of lives to the ambition of a single individual. The law, of which we are the instruments, strives even through the carnage to cure the wounds due to the law of war. Treatment by our antiseptic methods may preserve the lives of thousands of soldiers. Which of these laws will prevail, God only knows; but of this we may be sure, that science, in obeying the law of humanity, will always labor to enlarge the frontiers of life."

But the greatest epoch in biological science came with the advent of that master mind Charles Darwin, when, in 1859, appeared his "Origin of Species." With it came a radical change in the thought of the world in natural history, and to-day Darwin's "Theory of Evolution" is the guiding principle in every study of organic life.

Let us turn for a moment to physics. With Volta and Galvani, in Italy, began the age of electricity. The battery arose and a new, subtle force was born to science. Its first striking application resulted when the electric arc light shot its first beams from the laboratory of Sir Humphrey Davy in the dingy Albemarle Street of the Royal Institution in London. Davy's mind is well worthy of study. In the grammar school on the remote coast of Penzance it revealed no ability save for verse translations from the classics and for story-telling. Then the father died, and at sixteen the boy was left poor with his mother and six children. He became an apprentice to an apothecary, and in the apothecary shop began his introduction to chemistry. At twenty-four he was Professor of Chemistry in the Royal Institution. At thirty-eight he gave to the mining world his safety lamp, and the coal owners of Newcastle gave to him in recognition of its value to them a silver service. When Sir Humphrey Davy's will was opened it read, the silver service was to be melted into a medal for the most important discovery in chemistry made anywhere in Europe or in the Anglo-American countries. It was sixty years later, in 1877, before this medal was bestowed for the first time, and upon the Germans—Bunsen and Kirchoff—for their era-making discoveries in spectrum and analysis. Thus around Davy's mind centred the second epoch in the progress of physics. During this time, in Davy's laboratory, there was developing one of the greatest of the master minds of the Nineteenth Century, the son of a blacksmith and apprentice to a bookbinder, Michael Faraday. In thirteen days of unparalleled experiment, Faraday created a third epoch which encompassed every branch of science. He discovered that a magnet or current of electricity could originate another current in neighboring conductors. This was the starting point of the dynamo and the motor of to-day, and nearly everything that is known about electric inductions was disclosed in that half month of experiment.

To Faraday's prescient mind it was impossible to conceive of the electric forces as acting at a distance, except by means of some medium—an ether. Thus it was under Faraday's inspiration that there began those researches upon the properties of the ether, around which, to this very minute have centred the highest scientific thought. Faraday's epoch was but the precursor of those great periods of the Nineteenth Century when Clerk Maxwell and Heinrich Hertz were loaned to the world. Never before had science advanced so boldly. In Maxwell's well known electromagnetic equations lie nearly all our modern knowledge of light as an electric happening in Faraday's ether. Twenty years later, out of the mathematical thought of Maxwell, came the brilliant experiments of Heinrich Hertz, which gave to the world all the principles of electric radiation, by which has been made possible the art of wireless telegraphy.

Then came two striking epochs to mark the stride of science through the Nineteenth Century, the Conservation of Energy and the Second Law of Thermodynamics. With these come to us always the names of Helmholtz and Clausis respectively. It is not the place here to dwell upon the impulse and swing which these two broad principles have given to science.

It is strange, but the search for a reason why perpetual motion is absolutely and forever impossible led to the discovery of the conservation of energy by Helmholtz, while it is perhaps equally strange to realize that first to-day, after half a century, scientists are beginning to grasp the full meaning of that second law of thermodynamics of Clausius—the Law of Entropy, so-called.

With the close of the Nineteenth Century began the great epoch which is now in its making. Men claim it, I have said, as our age of science and invention. Looking back we can see that it is clearly the epoch next in succession from Faraday, Maxwell and Hertz. Logically, therefore, it had to be electrical. You recall that first has come the discovery of the X-rays, which are but electrical radiations; then the discovery of the electron, which is the atom of electricity; then the finding of radioactive substances, disintegrating into electrons and radiations;

and lastly that most recent theory—even now challenging attack—that energy itself has a physical structure and that it is atomic in its nature, thereby placing it in the list of substances. With these brilliant discoveries will always come to us the name of Roentgen, in Germany; Marconi, in Italy; Sir James Thomson, in England; Mme. Curie, in France; Rutherford, in Canada, and Max Planck, in Berlin. These are the brilliant minds in the physics of to-day.

It would seem then that master minds had created the great epochs in science and are responsible for its astonishing progress.

Is it not highly probable, then, that future progress will be similarly characterized by brilliant epochs and by the advent of other master minds, minds perchance even now unfolding somewhere in their making?

If this be true, it forces another question, What are master minds? Have they some common characteristic by which to identify them? Are they synonymous with genius? It is not easy to define genius—perhaps impossible. But surely the mind of a genius is one-sided; it is unsymmetrical. Whether by environment or by training, it has come to outstrip other minds in some one direction. It has either enormously extended knowledge along some one branch, or abruptly blocked it from false paths. The master mind, to some degree at least, seems to bear the stamp of genius. It also discloses an unsymmetrical aptitude. It has always pushed in the direction of its own peculiar bent. It has always been a leader. We become its helpless followers. Often unconsciously, but always unerringly, we have recognized its dominancy.

It would seem patent, then, that a mind which has, in potentiality, the possible making of some future epoch, would divulge somewhere or at some time in its development a dissymmetry. A keen observer and experienced educator might detect this.

It must be true that somewhere in our land, in the schools of our cities, and even in those of the remote and scattered country districts, there are to-day young minds in which there are traces of this inborn gift of mental leadership. Remember, it is given sparingly, only here and there, only now and then. The overwhelming majority of mankind possess it not.

But we know it is given to some, and it is worth the while to each one of us to lend his aid to its discovery, if possible. Who can tell what slightest incident may prove the turning point in a life. So I feel right in saying that there is a chance that a marked dissymmetry in mental faculties may be the very hall mark of the gift of genius.

So I ask, should there not be in our scheme of education special stress laid upon unsymmetrical minds, if such be found? Would not one-sided development, if pushed to its limit, bring highest results for such minds? But this upsets our school traditions. Symmetrical development of all mental faculties has been our ideal in education. Minds have been squeezed into a common mould, turned out after a common type. To say that one can generally pick out a college bred man is not necessarily complimentary. Nature does not bear her varied fruits on a single tree-type. So I say, whenever we find some marked dissymmetry in mental faculties, we should push its development to the full.

Of course I do not mean in the ordinary foundation work of our secondary and high schools. I have in thought the university and the technical schools. Here the student mind first grows conscious of a special vent, if it has any. Here, generally late in his course, a student begins to "find himself," but only in later, actual life, does he really "prove himself."

Rarely has an undergraduate accomplished anything original in science, or made any real addition to knowledge. The best he can do is to begin a development in the direction of his aptitude. So I will press the thought further. The world has always been led. The world has always had leaders; conquest and commerce, art and religion, science and invention have always been in the hands of leaders. Great leaders have come indiscriminately alike from humble rank and from high birth. Remember Newton, the farmer's boy; Brahe, the Dane of noble family; Pasteur, the tanner's son; Liebnitz, the son of a professor of moral philosophy. The father of Keppler was a soldier of fortune and his mother uneducated and undisciplined. Recall Faraday, the son of a blacksmith and himself a bookbinder's apprentice; Descartes and Napier, both of high rank and education; Hertz, the student of engineering in Munich; Helmholtz, the son of a professor and himself originally a surgeon in the Prussian army; Vorchow, the son of a small farmer, while Darwin's grandfather was a famed botanist and his father a physician. Neither royal blood nor heredity have been proved as dominant factors. Leadership has defied country, and ancestry, and environment. It is a God-given gift.

The world will always demand leaders, and for their making the world must naturally look most expectantly toward her highest schools. The day of the untrained mind in science or invention has gone by.

I do not consider it presumptuous to suggest that among a body of students, such as these we have here, there is a chance that there may be some one mind with an exceptional aptitude for some phase of science. Its possessor may be but vaguely conscious of his priceless possession. He may be merely aware that somewhere in his school course some particular subject held a particular claim for him. He knew he liked it, but he could not explain why. It seemed easy to him, but he did not know the reason the subject appealed to him, and once in a while what seemed like a mental thrill flashed through him as he penetrated deeper and longer into that particular subject. It was not the thought of compensation; not of a possible success: it was just the subject itself, just the pure and simple new knowledge of something revealed to him. If anyone has once felt that thrill, he knows that he has made a discovery. He has found his mind. He has revealed to himself a mental gift—a talent entrusted to his keeping.

But what of it? Suppose that he has discovered his talent. The future augurs almost invariably—the common experience of young graduates—the struggle for a livelihood. Everything drops out before it.

It is not my purpose to dwell upon this phase; everyone understands it too well. I am not thinking of the thousands of young men going out from the universities and the professional schools about this time of year, who will soon disappear in the complicated machinery that grinds out the world's work. I am interested in that mind with the undeveloped trace of genius in its make-up. I do not assert that it is in this school. But there are such somewhere. If it is given to any one of you, it is worth your while to make everything in the future subservient to it. Never mind if you go to-morrow to search in the mountains, to begin in the daily routine in the mills, you can afford to wait, you can make your opportunity; you can find a way to keep alive that innate faculty until you can shape its future development somewhere. It is not necessary that the engineering graduate should remain an engineer, nor even become one. Engineering training is proving itself more and more a fitting preparation for any business or profession. I sometimes feel that the young engineer has more than

an equal chance to be one of these gifted ones in whose mind lies that inspiration which forced the epochs of the past.

Tyndall was first an engineer; Hertz was first an engineer.

I sometimes fear, however, that we are drifting toward an idea that the engineering school is exempt from that fundamental conception of all education that the highest development of the individual carries with it an added responsibility for the uplift of society. The engineering school and the university stand side by side. The raw material is the same. The finished product of each is finished only in so far as each turns out MEN—men into whose eyes we can look straight.

