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GOWGANDA.

EDITOR'S NOTE.—The following notes were hastily thrown together barely in time to appear in this number. Our readers, we trust, will overlook the obvious lack of coherence. In our issue of March 1 a much fuller article on Gowganda will appear.

Whatever discount must be allowed for the overstatements of promoters, there is no lack of evidence that Gowganda is a most promising field for the prospector. At present the tangible results of work done are small, but, in some cases, encouraging. On several properties camp-buildings have been erected. Supplies are being rushed in. The new winter route from Sellwood (Moose Mountain), the northern terminus of a branch line of the Canadian Northern Railway, to Gowganda Lake has been completed. Sellwood lies about 38 miles north of Sudbury from Toronto. A night's journey in comfortable cars lands one at Sellwood. Here travellers are transferred to sleighs. One and one-half days' drive, through a splendidly timbered country, ends at Gowganda Lake.

Fuller details of this new route will appear in a later issue of the Canadian Mining Journal. Our present purpose is merely to draw attention to the fact that there is a new passenger and freight road to Gowganda. The Charlton route has suffered badly from congestion of freight. Both roads will be taxed to their utmost to handle the traffic.

The townsite of Gowganda is just being surveyed. Naturally no lots have yet been sold. There have been however, several fictitious sales. The unfortunate purchasers will have to be content with snow.

Meanwhile, before the exact limits of the townsite are known, many buildings have been erected. There are several hotels in full working order. Two banks are completing large log structures, their business, meanwhile being conducted under canvas. Four or five lawyers, one doctor, and several surveyors have already hung out their signs. Accommodation for man and beast is being increased as rapidly as expert bushmen can pile, log on log. A saw mill is working overtime to supply the demand for boards for flooring and sheathing.

The town is situated on the northwest extremity of Gowganda Lake. Its population may be safely estimated at from three hundred to five hundred. The daily arrivals average not less than fifty. Some of these remain in Gowganda. Others are distributed through the various mining camps that are springing into existence in every direction. The lone prospector takes his tent and supplies into the woods.

In the general vicinity of Gowganda Lake, but a trifling amount of mine development has been performed.

The camp is in the first raw stage that succeeds discovery. The deepest shaft is down not more than twenty-five feet. On many of the older properties the principal work done has been the stripping of veins and the erection of bunk-houses.

Supplies are costly, but not inordinately so. Freight is delivered from the nearest points on the Temiscaming and Northern Ontario and the Canadian Northern, over the winter trails, at the rates of three dollars and two dollars per hundredweight respectively. Hay sells for about $70 per ton in Gowganda. Bread retails at 25 cents per loaf. Other commodities bring corresponding prices.

Yet it is evident that very soon the cost of living and the prices of supplies and labor will be reduced. Proof of this is afforded by the statement that contracts have been let for shaft-sinking at rates only slightly higher than those obtaining in Cobalt.

On several mining properties visited by a representative of the Canadian Mining Journal, camp buildings had been erected. These rough, but comfortable, log structures are the first essential. Their builders are typical Canadian bushmen, French-Canadians mostly, hardy, resourceful men who appear to revel in such work. Under a competent foreman the speed with which these men construct is astonishing.

Gowganda has not yet a mining population. Indeed very few miners are to be seen, although the country is dotted with prospectors' cabins and tents. But miners are filtering in every day. Orders for machinery have already been placed and before spring there will be a considerable demand for skilled mine labor.

No one can fairly give an opinion of the district in its present condition. The country is covered with many feet of snow. Travel, except on the beaten trails, is almost impossible. Prospecting is out of the question. Of the veins discovered before the snow fell, several show high silver contents. Statements as to the horizontal extent of vein exposures cannot be checked until next summer. But it is by no means an exaggeration to say that the diabase areas of the district are well worth prospecting and that a few excellent discoveries have already been made. Indeed from a mining point of view the country offers many inducements, not only because of present showings but also because of the large future promises indicated by these showings.

So much for Gowganda itself. Gowganda's success or failure will depend very largely upon the methods of the men who exploit the region. If the district is proved and developed sanely and quietly, we believe that the chances are good that it will repay amply whatever expenditure is necessary to open it. If, on the other hand, promoters and brokers realize fortunes out of the sale of promotion stock before development is possible, then the drama of Cobalt's early days will be re-enacted.