It is hard to drive home the fact that the strength of a school lies largely in its ability to train. If it has been able to reveal to a student something of himself, it has done well for him. If it has been able to awaken some talent—previously latent in some mind—and to start it forward on its development, it has performed an additional service because that individual mind may have within it the very elements of leadership.

So I say we have a right to expect of our schools leaders for the future of science, but they will come, as they have all through the past, from the farm, from the city, from the poor, from the rich, from the high born, from the humble.

The gift of the master mind knows no country, no ancestry, no environment.

Commenting editorially on recently published discussion concerning the encouragement of the Canadian prospector, "Mining Science," of Denver, Colorado, observes: "In contrast with the attitude usually accepted in the United States, our Canadian friends lean frankly to the theory of state encouragement, even through subsidies. This policy has been pursued in other British colonies, especially in Australia. Special inducements, as one contributor expresses it, must be offered to revive interest in prospecting. State aid is easily suggested and oftentimes readily secured. Yet experience does not produce much argument in favor of this policy as applied to the work of the prospector. Paternalism is always suggestive of interference. The moment the state offers its services to an industry or to a class, it is apt to demand compensatory powers which serve to defeat the original purpose. The true stimulus to prospecting is the largest measure of freedom. Liberty to wander unmolested, to search without red tape or questionings of any kind, is the real foundation of mineral development. This is the thing that appeals most to the heart of the man in the field. Nevertheless we find men of high intelligence and broad education attempting to solve the problem in hand without any regard for the human factor in it. We may legislate and regulate and appropriate money and chew our ponderous words in support of happy theories; but we fail in all our efforts if we forget the primary fact that free access to the earth is the inspiration that develops the wilderness and brings forth its fruits. Among the first commands to be found in the pages of Christian Scripture is this: "Subdue the earth." Society has too often overthrown that mandate through the greed and stupidity of those who participate not at all in the grand work of subduction. The Canadian Government has not gone so far as our own in hampering the feet of the frontiersman, but Canadian citizens are apt to be led astray by parlor discussions.

GOLD DEPOSITS OF NEWFOUNDLAND AND LABRADOR

By J. W. McGrath.

Only the barest and most general knowledge is yet available of the minerals that are found in Newfoundland. It is a very striking fact that all the mines that have yet been worked were discovered not by experts or prospectors, for as yet the country has been visited by very few if any such.

The little prospecting that has yet been done has been almost entirely confined to a few miles from the sea coast. What the interior of the country holds in mineral ores is yet a closed book. Now and again finds of gold have been made, but little or nothing has ever been done to ascertain fully the value of the finds.

In all the copper mines that have been worked in the country varying proportions of gold have been extracted and although gold has not yet been mined for any length of time, yet the amounts of the metal that copper ores have yielded give positive indications of the presence of gold in quantities. All over the island free gold has been found, usually in quartz veins, and analyses indicate that some, if worked, would yield good returns.

Ten years ago operations began on a mine situated at a place called Mingo in the northern end of the island. The lode was a mixed one. It was composed of magnetite, pyrite, quartz and jaspery slate rock. Twenty tons of the ore was first mined and subjected to a trial assay. The yield of free gold was ten and a half ounces and in addition to this slimes contained a value of $55. Work was continued, and a shaft was sunk to a depth of about 100 ft., and a drift run along its course for a length of another 100 ft. A number of assays were then made of sample lots taken from varying depths and gave an average result of $12.40 per ton. Besides this two gold bars were produced of 11 and 37 oz. respectively. The finances of the promoters were now exhausted and sufficient capital was not forthcoming to continue the work, and perforce operations were discontinued and nothing since has been done on the property.

About the same time, in another part of the country, in White Bay, another attempt was made to mine gold-bearing quartz in a talcose schist. During the preliminary operations 150 oz. of gold was secured, but lack of interest by the people in the work and the consequent failure to raise sufficient money to go on with the attempt led to a discontinuation in this mine also. Other instances somewhat similar occurred from time to time. Lack of finances has crippled one after another. The geological survey of Newfoundland for 1900 says: "Quartz veins are numerous all over the island; but no systematic prospecting for gold by persons well skilled in that particular business has ever taken place."

As already stated the copper mines have all given a yield of gold. The Tilt Cove copper mine, which has been worked for fifty years, is known to produce about 1½ dwts. to the ton, which has been recovered in the reduction of the ore. No statistics relative to the actual amounts or the value can be procured, but for years it varied between 3,000 and 5,000 oz.

It is almost pathetic to record that on the Labrador coast geological work that has yet been done would not be made to fill a small volume and the research given to gold-bearing ore would hardly fill a page.

A wonderful deposit of gold was discovered there about fifteen years ago, and the promoters were sanguine of extraordinary developments. The location of

the find was popularly believed to be at a harbor on the sea coast named Hebron. A very expensive expedition was fitted out for the operation of the mine. Expensive apparatus and the most up-to-date equipment were provided. The vessel which carried these fittings never reached her destination and the mine still remains inoperative.

Dr. Wilfred Grenfell, who has spent years on the coast, says: "Indications of the mineral value of Labrador are practically in sight from the sea. No serious search for the treasures of the endless miles of Labrador has ever been undertaken."

Farther north towards the Hudson Bay limits, John Armstrong, chief engineer of the Hudson Bay Railway, who travelled through the greater part of this whole region, states: "Various specimens of the precious metals have been shown to our engineers; but the origin was preserved in so much mystery that they could not be treated as evidence of the metal in that territory."

There cannot be any doubt whatever that in a few years mines will be developed and worked with profit in a number of these localities. But it will first necessitate the people being educated to a knowledge of the nature of these deposits and the way to open them. When they come to realize that money as well as knowledge is a prerequisite to a commencement of such work then there are possibilities, and not remote ones either, that the next rush for gold might be into these regions.

MINERS' UNIONS IN CANADA*

(Continued from last issue)

Provincial Workmen's Association.

The oldest wholly Canadian craft labor organization in the Dominion is the Provincial Workmen's Association, a body of miners whose activities are confined to the coal fields of Nova Scotia. From the inception of the coal mining industry in Nova Scotia, the miners, as far as the records of the department show, were without any form of organization until the formation of the Provincial Workmen's Association. The iniative in organizing the miners in Nova Scotia was taken in Springhill, Cumberland county, on August 29, 1879. At a largely attended meeting of miners it was unanimously resolved to form an association to defend and protect the interests of the miners and other workers about collieries. Mr. Thomas Leadbetter was elected president; Mr. Robert Drummond, now member of Legislative Council of Nova Scotia, was chosen secretary and agent; a committee, consisting of Messrs. R. Wilson, James Wilson, Samuel Wilson, Simon Fraser, Alex. Ferguson, John Dooley, Wm. Boran and Alex. Ross, was appointed to act with the president and secretary to draw up a constitution and code of rules and by-laws for the governance of the association.

At a subsequent meeting, on the evening of the same day, the above mentioned committee, having formulated rules, etc., was organized into a provisional Grand Council to exercise the functions laid down in the constitution until such times as a Grand Council was legally constituted by the appointment of duly certified delegates from the various lodges which it was expected would shortly be constituted. The first local lodge formed was Pioneer No. 1, organized at Springhill on September 1, 1879. During the next two months three local lodges had been organized at the Pictou collieries; on October 17, 1879, delegates were sent by these lodges to Truro, where the first meeting of the Grand Council of the Provincial Miners was legally constituted. In March, 1881, the association was incorporated by an Act of the Nova Scotia Legislature under the name of the Provincial Workmen's Association. In the same year the employees of the Cape Breton collieries were organized. The lodges in the district held semi-annual meetings under the head of a sub-council, which had full authority in the Cape Breton region. The Grand Council and the sub-council met separately and semi-annually until the year 1890, when more complete railway connection permitted these bodies to assemble in one body, annual meetings taking the place of the semi-annual gatherings.

Until the year 1883 none but workmen employed around the collieries and at the coal piers were taken into the association. In that year application for a charter was made by the glass blowers of Pictou county, and they were formed into a local lodge. Later a lodge of iron workers was organized, and in 1897 the boot and shoe workers of Amherst joined the association. In 1898 the Knights of Labor contested ground with the association, but unsuccessfully. With the exception of this incursion on the part of the Knights of Labor, the P. W. A. had little opposition in its territory from any other labor body until the year 1908, when the United Mine Workers of America, which had some years previously established itself in the coal field of the Crow's Nest Pass in Alberta and eastern British Columbia, entered the Nova Scotia coal regions by forming a lodge at Springhill, the locality in which also the P. W. A. had its birth. The lodge, which is known as No. 469 of the U. M. W. A., was organized in December, 1908, the mine working members of Pioneer and Mechanics' lodges of the P. W. A. going over in a body to the new lodge. Other lodges of the U. M. W. were later formed in various localities.

In the early years of the previous decade the Provincial Workmen's Association gained considerable strength, every colliery in the province of Nova Scotia being organized. In addition to miner's lodges, branches composed of railway men, steel workers, tramway men, retail clerks and other classes of wage-earners were formed, so that at one time more than one hundred classes of workmen were represented in the organization, and instead of being a craft union the association became an industrial organization.

With such a varied body of workmen it soon became apparent that the P. W. A. had assumed a task for which it was hardly intended. The P. W. A. had not apparently made any organized effort to bring these classes into its fold; they had entered of their own volition, and mainly, no doubt, because no other organized body represented their trade in the immediate vicinity. For a time the executive of the P. W. A. did its utmost to perform the duties of a union to the various classes which had affiliated, and met certainly with some success. In 1903 a dispute arose at the Sydney steel plant over a reduction of wages, which final-

*Extracts from the Fourth Annual Report of the Department of Labor, Ottawa.

ly resulted in a strike. The P. W. A. took the course which seemed best to it in maintaining the strike, which, however, failed. For four years longer the association retained its industrial features, but the membership did not develop along the lines of industrialism. When lodges outside of the collieries lapsed they were not reorganized, and the P. W. A. gradually reverted to its original type, viz., a coal miners' union.