Continual warnings are a weariness to writer and reader. They are necessary because the crop of dupes is never exhausted. We have no wish to protect the gambler in stocks. Our desire is to guard the *bona fide* investor, particularly the investor whose means are limited. We advise strongly that all investors seek the counsel of disinterested mining engineers. And in all cases where it is at all possible the investor should visit the mining property himself. It is no longer a matter of great difficulty to reach the new mining districts of Ontario and a journey of this sort is worth taking on its own merits.

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Among the most vivid impressions that Gowganda makes upon the visitor are those of restless energy, a shrewd sense of commercial opportunities, and, especially in the mining camps, unlimited hospitality. Whilst on the streets of our cities a man may die of hunger, in Gowganda no one need go without a meal. As a contrast to this milk of human kindness, a teamster will calmly ask you ten dollars for an hour's drive.

The pioneer spirit of Canadians is exemplified in the amazing speed with which a well-equipped winter road, through 70 miles of heavily wooded country, has been finished. Work was begun in the second week of January, 1909. The road was pushed through to Gowganda before February 1st.

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Gowganda may be but one section of a silver-bearing region extending far towards the west. Here is inspiration for the prospector. Gowganda may become a producer of wealth or it may prove the graveyard of hopes and reputations. It is now a realm of probabilities. The thoughtful will take pains to inform themselves at first-hand.

A NEW BUILDING FOR THE KINGSTON SCHOOL OF MINING.

The Kingston School of Mining is asking the Government of Ontario to provide the money to erect a much needed building for the Departments of Chemistry, Mining and Metallurgy. The Government aids the school by a substantial annual grant for maintenance and equipment; and from time to time special sums have been voted by the Legislature for building purposes. By this means the Mining Laboratory was built in 1894 and in 1900 the two buildings for the departments of Mineralogy, Geology, Physics, and General Engineering.

In the sixteen years of its existence the School of Mining has grown rapidly, so that it now has 292 students taking engineering courses. This number would be very much larger if matriculation were not rigidly enforced as a condition of admission. As the overcrowding in some of the buildings had reached a critical stage. it was decided several years ago to keep down the numbers in this way. But even under these restrictions the departments referred to have become so crowded that it is impossible to carry on the work with the usual practical efficiency, or even with due regard to the

health of students and instructors. The Board of Governors has therefore decided to appeal to the Ontario Government for a grant of $150,000, with which to erect a home for those departments that have done so much to develop the mineral industries of the province. A deputation of friends of the School of Mining will wait upon the Government at an early date. There will be no difficulty in getting a large and representative deputation. The work of the school is well known throughout the province, and doubtless the Government will see its way clear to return for the benefit of mining education a small part of the revenues received from mining lands.

TRAINING STATIONS FOR RESCUE WORK.

Upon more than one occasion we have alluded to the urgent need of Government Rescue Stations in the coal mining regions of Canada. A long series of calamities has aroused the United States authorities to the point of action. The technologic branch of the U. S. Geological Survey has in hand the establishing of Rescue Stations in all the larger coal mining districts of the United States. At Pittsburgh a fully-equipped station was formally opened in December, 1908. Others are being built and equipped as rapidly as possible.

At these stations squads of men from surrounding collieries will be trained on the use of breathing apparatus and in administering first aid to the injured. In this way hundreds of miners will become familiar with the use of the devices. Hence, in course of time no coal mine in the United States should be without the means of entering the mine workings immediately after an explosion and of fighting underground fires in a manner infinitely more effective than is now possible.

Apparatus, however, is not everything. Every miner should be given an opportunity of acquiring a working knowledge of the "breather." This is essential. The untrained man is worse than useless.

We regret that Canada has not, as a nation, taken the lead in this humane work. True, one Canadian company, the Dominion Coal Company, has been the pioneer for this hemisphere. But it is certainly the duty of the Federal Department of Mines to act, and that right rapidly.

We bespeak the attention of that Department and of all Canadian coal mining companies. No further lessons are needed. We can secure the means of saving lives and an almost incalculable amount of coal. Delay is dangerous—perhaps criminal.

BOOKS.

The progress of the mining and metallurgical sciences is a function of the dissemination of technical literature. Technical literature is distributed in five forms, periodicals, proceedings of societies, official geological reports, text books and trade catalogues. Periodicals embody what is most timely in current literature including much that appears in the two proceeding classes along with original articles, discussion of live topics, current news, and much miscellaneous matter. Official geological reports stand as permanent sources of reference. Text books provide a means of education in any desired department of technical work. The modern catalogue is often a mine of special information especially useful to the working superintendent.

Thus the well-stored mind must draw from all these sources. Discretion is necessary in the choice of periodicals. So far as society proceedings and geological reports are concerned the average reader takes what he can get. But the choice of text books is a weighty matter. Book reviews are not seldom mere cursory notices of the volume's contents. But, in the main, they indicate to the reader the range, scope, style, and character of the book reviewed. In all periodicals the reviews should be carefully read. Moreover mining men of all classes should add steadily to their libraries. A knowledge of books is a most desirable qualification.

THE WESTERN BRANCH OF THE C. M. I.

There is evidence of healthy interest in the western branch of the Canadian Mining Institute. The fourth general meeting was held at Greenwood on January 25. Here a civic reception was tendered to the visiting members.

The first new business undertaken was the drafting of three resolutions. The first of these was a resolution congratulating Mr. R. W. Brock on his appointment as director of the Geological Survey; the second endorsed the application of the Nelson electric zinc smelter for aid from the Dominion Government; the third approved of the step taken by the British Columbia Government in assisting the Nelson enterprise.

On the second day of the meeting several papers were read.

Apparently the mining men of British Columbia are working together in a manner that should be followed by the other provinces. There has not yet been a general Ontario meeting. Nor have the mining men of Quebec foregathered. Nova Scotia, through her own Mining Society possesses the machinery for deliberation and action upon exigent issues. But Ontario and Quebec lack that spirit of unity that is so essential when emergencies arise.

Very often it is impossible or irrelevant to bring before the Canadian Mining Institute as a whole, matters that affect deeply the welfare of one province's mining industry. Often also, prompt action is necessary. The need of strong provincial organizations is obvious for more than one reason.

We are of the opinion that this matter should be taken up seriously at the next annual meeting.

OUR VISIBLE SUPPLY OF BRICK.

M. B. Baker, School of Mining, Kingston.

The manufacture of clay products is probably the oldest industry on earth, for if we go back in thought to earliest man, we find him fashioning various articles both useful and ornamental from clay. This homely industry has been much ignored by scientific men in favor of other mineral industries that appeal more readily to the imagination, speculation, or cupidity; but the eye of the economist in all countries, is now being turned in the direction of this very old yet new industry.

In the selection of structural material we must admit that timber is already, or will very soon be, a thing of the past. Steel and iron, with various forms of clay products is now playing a most important role, but the days of cheap steel and iron will soon be over also. Even in this new American continent we can already estimate our iron ore reserves, and long before these are exhausted, the use of iron will be prohibitive, except for such purposes as will not be served by any other material. That being the case something must be found to take the place of timber and iron as structural building materials to a very large extent. That substitute will undoubtedly be clay products of various forms, including cement. Indeed this industry is already the most important mineral industry in almost every country in the world. Even in this our own Dominion, whose virgin timber is very largely untouched yet, by comparing the last mineral statistics of Ontario, whose mineral products are the most widely exploited and records kept most carefully, we can see that clay products including cement form one-quarter of the value of the whole mineral output, metallic and non-metal, and employ more men than the total metallic production.

Deposits of pure clay or kaolin, the results of normal rock decomposition, are practically unknown in Canada. Glaciation has removed our residual clays, and much of our rock materials as well, but has left in their stead enormous deposits of glacial material both sorted and unsorted. The sorted clays ensure an unlimited supply of structural material in almost every part of the country. My description of the clays will apply only to the eastern part of Canada, say east of Winnipeg. Whether it applies west of Winnipeg or not, I cannot say as I have had no work with clays west of that point. My work east of Winnipeg has extended over four years, two of which were spent in a study and report entitled "Clays and Clay Industry of Ontario for the Bureau of Mines." Report part II., 1906.

Four distinctly different clays are used in Eastern Canada in the manufacture clay products. I am not including the shales here, which are used exclusively in the manufacture of pressed brick, terra-cotta, sewer pipe, and paving brick; I refer only to the loose accumulations of clay, lying almost everywhere upon our glaciated rock surfaces. Those four clays are named Erie, Red Top, Leda, Saugeen. The Erie clay yields white goods, all the others yield red.