In the early years of the Provincial Workmen's Association wages were low and progress in wage increases necessarily slow owing to the state of the coal trade and the condition of the country. The eastern coal trade partook, however, of the general prosperity of the country, and wages began to increase somewhat rapidly. Perhaps the efforts of the P. W. A. had some effect in this direction. At any rate the association took some credit for improved conditions, which it sought also by actively promoting legislative reforms.

It may be of interest to note the entry of Mr. Robt. Drummond, the first grand secretary, into the association. One month previous to the formation of the society the men at Springhill mines had ceased work as a protest against a second reduction in wages within a short period. Mr. Drummond, who was a Halifax newspaper correspondent, took the side of the men by public speech and with the pen; it is said, as a result, he lost his position. At the organization meeting of the association Mr. Drummond applied for admission and was welcomed into the gathering. He was elected grand secretary, a position he held for nineteen years. At the time (1879) the association was formed, unions had very few friends in the press, and it was thought advisable to start a journal to spread the news and views of the society. The first proposal was that it be a joint stock affair, the members to be the shareholders. A plant was purchased by the secretary, but the subscriptions to the capital stock did not reach $20. He, therefore, financed the undertaking alone for a time. In 1898 Mr. Drummond severed his connection with the P. W. A. and began the publication of the Maritime Mining Record, a journal, no longer a union organ, but distinctly commercial in character, though frequently containing information of particular interest and value to coal miners. Mr. Drummond is now a member of the Legislative Council of the Province of Nova Scotia.

The objects of the Provincial Workmen's Association, as laid down in the constitution, are as follows:

1. To advance materially its members, by promoting such improvement in the mode of remuneration of labor as the state of trade shall warrant or allow, and generally to improve the condition of workingmen morally, mentally, socially and physically.

2. To shorten the hours of labor, to strive in obtaining better legislation, whereby the more efficient management of mines and other works may be effected—thereby securing the health and safety of the workmen—and in enforcing such legislation as already exists.

3. To secure the true weight of the miner's output at the pit head, to assist in abolishing all illegal stoppages at pay offices, and recovering the prices and wages bargained for by its members as an equivalent for their labor.

4. To foster habits of thrift, industry, economy and sobriety among its members.

5. To secure compensation for injuries received while at work—where the employers may be liable.

6. To extend support to lodges and their members who may be locked out by their employers or forced into discontinuing work on account of insufficiency of wages or for any unjust cause whatsoever.

The chief features of the scheme of organization of the Association are briefly as follows:

The Grand Council, as the chief governing body is called, is composed of delegates elected by the local lodges, the term of office being for six months. Each local lodge is entitled to one delegate. The officers of the Grand Council consist of a grand master, associate grand master, grand secretary, grand treasurer, grand chaplain, grand guardian, grand inner watchman and grand outer watchman. The meetings of the Grand Council are held at such times and places as may be most suitable. The annual meeting is held in September, at which time the Grand Council officers are elected by a delegate vote.

Where mine operators make any change in working conditions, or attempt to make alterations whereby the wages of members of any lodge are reduced, or where through such change the interests of the members are affected in any way, the lodge concerned is required to lay all the facts before the grand secretary, who may ask for all evidence in the matter, to be presented to a special meeting of the Grand Council if such is deemed necessary. No lodge or portion thereof is allowed to cease work with a view of striking unless such action is sanctioned by a majority of legally appointed Grand Council delegates in session assembled. Any lodge striking without the sanction of the Grand Council, Grand Council committee, or sub-council, forfeits all claim to support, and may have its charter revoked. Lodges are not allowed to enter into contract concerning wages or hours of labor without first submitting the whole of such proposed contract to the members, and obtaining sanction of the majority, the vote to be general and secret. Where accidents to members have occurred through the neglect or liability of employers, the Grand Council may appoint counsel to take the necessary steps to recover damages. Members who have been dealt with contrary to the rules of the lodge may appeal to the Grand Council, whose decision in the matter shall be final. Any member or members at variance with their lodge, and who are desirous of forming a new lodge, must first secure permission from the council. The association cannot be dissolved so long as one lodge with forty members in good standing shall object thereto. The constitution provides for three sub-council districts, known, respectively, as Cumberland, Pictou and Cape Breton districts. These sub-councils have power to make rules and by-laws for their own governance, provided such do not conflict with the constitution.

P. W. A. Strikes—The association had been in existence but a few months when a dispute arose which concerned the members of Cameron lodge at the Drummond colliery in Westville. The issue related in the first place to reduction of wages, but later developed into the question of recognition. Sanction of the strike was opposed by the grand secretary, on the ground that all efforts at a peaceful settlement had not been exhausted. This view was relaxed when it was made to appear that if sanction were refused the lodge would be dissolved. The strike barely started when it was reported to the grand secretary that certain members, in order to frighten the mine manager into submission, had proposed to fire shots close to the windows of the manager's residence. These men were informed that if anything of this nature was attempted either the charter of the lodge would be revoked or it would be necessary to secure another secretary. A strict watch was kept on the men during the

night, and nothing further was heard of any such methods. The manager of the colliery, however, fearing violence, made application for the militia, which was granted. No disturbances occurring, the soldiers fraternized freely with the strikers and engaged with them in various games and sports. No settlement being reached, the matter came before the directors in Montreal. The directors, a little later, visited Westville and conferred with the lodge committee, with the result that the P. W. A. secured the coveted right of having duly appointed lodge committees wait on the management, the measure of recognition obviously necessary before a union can negotiate. This dispute continued only a few weeks.

In 1882 a strike occurred at Lingan colliery, Cape Breton, and continued for one year, and ended favorably to the men. Workmen, it appears from the records of the time, were brought from Scotland to take the places of the strikers, but the newcomers, on learning that a strike was in progress, had refused to go to work, joining the strikers. The militia was again called out, but as at Westville their services were not required. The outcome of this strike is uncertain, no particulars having been preserved so far as can be discovered.

On November 5, 1900, an executive meeting of the miners of Nova Scotia was held in Sydney and the owners of fourteen collieries were asked to give their employees (mechanics and helpers excepted) an advance of 12 per cent., to take effect on January 1, 1901. For mechanics, carpenters and blacksmiths an increase of 50 cents per day was requested, and 25 cents per day for helpers. In some mines the increase was readily conceded; in other cases it was not until a strike seemed imminent that the increased scale was granted. The miners went on strike in several cases, about 1,500 men in all being affected. The strike lasted only five days, when the demands of the men were conceded in full.

On December 1, 1903, the miners at Springhill, to the number of 1,650, went on strike against a change in the company's method of payment. The strike was settled on December 7, the men accepting the change conditionally. The company claimed that the strike had been contrary to the rules of the union and of the working agreement, which provided that no strike should take place, save on fifteen days' notice, a view which the union seems to have admitted.

On June 1, 1904, the association was involved in a strike of the steel works employees at Sydney, N.S., to the number of 1,500. The cause of the dispute was the refusal of the company to grant a demand for a restoration of the scale of wages paid prior to December 1, 1903. During the first month of the strike there was little trouble. When, early in July, the company made an effort to resume operations, it was reported that the local police were inadequate to give the protection deemed necessary, and the militia were called out. The dispute was finally settled under the Dominion Conciliation Act, the strike being declared off on July 22. It will be remembered that up to this time the P. W. A. included other classes of labor than coal miners.

During the year 1905 no less than three strikes took place in Springhill district. The first occurred on June 13, about 1,700 men being affected. The cause of this dispute was the objection of the local lodge to the treatment of a disabled workman who had been discharged from a position in the lamp station for alleged incompetency. The company offered other employment at current rate of wages, but the offer was refused. Later the offer of the company was accepted by the local lodge, and the strike was declared off, the men returning to work on June 22. The mines at Springhill were again closed on July 7 and 8, and also on July 13 and 14, owing to a strike of 150 boys employed in the mine, the cause of the dispute being the suspension of a trapper boy for neglect of duty. The company laid a charge of conspiracy against the suspended boy, promising to reinstate him no matter what the result of the trial might be. On July 15 the boy was acquitted and no further trouble occurred with regard to the matter. On September 26 the association was involved in yet another strike at Springhill, this time for an increase in wages for firemen, water tenders and engine drivers employed by the Cumberland Railway and Coal Company. The mines were closed as a result of the dispute, some 1,500 persons being affected directly and indirectly. The demands of the men were conceded on the following day, and the strike ended.

On March 16, 1906, a strike involving 400 men occurred at Inverness, the principal cause being the introduction of a docking system. The local lodge refused to accept the docking system, and formulated other demands on the company, which were not entertained. After being out for a week, work was resumed, the matter in dispute being referred to the grand sub-council of the association. Some of the men's demands were conceded, and it was stated that others would be granted later. On May 9, a strike took place at River Hebert over the refusal of the employing company to allow a chain runner to do the work of loading in lieu of granting him an increase of 10 cents per day. On May 24 the 150 men affected returned to work, the company having granted the demand at the request of the local lodge. On July 2 the coal boys at Springhill declared a strike, which affected 1,400 persons, owing to a dispute over wages. The strike was ended on July 6, the employees having secured a satisfactory settlement. On November 20, Springhill was the scene of another strike of 600 underground workers (not including miners, who, however, to the number of 900 were indirectly affected by the strike). The cause of the dispute was the transfer of two employees to another part of the mine, and the refusal of the company to reinstate them in their former positions. The strike was terminated December 3, the strikers returning to work unconditionally. On November 6 a strike of miners employed by the Intercolonial Coal Company of Westville took place owing to the refusal of the men to work with non-unionists. On November 8 the non-unionists became members of the local lodge of the association, and the strikers, numbering some 850, returned to work.

In 1907 the Provincial Workmen's Association was concerned in five strikes, three of which were against the employment of non-unionists. The first of these took place on February 4, 1907, at Sydney, about 1,000 men being affected. The second strike took place on March 19 at Bridgeport, and involved 900 men. After a week's idleness, during which time the non-unionists became members of the P.W.A., the men returned to work. On April 1, 1,700 employees of the Cumberland Coal Company at Springhill went on strike on account of objection to working with non-union men. On learning that their action was a violation of the Industrial Disputes Investigation Act, which had just been recently passed, the men returned to work on April 8, all the non-unionists having joined the associa-

tion in the meantime. The local lodge made application for a board under the Industrial Disputes Investigation Act, being the first request for the invoking of the law, but as the men returned to work, it was not necessary to take further steps in the matter. On August 1 a strike again occurred at Springhill in which about 1,250 men were involved. The dispute arose on account of the employees' claim for payment of a certain rate for stone in pillar work being disallowed by a Board of Conciliation and Investigation which had been established in June under the Industrial Disputes Investigation Act to inquire into certain differences existing between the men and the company. Both majority and minority reports were presented neither of which were acceptable to both parties. Efforts were made by many public men to bring about a settlement of the trouble, and after inquiries as to the possible reference to a board of matters remaining in dispute, the men resumed work on October 31. On September 21 the employees of the Acadian colliery at Westville to the number of 325 went on strike for a short workday on Saturdays. On September 26 the strikers resumed work without the concession being granted.

The only strike in which the association was concerned during 1908 occurred on May 1 at Port Hood, and arose from the refusal of the company to grant an increase in wages of 15 per cent. in accordance with a demand of the Grand Council. On May 5 the strikers, numbering about 300, returned to work, the matter in dispute being referred to a Board of Conciliation and Investigation under the Industrial Disputes Investigation Act. The Port Hood miners again went on strike on March 22, 1909, over a question of wages. The strike was terminated on April 12, the terms of settlement not being reported.

A strike, which lasted a month, occurred on May 5, 1909, at the Drummond colliery in Westville, over the demand of about twenty drivers for increased wages. The stoppage of work by these drivers affected some 700 employees. On June 2, at a meeting of the local lodge of the association, a vote was taken which resulted in favor of resuming work.

In the strike of the United Mine Workers for recognition, which took place in Glace Bay in July, 1909, the Provincial Workmen's Association was brought directly into conflict with the international body. The P. W. A. had for many years exercised jurisdiction over the miners in the district, and at the time of the strike the company concerned in the dispute had an agreement with the association covering the conditions of employment, etc., of its members. During the strike much bitterness was displayed between these two bodies, and when the mayor of the town protested against the militia being sent to the strike zone the P. W. A. took exception to the attitude of the mayor and urged the dispatching of troops in order that their members who desired to work would be accorded proper protection. The P. W. A. appears to have retained substantial control in the district, although the U. M. W. still has a few local branches in the locality, with a small membership.

Since the passing of the Industrial Disputes Investigation Act in 1907 the association has taken advantage of the law, and through its provisions many disputes have been settled. This line of action is believed to have contributed to the comparative freedom from strikes during the last few years in the district through which its interests extend. Two-thirds of the coal now mined in the province of Nova Scotia is paid for on a wage rate drawn up six years ago by a Board of Conciliation and Investigation appointed under the Act.

At the close of 1911 the membership of the Provincial Workmen's Association was reported at 4,000, being comprised in twenty-two local lodges. For the years 1912 and 1913 the membership was given at 5,000, and twenty-three lodges. For 1914 the membership was reported at the same figure with twenty lodges.

MONAZITE, THORIUM AND MESOTHORIUM.

"Monazite, Thorium and Mesothorium," is the title of Technical Paper No. 110, by Karl L. Kithil, mineral technologist, just issued by the U. S. Bureau of Mines. In this paper it is stated that there exists a possibility that resources of monazite can be used profitably in the manufacture of the chemical products, thorium and mesothorium. Thorium nitrate is used extensively in the manufacture of incandescent gas mantles; mesothorium has been successfully employed in therapeutics, its properties being similar to those of radium.

Most of the monazite imported by the United States in late years has come from Brazil, where the mineral occurs in the beach sands along the coast of certain states and where it could be mined more cheaply than from inland placers. The mining of monazite in the United States has been practically at a standstill since 1906, especially since the price for thorium nitrate was reduced by European manufacturers to such an extent that it could be imported more cheaply than it could be made here, and this in spite of an import duty of 25 per cent. ad valorem on the salt. In former years, especially previous to 1906, there existed considerable activity in the monazite belt of North and South Carolina, and many hands were employed to mine the mineral. Since then practically no mining of this mineral has been done in these and other states where monazite occurs.

Mesothorium can be obtained as a by-product from thorium nitrate manufacture, and this may help the American manufacturer to utilize domestic resources at least to some extent.

The paper contains a full description, and references to occurrences of the mineral in the United States and the methods used in the mining of monazite sands are thoroughly discussed. The best methods for the separation of monazite from other heavy sands are given, together with flow-sheets and other technical details.

A short outline of analyses for thorium is given and the methods employed in the chemical manufacture of thorium nitrate and mesothorium are referred to. The complete history of the development of this industry is of interest and is brought out in detail. It is of further interest to know, for instance, that in spite of the wonderful development and increased use of the metal filament lamp the consumption of incandescent gas mantels has increased.

Valuable points for the examination and valuation of monazite deposits are outlined in the paper. Monazite is found in the states of North and South Carolina, in Idaho and in the black sands of the Pacific slope.

Copies of this technical paper may be had by applying to the Bureau of Mines, Washington, D.C.

Another shipment of refined silver from the Consolidated Mining and Smelting Co.'s electrolytic lead-silver refinery at Trail was made last month from Vancouver, B.C. This lot was consigned to China, for coinage purposes; its value was reported to be about $50,000.

PERSONAL AND GENERAL

The Cobalt branch of the Canadian Mining Institute has invited the Porcupine branch to visit Cobalt on September 16 and 17.

Mr. Justin S. DeLury, a graduate of the University of Toronto, and for some years on the staff of the University of Idaho, has accepted a position as lecturer in geology at the University of Manitoba.

Mr. John Knox, general superintendent of the Calumet & Hecla mines, has returned to Calumet from Hamilton, where he attended his father's funeral.

Mr. D. M. Steindler, Mr. M. B. Davis, and Mr. A. G. Kirby visited the Dominion Gold Company's mine in Munro township last week.

Mr. A. R. Whitman has been engaged by Cobalt mining companies operating north of Cobalt lake to make a study of the structural geology in that vicinity.

Mr. C. Miller and Mr. T. H. Rea, of Toronto, have been visiting properties in Northern Ontario.

Capt. H. C. Anchor is again in charge at the Dome Extension, Porcupine.

Messrs. Smith and Durkee, Sudbury, have secured a contract for diamond drilling at the North Dome mine.

Mr. F. L. Sherrill was in Porcupine recently and visited the Martin claims, where it is said development work is to be undertaken shortly.

Mr. A. G. Kirby is manager for Dominion Gold Mines, Ltd., the company organized to work the Dobie-Leyson claims in Munro township, recently acquired by shareholders of Dominion Reduction Co.

Mr. Percy Hopkins of the Ontario Bureau of Mines staff is at Kowkash, Thunder Bay district, examining the gold discoveries recently made there.

Mr. J. H. Stovel, of the Mond Nickel Co., formerly in charge of the Frood Extension, is opening the Bruce Mine for the Mond Co.

Mr. Vannoy H. Manning has been appointed Director of the U. S. Bureau of Mines, succeeding the late Dr. Holmes.

Mr. A. G. Kirby has returned to Cobalt after a visit to Toronto and New York.

Mr. C. H. Poirier is consulting engineer for Dominion Gold Mines, Ltd., operating in Munro township.

Mr. Chas. A. Banks, general manager of the Jewel-Denero Mines, Ltd., has returned to the Jewel mine, near Greenwood, B.C., from a trip to Cobalt and Porcupine districts and thence to Chicago, St. Louis, Kansas and Salt Lake City.

Mr. Darsie C. Bard, professor of geology at the Montana State School of Mines, Butte, Montana, was in Victoria, British Columbia, late in August, on his return journey from Atlin, in the northern part of that province.

Mr. J. W. Bryant, formerly mining engineer for the Tyee Cooper Co. in British Columbia, is now in Cornwall, England, after having been for some time at the property in Siberia of the Spassky Copper Mine, Ltd.

Mr. D. B. Dowling, of the Geological Survey of Canada, will present a paper on the Correlation and Geological Structure of the Alberta Oil Fields to the meeting of the American Institute of Mining Engineers to be held in San Francisco, California, on Sept. 16-18.

Mr. R. F. Segsworth, of Toronto, and Miss Mabel Dalton, of Kingston, were married on August 31. On the preceding Friday Mr. W. E. Segsworth gave a dinner at the National Club in honor of his brother. About forty friends, including many well-known mining men, were present.

Mr. Geoffrey B. Kitto, who prior to the closing of the Tyee Copper Co.'s smeltery at Ladysmith, Vancouver Island, British Columbia, was superintendent of the works, last month arranged a mineral exhibit sent to the annual exhibition in the city of Vancouver by the British Columbia Department of Mines.

Mr. J. M. Macoun, of the Geological Survey of Canada, was in Victoria, B.C., at the end of August.

Mr. Dudley Michell, instructor in First Aid and Mine Rescue work for the British Columbia Department of Mines, has been requested to act as one of the judges at the Mine Rescue competition to be held shortly at the Panama-Pacific International Exposition at San Francisco, California.

Mr. M. K. Rodgers, now of Santa Monica, California, in August visited the Granby Consolidated Co.'s mines at Phoenix and smelting works at Grand Forks, British Columbia. He is now a director of that company.

Capt. John L. Retallack, of Kaslo, B.C., long actively connected with mining in Ainsworth and Slocan mining divisions of West Kootenay, British Columbia, is now in England with other soldiers from that province.

Mr. S. I. Silverman, of Spokane, Washington, well known in the Northwestern States and on the Western Canadian coast in connection with mining, is arranging to send into the Stikine mining division of British Columbia supplies for a party of men who will spend some time in prospecting and developing mineral claims in that country.

Mr. Charles F. Schnepp, of Cobalt, has been proposed for membership in the American Institute of Mining Engineers.

Mr. R. H. Stewart, of Trail, B.C., general manager for the Consolidated Mining and Smelting Company of Canada, Ltd., has been in Ottawa in connection with the proposed establishment of metal refining works in British Columbia.

Mr. John Vallance, for several years superintendent of the Standard silver-lead mine, near Silverton, Slocan Lake, British Columbia, has returned to Twodot, Montana, from a visit to his family resident at New Denver, B.C.

Prof. T. L. Walker, of Toronto University, has been spending a week or two in Kootenay district of British Columbia.

Mr. E. G. Wallinder, managing director of the Kamloops Copper Co., has returned to Duluth, Minnesota, after having been for a time at the company's Iron Mask mine, near Kamloops, B.C.

Mr. Alfred R. Whitman, of Timmins, Ontario, has become a member of the American Institute of Mining Engineers.

Mr. George Williams, for several years superintendent of the British Columbia Copper Co.'s smelting works at Greenwood, Boundary district, is now with the Anaconda Copper Co. at its big Washoe smeltery in Montana.

Mr. Conrad Wolfle, of Spokane, president and general manager of the United Copper Co., operating at Chewelah, Washington, recently became a member of the American Institute of Mining Engineers. About two years ago he bonded two groups of copper claims on Vancouver island, British Columbia, one of which was afterward transferred to Mr. Maurice W. Bacon, manager of the Stewart Mining Co., operating in the Coeur d'Alene district, Idaho.

Mr. R. G. McConnell, Dominion Deputy Minister of Mines, when in Nelson, B.C., about the middle of August, met several members of the Industrial Committee of the local Board of Trade, who made representations to him relative to the mining industry of the district. Mr. O. E. LeRoy, of the Geological Survey, was also at the meeting.

The committee appointed to deal with a machine gun fund freely subscribed to by miners and others resident at Phoenix, in the Boundary district of British Columbia, includes Mr. P. B. Freeland, one of the Granby Consolidated Co.'s mining engineers, and Mr. John McLaughlin, foreman at the company's big copper mines at Phoenix.

The Standard Silver-Lead Mining Co., operating the Standard mine and concentrating mill near Silverton, Slocan Lake, B.C., has resumed dividend payment, having declared a dividend of 2½ cents a share, total $50,000, on the 2,000,000 issued shares of the company. No dividend was paid by the company during eleven months following September, 1914. Messrs. Henry White, of Wallace, Idaho, and John F. Clark, Spokane, Washington, have been elected directors of the company in place of Messrs. John A. Finch and Patrick Clark, both of Spokane, who died several months ago.

Mr. P. H. Clark, of Spokane, is directing the further development of the Galena Farm mine, near Silverton, Slocan, B.C., which property was bonded by the late Mr. Patrick Clark several months prior to his death.

Messrs. Roy H. Clark and H. Johns, of Spokane, were at Nelson, B.C., in August, in connection with mining operations in that division.

The committee on arrangements for the meeting of the American Institute of Mining Engineers, to be held in San Francisco, California, on September 16-18, consists of Messrs. Charles W. Merrill (chairman), Edward H. Benjamin, Fred. W. Bradley, Abbott A. Hanks, H. C. Hoover and W. C. Ralston.

MOLYBDENUM.

Molybdenum ores, owing to the war, have recently been much more in demand than formerly and enquiries concerning the deposits and the market are frequent. The consumption of molybdenum, under ordinary conditions, is small and the market irregular. Consequently little molybdenum mining has been carried on either in Canada or the United States. Where it has been undertaken, great difficulty has been experienced in concentrating the ores.

The chief, and almost only, source of molybdenum is the mineral molybdenite, a sulphide having the composition MoS_2. This is a soft mineral of bluish black color closely resembling graphite. It commonly occurs in flakes and platy crystals in coarsely crystalline rocks. In breaking the rock to free the flakes the latter are also broken and a considerable part is lost in treatment.

The chief use of molybdenum is in the manufacture of steels, as a hardening agent. Certain salts, such as ammonium molybdite and molybdic acid are used in chemical laboratories, the former being much in use in the determination of phosphorus.

Ordinarily molybdenum ore is quoted at so much per unit. Ores containing over 85 per cent. MoS_2, and free from copper, arsenic, bismuth and tungsten ordinarily sell at about $10 per unit of MoS_2. During the war the price has been three or four times the normal, selling at over $2,000 per ton. No regular quotations are available as the price varies greatly from time to time; the offering of a few tons being sufficient to make a serious change. The principal purchasers in the United States are: The Electrometallurgical Co. of America, New York; Primos Chemical Co., Primos, Pa.; De Gobia and Atkins, San Francisco, Cal.

Molybdenite occurs at several localities in Canada, and the Mines Branch, Ottawa, has published a report on "Molybdenum Ores of Canada," by Dr. T. L. Walker, of Toronto University. Dr. Walker says:

"The chief use to which most of the world's molybdenum is devoted is the preparation of special varieties of steel. . . . . Molybdenum steel is used for rifle barrels, propellor shafts, large guns, wire, and particularly for the manufacture of high speed tools. Molybdenum high speed steel contains from 8 to 10 per cent. molybdenum. When the other elements exist in the right proportion, a steel is obtained of great hardness, with the peculiar property of retaining its temper when heated to a high degree, differing in this respect from all carbon steels. Owing to this property, it is possible to take extremely heavy cuts at high speed, the tool often being heated through this hard use to a dull red heat without impairing its usefulness."

Most of the known occurrences are described by Dr. Walker who selects the following list as representing the most promising deposits as they were to be seen in 1909 and 1910: island opposite Romaine, lower St. Lawrence; Aldfield and Egan townships, north of the Ottawa river, deposits in the vicinity of Kewagama lake in the northern part of Pontiac county, Que., near the Grand Trunk Pacific railway; Brougham, Lyndoch and Ross townships in Renfrew county, Sheffield township, Addington county, and Cardiff township, Haliburton county, in Eastern Ontario; and the Giant mine, Rossland, B.C.

Deposits of molybdenite are known in Northern Quebec on Lake Kewagama in La Motte and La Corne townships. These were described in the reports on Mining Operations in the Province of Quebec for 1911 and 1912. The great difficulty encountered in the exploitation of these deposits has been the problem of concentration, as the molybdenite is found disseminated throughout the rock in a very irregular manner. Several other occurrences, at Manicouagan, at Olomanoshibo, both on the north shore of the Gulf of St. Lawrence; in Egan, Alleyn, Aldfield townships; on Calumet Island, are described in the report by Dr. T. L. Walker.

A NEW BANK AND RAILWAY MAP.

A striking illustration of the financial progress throughout the two older provinces of the Dominion during recent years, with respect to banking facilities, is graphically shown in a new edition of a Bank Map of Ontario and Quebec which has recently been issued by the Department of the Interior at Ottawa. According to the information which has been incorporated in the publication, the number of branches in operation in 1901, the first year for which statistics of this nature are given, totaled approximately 500, in comparison with 2,000 at the present time. This interesting compilation of current banking information is valuable also as a railway map, showing as it does the location, on the various main and branch lines, of all towns and cities. This, together with other general information, makes the publication very useful for reference purposes.

A copy may be procured free of charge upon application to F. C. C. Lynch, superintendent of the Railway Lands Branch, Department of the Interior, Ottawa.

SPECIAL CORRESPONDENCE

PORCUPINE, KIRKLAND LAKE, MUNRO AND KOWKASH

Kowkash—The interest in the new gold districts of Northern Ontario is dwarfing everything else. At this time of writing the discovery at or near Kowkash station on the Transcontinental has developed a regular stampede of the type that prevailed when Cobalt was a new name. Prospectors who have been running drills or attending tables for the past two years; prospectors who have been farming; prospectors who have returned to the city, have thrown up everything to again take the trail on the Transcontinental. So poor were many of the prospectors that without a grubstake they were unable to obtain the modest expenses required to reach a new camp, but interest has been so tense that it has not been difficult to obtain grubstakes. The new discovery is so favorable to everyone that some available information is to be obtained even as early as this, only one week after the stampede began. The National will take any one from Toronto and will land them at Kowkash station at two o'clock in the morning, but one day and one night after they have left the city. The point of interest is 297 miles west of Cochrane, immediately north of the centre of Lake Superior, and not more than 100 miles from the heart of the Michigan Copper district. From Johnson creek or Kowkash station, two points at which prospectors are entering, it is 14 miles and 20 miles respectively to the Dodds discovery.

At this time of writing the discovery is remarkable rather for the fact that it has been made in an entirely new country of favorable formation than anything else. It is stated that at this time, September 7th, the vein stripped is only two to eight wide and not more than twenty feet long. It is phenomenally rich. The country rock is quartz porphyry and schist, and there appears to be quite an area of it.

There are several hundred prospectors in the bush and a very large number of claims have been staked and recorded. It is reasonable to expect that a large amount of work will be done before the snow falls. To date there is practically no work done except on the vein itself, where the bush is burned. Prospectors are coming from all quarters east from Haileybury, from Cobalt, from Porcupine, from Cochrane, up the Algoma Central from the Sault and west from Winnipeg. There is a wild scramble for claims and the discovery clause is disregarded absolutely.

Munro.—The remarkable ore being obtained from the shaft on the Dobie by the Dominion Reduction Co. is still attracting much attention. It is an old field, however, and long discredited, and it is difficult for those who have put money into this section to believe that anything can come out of it; however, in spite of the remarkable showing on the Dobie there is not more than a handful of prospectors running in and out of Matheson into the townships tributary to the town. The first gold discovery to be made in Munro township was made in the fall of 1907 by prospectors coming into the Abitibi district following the discovery of gold there. The country was staked wild, and wild catting was abundant. Two years ago remarkable discoveries were made on claims owned by Mr. Dobie and Dr. Taylor of Cobalt, but so thoroughly was the district discredited, that it was not until the past few months that any company could be induced to accept the terms asked by the owners. In regard to the Dobie this demanded a $5,000 cash payment, and this was the stumbling block. Now that the Dominion Reduction has taken it over a shaft has been sunk on the vein at an angle of twenty degrees for 110 feet. It is declared, unofficially, though on good authority, that out of the shaft there has already been taken approximately $150,000.

The vein is from 18 in. to 3 ft. wide, and in addition to the dazzling ore, a sample of which was on exhibition in Toronto, the quartz and basalt is impregnated with fine sulphides. Free gold is often associated with these sulphides and they run well. The presence of telluride ore has also been detected, but it is not known yet what mineral it is. From the shaft 750 lb. of the highest grade ore was hand picked and sent to the Dominion Reduction plant at Cobalt. This ore was again broken up, as well as its extraordinary mineral contents would allow, and jigged. By this means the 750 lb. parcel was reduced to 225 lb.; one quarter of which was gold. It was melted down into two bricks worth approximately $50,000 and shipped to New York.

To-day the station is being cut at 110 ft. and drifting on the vein will commence both ways. Several other people of standing have determined to attempt more development in the vicinity of the Dobie. Mr. A. J. Young and his associates have taken up a veteran claim, and already a small gang of men are at work prospecting. Mr. Chas. Miller of Toronto has been in to see the shaft on the Dobie, and he is determined to start work on a claim which has belonged to him for five or six years past. Two daily stages run from Matheson to Munro and the road is not very difficult.

Tough-Oakes—Owing to the release of about 2 ft. of water stored at the dam of the Charlton Power Co., the Tough-Oakes mine has been closed down for six weeks or two months. The Tough-Oakes has grown so rapidly that the power plant at Charlton was loaded to capacity to run the plant. Now that this 2 ft. of water has been released, it is impossible to run both mill and mine. It was determined, therefore, to run the mill and clean up all ore in sight and shut down the mine. The dumps will be cleaned up and any ore that can be taken from the surface without much difficulty will be run. More than half the force at work have been allowed to go. In the meantime another steam compressor has been ordered, and when this is installed 3,000 ft. of air will be available. This will run the mine and electric power will be used to run the mill only. Development lately at the mine has been very satisfactory. The main vein will run $70 across 5 ft. of the winze from the 300 to the 400 ft. level. Both the number three and number six veins have been good and show fine ore.

Goodfish Lake.—In the Goodfish Lake section of the Kirkland Lake camp the Dominion Reduction Co. of Cobalt has taken up a group of claims aggregating 400 acres. Some of these claims, adjoining the Costello and some the Gibson, have been obtained on easy terms, and the intention of the company is to prospect them with a view of discovering if there are any more orebodies of importance in the district.

Teck-Hughes.—Mr. J. L. Denison and associates have purchased outright the control of the Teck-Hughes Mining Co. in Kirkland Lake. They have at once started to lay the foundation for the mill and

for a power plant. The mill will be 100 tons and the power plant of sufficient capacity to take care of the requirements of the mine for some time to come.

Prospecting at Porcupine.—In Porcupine interest in many prospects in the camp is steadily growing. This is the result of the remarkable development of the dividend paying mines, particularly the Dome. Upon the Preston East Dome a drill has been placed and a series of holes will be put down. The company has about $9,000 in its treasury and this will be sufficient to pay for the work. If the results obtained are satisfactory, no doubt the reorganization of the company will follow. On the North Dome the Temiskaming Mining Co., who now owns this property outright, has placed a diamond drill, and several holes have been put down to 1,000 ft. Until this is finished no underground work will be commenced.

Rea.—The New Rea Mining Co., which has absorbed the old Rea Consolidated Gold Mines, had determined to sink a shaft on the vein with diamond drill. This vein on the surface is much broken, but very rich. Four drill holes were put down on it. All four cut the orebody; two of them at 175 ft. and two at 263 ft. These four holes showed a vein of promising width and grade. Before closing down the Rea workings the Mines Leasing and Prospecting Co. took out $230,000 from the old orebody.

Mills and Stamps.—An interesting contest has been staged at the Dome and Hollinger mines between the Hardinge Conical mills and stamps. Mr. Hardinge claims that both in regard to costs and tonnage treated, his mills are much better than stamps for the Porcupine ore. At his expense an 8 ft. Hardinge mill has been installed both at the Dome and the Hollinger. They have been placed along side the stamps and will work under parallel conditions. As there has always been a good deal of controversy as to the respective merits of ball mills and stamps in the camp the experiment will be watched with much interest.

COBALT AND GOWGANDA

Upon the conglomerate north of the centre of the town of Cobalt it has been decided to employ Mr. A. R. Whitman to endeavor to establish some facts in regard to the very complicated faulting. Mr. Whitman, who made a name for himself in Porcupine at the McIntyre, will work on the Chambers Ferland, the La Rose, the Nipissing and the Mining Corporation of Canada. He will devote most of his time to an examination on the surface before the snow comes and will afterwards go underground to check up results. As this section of the silver camp is looked upon as the most promising of the unproductive section of the district, the progress of the work undertaken by Mr. Whitman will be followed with a great deal of interest.

The Crown Reserve Mining Co. has passed its dividend and operations have been restricted very considerably. Mr. S. W. Cohen, who is manager, has gone to California to examine a prospect upon which the Crown Reserve Mining Co. has an option.

In the past week silver has risen to over 48 cents, but there is no general confidence that this price will be maintained, low as it is. The market seems to be so fluctuating and uncertain that the mining companies are prone to curtail operations as much as possible.

BRITISH COLUMBIA

Brief mention was made editorially in the Canadian Mining Journal of August 15 of unofficial reports sent out from Ottawa relative to the proposed establishment of copper and zinc refineries in Canada, and Trail, B.C., was mentioned in this connection. Various statements have been made in British Columbia newspapers in connection with the advocacy of certain places as suitable for the location of such works, but there does not yet appear to be good grounds for concluding that there is a reasonable probability of the refining of zinc or copper being undertaken on a commercial scale anywhere else in British Columbia than at Trail, at least not for some time to come. Announcement has also been made that the Federal Government has passed on order-in-Council providing for the payment of a bounty on refined zinc produced in Canada from Canadian ores, such payment to be commenced after the close of the European war and to be continued under certain specified conditions until August 1, 1917. Further reference will be made later to this matter, when more information shall be available; meanwhile it may be noted that it appears to be unlikely that much bounty will be earned in British Columbia; if any, then only during a few months.

West Kootenay.

Slocan. — With the resumption of ore shipping to Trail by the Standard Silver-Lead Mining Co., there has been a marked increase in the quantity of Slocan silver-lead ore received at the Consolidated Mining and Smelting Co.'s works. During 26 weeks of the current year, ended July 1, the total of receipts was 2,385 tons, an average of about 92 tons a week; for the eight weeks following, ended August 26, the total was 3,913 tons, an average of about 489 tons a week. This leaves out of account some silver-lead concentrate shipped to the United States and all the zinc ore and concentrate, also shipped to that country.

The Ivanhoe concentrating mill at Sandon was destroyed by fire on August 30, with an estimated loss of approximately $50,000. The mill was being operated under lease by Mr. J. P. Keane and associates as a custom concentrator, and had for some time been treating ore from the Surprise mine, near Cody, making both silver-lead and silver-zinc concentrates, which products were being shipped to the United States. Quite recently a commencement had been made to also concentrate lead-zinc ore from the Lucky Jime mine at which production was resumed in July after a lengthy suspension of operations. It is announced that arrangements are being made for treating elsewhere the ores from those mines. The Ivanhoe mine and mill were owned and operated ten to twelve years ago by the Minnesota Silver Co., with between 60 and 70 men employed, but for some years both had been inoperative until last year, when different lessees did work at mine and mill respectively. The mill equipment comprised Blake crusher, Robins picking belt, rolls, trommels, one 3 and six 4-compartment jigs, eight Wilfley tables, etc.; its treatment capacity was 65 to 70 tons a day of 12 hours and its products when running on Ivanhoe ore about 7½ tons of silver-lead and 3 tons of zinc concentrates a day.

Other concentrating mills near Sandon are those of the Ruth-Hope and Slocan Star Companies. The former has lately been overhauled and announcement was made recently that it would be operating by the end of August; the Slocan Star mill has been running

throughout the summer after having been closed from the time of the commencement of the European war. At one time there was a concentrating plant, capable of treating 200 tons of ore in 24 hours, in connection with the Payne mine, also near Sandon; another one at the Whitewater mine, within ten miles of Sandon; and still another in connection with the Province Montezuma mines, 10 or 12 miles from Kaslo, but all three were burned at different times. The Rambler-Cariboo Co.'s mill, three miles from Three Forks, up the middle fork of Carpenter creek, is being operated and is making two products, namely, silver-lead and silver-zinc concentrates. At Cody, about two miles south of Sandon, the Noble Five Co. has a concentrating mill, but it has been unused for a long time. It is not unlikely, though, that when a sufficient supply of ore shall have been opened by development work now in progress at the Noble Five group of mines this plant will again be operated. Between Three Forks and Slocan lake, in the western part of Slocan district, there are two unused mills—the old Alamo plant, not likely to be operated again, and a comparatively modern plant near Roseberry that has not yet done much, if any, concentrating work. Near Silverton, Slocan lake, the Standard Co.'s mill, and that of the Silverton Mines, Ltd., known as the Hewitt mill, and situated several mines from the lake up Four-mile creek, are both modern and both make a high percentage saving of the marketable contents of the ores they treat. The Van-Roi mill, still higher up the creek, is also a comparatively new mill, but it has been idle for more than a year. The Enterprise mill, on Ten-mile creek, Slocan City mining division, has not been operated in recent years. In addition to the foregoing, there are several concentrating plants in Ainsworth mining division, in the eastern part of what is comprehensively known as the Slocan district, but at present only two are being operated, namely, that of the Cork-Province, on the south fork of Kaslo creek, and the Highland mill, near Ainsworth. The Bluebell mill is at Riondel, across Kootenay lake from Ainsworth; this plant was closed in August, 1914, when the war demoralized the market for lead, but if not already running is expected to be in operation again shortly.

Trail Creek Division.—Ore receipts at the Consolidated Mining and Smelting Co.'s smeltery at Trail are being well maintained, the average weekly total for eight weeks of July and August having been 8,653 tons as compared with an average of 8,370 tons a week for the half year to July 1. The total for 34 weeks ended August 26 was 286,850 tons, an average of 8,437 tons a week. This compares with a total of 248,043 tons and an average of 7,295 tons a week for the corresponding period of 1914. The proportion from Rossland mines was 222,109 tons, or 6,553 tons a week this year, against 172,111 tons, or 5,062 tons a week during 34 weeks of 1914. It is noteworthy that the mines of the Consolidated Co. produced by far the greater part of the ore shipped from Rossland mines this year, the output of the company's Centre Star group during the period under notice having been 122,854 tons, and of the Le Roi 87,745 tons, together 210,599 tons. All but 5 tons of the remaining 11,510 tons was from the Josie group of the Le Roi No. 2, Ltd.

The report of the Josie mine for the month of June, received in London from the company's managers at Rossland, was issued by the Le Roi No. 2, Ltd., at the end of July, and in due course reached British Columbia. It was as follows: Shipped to Trail in June 1,220 tons of ore and 92 tons of concentrate. Receipts from the smeltery were $21,154 in payment for 1,360 tons of ore shipped and $721 for 57 tons of concentrate; sundry receipts were $757; total receipts for June, $22,632. Estimated working costs for the month were for ore production $7,500 and milling $500; outlay on development was $4,500 and for powder (purchased but unused) $4,968; total expenditure, $17,468. Published figures for April and May were as follows: April, total receipts $22,216, expenditure $12,631; May, receipts $23,865, expenditure $11,050. The receipts for three months, April-June, totaled $68,713 and the expenditure $41,149, leaving a balance of receipts over expenditure in British Columbia of $27,564.

Boundary.

After having been operated for nearly three years with little intermission, the Jewel gold mine and 15 stamp mill, situated near Long lake, eight miles from Greenwood, have been temporarily closed so far as production is concerned, though it is probable a few men will be kept on, doing development work in the mine. The general manager for the Jewel-Denero Mines, Ltd., Mr. Chas. A. Banks, hopes to shortly have work resumed in a small way in the Idaho-Alamo mines, in Slocan district, in which case he will divide his time between directing the further development of that group and the work on the Jewel.

The Greenwood "Ledge" states that about 300,000 lb. of copper is being shipped monthly from the British Columbia Copper Co.'s smeltery at Greenwood. It is estimated that between 20,000 and 25,000 tons of ore a month is being smelted at the works, at which the present ore supply is stated to be sufficient only to keep one 750 ton blast furnace running. The same newspaper recently published the information that Archie Aberdeen, 86 years of age, had gone to work at the B. C. Copper Co.'s Mother Lode mine, near Greenwood, and the suggestion was made that probably Mr. Aberdeen is the oldest miner working in Canada.

Yale.

While the mineral production of this district continues to be unimportant in comparison with that of the Kootenay and Boundary districts, there is a little mining being done in it and a number of prospectors are giving their attention to mineral showings in various parts of the large area included within its boundaries. Early in the year a trial shipment of 8 tons of ore was made to the smeltery at Trail from the Rainbow, in the Hope section of the district; a few weeks ago 21 tons was shipped to Trail from the Copper King group, Coutlee, in the Nicola section; ore receipts at Trail from the Iron Mask, near Kamloops, during June and July, totaled 405 tons. Other claims have been or are being prospected this year, in some instances with encouraging results. In this connection it may be mentioned that the Hope "Review" lately published some particulars of work in progress on a group of claims on which it is claimed there has been opened a gold-bearing quartz vein from 12 to 18 in. wide. This vein is stated to have been traced for more than 3,000 ft. on the west side of Coquihalla river, near Ladner creek, at an elevation of 2,700 ft. A short adit has been driven and near by a log cabin has been erected. The group comprises 20 mineral claims, and others have been staked in the neighborhood by other men attracted by the samples of gold ore obtained.

NEWFOUNDLAND

Never before in the history of Newfoundland was there such general prosperity in mining matters as prevails at present. Every mine throughout the country is working full time, with full complements of men, and in most cases working day and night.

The output of hematite iron ore from the Wabana mines, owned by the Dominion Iron and Steel Co. and the Nova Scotia Steel Co., has increased from week to week since the early spring days, and now exceeds 100,000 tons weekly. During one day last week no less than six steamers arrived at the different ore piers of Wabana for ore cargoes, and were given ready and quick despatch. Apart from the large quantity of this ore which finds its way to the smelters at Sydney, C.B., several cargoes are being shipped to Great Britain. Only one cargo has been destroyed by German submarines.

Activity in the copper mines is equally great; although the shipments are not so large. All of the old copper dumps which have lain around some of the mines which have been worked out or shut down for years, have been gathered up, and shipped to the smelters of Pittsburg, New York and other American cities. As a result of the great boom in copper, several prospecting companies have gone out during the past season, and reports are reaching the Department of Agriculture and Mines weekly of valuable discoveries being made in copper and other minerals. In the early days of copper mining in this country—some thirty to forty years past—much of the ore taken from the mines of Tilt Cove, Bett's Cove and Little Bay was smelted locally; but owing to the crude machinery employed and the resultant waste that occurred, the work of smelting was abandoned, and the ore was shipped to Swansea in a green state.

Now, however, I am pleased to state Newfoundland is shortly to have an up-to-date electric smelter established in one of the central districts. The work which will mean so much to the copper industry of the country is being undertaken by Mr. Wm. McKay, a Newfoundlander by birth, but who has had many years of very successful experience in the coal and other mining and smelting interests of Sydney, C.B.

Apparently what will give additional impetus to the great mining activity now going on throughout the Colony is the establishment of shell factories within the country. The first will commence operation shortly, with a capacity of one thousand shells weekly. This is to be followed by others in due time.

The first cargo of manganese ore to be shipped abroad for some time leaves the workings of Brigus, Conception Bay, for Pittsburg within a few days. For some time the authorities debarred the shipment until satisfactorily assured by the owners and buyers that the same was not to be utilized for the use or aid of the enemy.

Since the advent of the great European war, many enquiries have been made to the Mines Department and to private parties from some of the large iron ore corporations of the United States as to the quality and probable extent of the manganese deposits of Newfoundland. As a consequence of these enquiries, we hear from time to time of new discoveries of this ore being brought to light; but as yet the practical eye of the mining engineer and the searchlight of the assayist has to be brought to bear upon these new finds.

Many enquiries have also been received lately, both from England and the United States, for deposits of magnesite and antimony within the Colony. Both ores are known to exist here, but as to what extent has never been determined.

NEW YORK

Relative to the extraordinary increase in the export of American manufactured goods, the Secretary of Commerce at Washington has commenced sending out a series of circulars to thousands of business men, at a cost of five cents per week. These circulars give a daily survey of world trade opportunities as reported by over 300 consular agents. Such a source of information and foreign point-of-view is sorely needed, if American business men are to hold any considerable export trade in manufactures.

Aluminum is finding increased uses constantly. For automobile parts, and all light vehicle or hand utensils, its advantages are undeniable. The recent strike in the big smelting plant at Massena, N.Y., just across the Canadian border, was settled by granting small increases in pay to the men. Aluminum prices have advanced to 40-45 cents per lb.

Utah Copper, Chino, Ray Consolidated and Nevada Consolidated, the four big "porphyry" coppers, had a combined output for July of 22,000,000 lb. of copper, which about equals Anaconda's output for the same month, but is somewhat under the output of the Lake Superior district.

The New Jersey Zinc Co., generally credited with being the largest spelter producer in the word, has been making large profits, because of its control of particularly high-grade zinc from the Franklin furnace, New Jersey, fields, which are within 50 miles of New York City. No lead occurs mixed with these New Jersey ores. Besides its holdings in the East, this company operates custom zinc smelters throughout the Middle West.

During this period of readjustment to war conditions, many American financiers are showing unusual interest in Canadian conditions, and are disposed to buy Canadian issues in cases where prices are depressed.

President Earling of Chicago, Milwaukee and St. Paul Railway, which controls a line of railway from Chicago through the North West to the Pacific Coast, has announced that the Panama Canal cost the road $1,000,000 in gross revenues in the last fiscal year. Reduction was mostly in west bound commodities.

Calumet and Hecla's dividend No. 173 of $15 per share recently declared makes a total so far this year of $35, compared to $10 in 1914, $32 in 1913, $42 in 1912, $24 in 1911, $29 in 1910, $27 in 1909, $20 in 1908, $65 in 1907, $70 in 1906. The high figure is $100 in 1899.

Anaconda, the premier copper producer, is aiming at an eventual output of the enormous quantity of 300,000,000 lb. per year.

The German Government is paying its citizens 43.3 cents per lb. for copper pots, pans and boilers, and 33 cents per lb. for brass articles.

The improvement in Porcupine conditions at depth is much liked, and curiosity exists as to the outcome of the new Canadian electric zinc smelter at Welland, Ontario. Relative to the mining of zinc ore in Quebec, it is pointed out that important high grade zinc ores have long been mined in the Appalachians in western New Jersey, while a rich zinc mine is now successfully operating in northern New York, only 30 miles from the Canadian border.

METAL PRODUCTION IN CALIFORNIA IN 1914.

The total yield of mine gold in California in 1914, as reported by Charles G. Yale, of the United States Geological Survey, was $20,653,496, an increase of $246,538 over that of 1913. With the exception of one year—1883—the mine gold output of the State in 1914 was higher than it has been since 1864, 50 years ago.

The value of the entire mine output of gold, silver, copper, lead and zinc in California in 1914 was $25,710,645, which is $1,101,842 less than the value in 1913. The decrease is mainly due to the falling off of the production of copper brought about by the closing down of certain large properties soon after the outbreak of the war. Since the close of the year, however, these plants have resumed operations. There was an increase in the output of silver of 93,460 oz., and of lead of 737,581 lbs., but the output of zinc declined.

In 1914 there were 658 properties reporting production, of which 318 were deep mines and 340 placers. The producing deep mines may be classified by metal product as follows: Gold, 277; copper, 19; silver, 7; silver-lead, 6; and lead, 9. Of the placer mines 105 were hydraulic, 60 dredges, 70 drift, and 105 sluicing or surface placer mines.

In 1914 there was treated in gold and silver mills in California 1,993,821 tons of ore, containing altogether $10,743,207 in gold, an average value of $5.39 per ton, and $91,327 in silver, an average value of $0.05 per ton. This gives a total value of $10,834,534 in gold and silver, or an average per ton of $5.44 in both metals. In milling the 1,993,821 tons of ore there was recovered as bullion $8,637,329 in gold and silver, or $4.33 per ton, and from this ore was derived 46,072 tons of concentrates, which yielded in gold and silver $2,197,205, or an average of $47.69 per ton.

The 449,132 tons of smelting ore treated yielded altogether metals valued at $5,633,856, or an average of $12.54 per ton, including all metals. There was treated also 22,532 tons of old tailings, which yielded $83,624 in gold and silver, or an average of $3.71 per ton.

The 340 productive placers in California yielded $9,080,849 in gold and $19,287 in silver, a total of $9,100,136, which is an increase of $242,590 from this source over the yield of 1913. The dredge yield fell off $306,900 in gold, but there was an increase in total output from the hydraulic, drift, and surface placers of $551,572 in gold, or $244,672 more than the decrease in the dredge yield. Of the total placer gold the 60 dredges yielded $7,783,394, or 86 per cent.; the 105 hydraulic mines, $702,884, or 8 per cent.; the 70 drift mines, $329,948, or 3 per cent., and the 105 surface or sluicing mines, $264,623, or 3 per cent. The dredges in the State produced 38 per cent. of the total gold yield from all sources. The placers produced 44 per cent. of the total gold yield, for 1914, and the deep mines 56 per cent. These average percentages have changed very slightly for several years past. There are now 60 gold dredges operating in the State, and since the commencement of dredging in California in 1898, the total gold yield from this source to the end of 1914 has been $71,307,766. The three principal dredging fields in the State are at and near Marysville, Yuba County, with a dredge gold yield in 1914 of $2,755,734; at and near Oroville, Butte County, with a yield in 1914 of $1,637,515; and at Folsom, Sacramento County, with a yield in 1914 of $2,161,653. Dredges are also in operation in the Counties of Calaveras, Merced, Placer, Shasta, Siskiyou, Stanislaus and Trinity.

Of the total ore milled in California from deep mines, 1,243,529 tons, or 62 per cent., came from the mines in the five Mother Lode counties of Amador, Calaveras, El Dorado, Mariposa and Tuolumne. This ore yielded, on an average, in gold and silver, $5,075,552, or $4.08 per ton.

The 629,037 tons of ore from Amador County yielded $4.89 per ton, but the 859,509 tons from Calaveras County averaged only $2.32 per ton. The average value per ton in El Dorado County was $4.95; in Mariposa, $9.19, and in Tuolumne, $4.24.

The two largest gold-producing deep-mine camps in the State are Grass Valley (including Nevada City), and Jackson (including Sutter Creek), in Amador County, and it is the productiveness of these two districts that gives Nevada and Amador first and second rank, respectively in the quantity and value of gold produced in 1914. The largest gold producing mines on the Mother Lode are in the Jackson district where the 387,602 tons of ore was treated in 1914, yielding $2,113,098 in gold and $12,674 in silver, an average of $5.48 per ton. In the Grass Valley and Nevada City districts, 267,618 tons of ore was treated, yielding $2,997,405 in gold and $25,868 in silver, an average of $11.30 per ton in gold and silver. The most productive metal camp of the State is at Kennott, Shasta County, where the mines and smelter of the Mammoth Copper Co. are located. From all the mines at and near this place 243,138 tons of ore was treated, yielding $376,846 in gold, $299,110 in silver, and $2,411,323 in copper, a total of $3,087,279, or $12.70 per ton.

COMPOSITION OF NATURAL GASES.

The United States Bureau of Mines has just issued Technical Paper 109, which deals with the chemical and physical properties of the natural gases used in twenty-five cities in the United States. In this paper, which gives the first comparative data of this kind ever published, the authors, G. A. Burrell and G. G. Oberfell, say:

"The composition of the natural gas from twenty-five cities in the United States is shown. Five of the samples contain methane only as the combustible gas. The others contain in addition to methane, higher members of the series of paraffin hydrocarbons. The heating values range from 735 to 1312 B.t.u. per cu. ft. at 0° C. and 760 mm. pressure.

"Natural gas in two different sands of the same field may vary materially in composition.

"Some of the natural gas used in Texas has a heating value of about 740 B.t.u. per cu. ft. at 0° C. and 760 mm. pressure.

"The natural gas used in Pittsburg, Columbus, Cleveland, Cincinnati and many other places in the East is quite uniform in composition.

"The explosive limits of mixtures of natural gas and air lie between about 5.00 per cent gas, low limit, and 11.50 per cent. gas, high limit.

"For many of the natural gases listed, there is required about 10.0 cu. ft. of air per cu. ft. of gas, for complete combustion.

"There is needed a very large amount of natural gas to suffocate men. As far as small animals (canaries) are concerned, the effect on them of mixtures of natural gas and air is principally due to the lowering of the oxygen content of the air by the diluting action of the gas.

"The composition of the natural gas used in any one town may remain remarkably uniform for a long period of time.

Copies of this paper may be obtained by applying to the Bureau of Mines, Washington, D.C.

MARKETS

STOCK QUOTATIONS.

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

September 9, 1915.

New York Curb.

	Bid.	Ask.
Alaska Gold	32.00	32.25
British Copper.	.50	1.00
Braden Copper	81.00	81.25
California Oil	303.00	306.00
Chino Copper	45.25	45.50
Giroux Copper	.50	1.00
Goldfield Cons.	1.25	1.37½
Green Cananea	37.00	39.00
Granby	81.50	..
Inspiration Copper	..	..
International Nickel	189.00	191.00
Miami Copper	27.00	27.12½
Nevada Copper	14.62½	14.75
Ohio Oil	154.00	156.00
Ray Cons. Copper	22.25	22.50
Standard Oil of N. Y.	193.00	194.00
Standard Oil of N. J.	443.00	446.00
Standard Oil (old)	1450.00	..
Standard Oil (subs.)	1050.00	..
Tonopah Mining	5.75	6.00
Tonopah Belmont	3.75	4.00
Tonopah Merger	35.00	37.00
Yukon Gold	2.25	2.50

Porcupine Stocks.

	Bid.	Ask.
Apex	.02¾	.02⅞
Dome Extension	.24¼	.24¾
Dome Lake	.23	.24
Dome Mines	21.00	21.50
Foley O'Brien	.28	.30
Hollinger	25.40	26.50
Jupiter	.12¾	.13
McIntyre	.47½	.48
Moneta	..	.07½
Pearl Lake	.00¼	.00⅜
Porcupine Gold	....	.00⅝
Porcupine Imperial	.05¼	.05½
Porcupine Crown	.71	.73
Preston East Dome	.05¼	.05⅜
P. Vipond	.64	.64½
P. Tisdale	.01	.01½
West Dome	.08¼	.08⅜

Cobalt Stocks.

	Bid.	Ask.
Bailey	.04	.04⅛
Beaver	.26	.27
Buffalo	.30	.50
Chambers Ferland	.13½	.14
Coniagas	3.85	4.00
Crown Reserve	.34	.34¾
Foster	.01	.03
Gifford	.01½	.01⅞
Gould	.01	.01⅛
Great Northern	.02½	.03
Hargraves	.01	.01½
Hudson Bay	20.00	..
Kerr Lake	3.40	3.55
La Rose	.49	.55
McKinley	.21	.26
Nipissing	5.75	5.80
Peterson Lake	.19¼	.19½
Silver Leaf	.01½	.02
Teck Hughes	.06½	.07
Temiskaming	.33	.33½
Trethewey	.11½	..
Wettlaufer	.05	.09
Seneca Superior	..	.80
York Ontario	.01½	.02

SILVER PRICES.

August—	New York cents.	London pence.
25	46⅞	22 13/16
26	46¾	22 13/16
27	47⅛	23 1/16
28	46⅞	22 15/16
30	47	23
31	46⅝	23
September—		
1	46¼	23 3/16
2	47¼	23 5/16
3	48⅜	23 9/16
4	48½	23½
6	Holiday	23 11/16
7	48⅝	23⅝
8	48¼	23⅝
9	48⅝	23 11/16

TORONTO MARKETS.

Sept. 9, 1915 (Quotations from Canada Metal Co., Toronto)—
- Spelter, 18 cents per lb.
- Lead, 6½ cents per lb.
- Tin, 40 cents per lb.
- Antimony, 40 cents per lb.
- Copper casting, 19 cents per lb.
- Electrolytic, 19 cents per lb.
- Ingot brass, yellow, 13c.; red, 15c. per lb.

Sept. 9, 1915 (Quotations from Elias Rogers Co., Toronto)—
- Coal, anthracite, $7.75 per ton.
- Coal, bituminous, $5.25 per ton.

NEW YORK MARKETS.

Sept. 9, 1915—Connellsville coke (f.o.b. ovens)—
- Furnace coke, prompt, $1.60 to $1.65 per ton .
- Foundry coke, prompt, $2.30 to $2.60 per ton.
- Tin, straits, 33.12½ cents.
- Copper, Prime Lake, 17.37½ to 17.62½c.
- Electrolytic copper, 17.25 to 17.50c.
- Copper wire, 19.25c.
- Lead, 4.70c.
- Spelter, 14.25 to 14.50c.
- Sheet zinc (f.o.b. smelter), 16.00c.
- Platinum, hard, $44.00 per oz.
- Platinum, soft, $42.00 per oz.
- Quicksilver, $89.00 to $90.00 per 75-lb. flask.