If a line be drawn roughly from Prescott on the St. Lawrence River in a northwesterly direction, through Perth, Ottawa, Arnprior, across the Ottawa River, it will mark approximately a former height-of-land, and the position of a great ice dam, which formed about the middle of the glacial period. The waters west of this dam were all fresh, and drained through the Hudson River Valley of New York State. East of this dam the waters were salt, and the valleys of the St. Lawrence and Ottawa rivers were filled with backed-up salt water from the Atlantic to a depth estimated at 600 feet above the present water level. The great glacial moraines were being sorted by water and west of this line we find a clay called Erie clay, high in calcium carbonate, and carrying a few fossils of fresh water organisms. East of this line, however, a contemporaneous clay, looking in every respect like the Erie, but low in calcium carbonate, and carrying only fossils of marine organisms: this clay is called Leda clay.

The Erie clay is widespread in Ontario. In Geology of Canada, 1863, we find a note on the Erie clay, as follows: "The Erie clay, with few interruptions, runs along the north shore of Lake Erie from Long Point westward to the Detroit River, and appears to underlie the whole country between this part of the lake and the main body of Lake Huron. It is again found at Owen Sound, and occurs along the Nottawasaga River, and along the shores of Lake Ontario, and as far east as Brockville." Even at that time the Erie clay had been sufficiently studied to show that it was of great extent in Ontario; but during my examination of the clay deposits of the Province, I have found the Erie clay in every county west of the line mentioned above as extending from Prescott to Ottawa, showing that the whole of Western Ontario is covered by a mantle of Erie clay which varies in depth from one foot to 130 feet, and in many places is no doubt thicker still.

The Erie clay is of a deep blue color when wet, and of an ashy-gray color when dry. It is highly calcareous, as will be seen by the analysis given below, so much so that it effervesces freely when moistened with acid. Some specimens, especially from the more westerly parts of the Province, contain as much as 30 jer cent. of carbonate of lime. Most of the Erie clays which are used in the manufacture of clay products do not exceed 18 per cent. lime, but even this is sufficient to counteract the effects of as much as 6 per cent. of ferric oxide and cause the brick to burn to ferrous compounds which give the white clay. All the white brick, white tile, hollow block, etc., made in Ontario, are from the Erie clay.

Red Top Clay.

What I have here named the Red Top clay is not a separate formation, but is simply a weathered zone on the top of the Erie blue clay. It is given a new name because it is an extremely important formation in Ontario and so far as I am aware, it has not been described before. The Red Top clay is of a dark chocolate color when wet, and is found lying immediately on top of Erie clay wherever exposed. It burns to a rich red color, instead of a white or buff color as does the Erie clay from which it undoubtedly formed through weathering.

It was formerly thought that all the red brick, tile, etc., made in Ontario, were from the Saugeen clay, or from the various shales. But this is not the case. The greater part of the red brick made in the Province, is simply the product of this upper weathered band of the Erie blue clay. The weathering extends to a very un-

even line, in some places reaching 4 feet, while in others not over a foot. The deepest spots are along cracks or joints, or following roots of weeds, shrubs or trees.

Thus we see how irregular is the contact between this Red Top clay and the underlying Erie clay. This fact leads to a great deal of trouble for those brick makers using the Red Top clay, as they are constantly digging too deeply, thereby including some of the underlying Erie clay, which causes the resulting brick to be spotted by inclusions of the white-burning clay.

From the analyses given below, it will be noticed that the lime is reduced from over 15 per cent. in the case of the Erie clays, to about 2 to 4 per cent., in the Red-top, while the percentage of iron remains about the same. The percentage of magnesia is also reduced, and the loss on ignition is also lessened from roughly 18 per cent. to about 5 per cent. All these are the result of the weathering of the original Erie clay.

With these various losses there is naturally a corresponding increase in percentage of the insoluble residues in the resulting clay. Iron oxides are insoluble in these weak solutions, therefore the percentage of ferric oxides in the new clay is a little larger as a rule. All the free silica will remain undissolved, thereby increasing its percentage in the resulting clay. Similarly with the other insoluble ingredients.

I mentioned above that the Erie clay contains much calcium carbonate. In burning this Erie clay, the calcium carbonate is broken up by heat, and carbon dioxide gas is given off, which accounts for the large percentage of loss by ignition.

In every place where the Erie blue clay is found in the Province, and exposed on the surface, a band of the Red-top clay of some thickness was found as the first mantle, varying from a few inches to 4 feet, according to the ease with which the percolating solutions could attack the clay. And in every case upon digging through the Red-top clay, the underlying Erie clay was found. We can therefore see that our supply of red-burning clay in what is usually spoken of as "Old Ontario," is quite limited, and consists of a weathered belt rarely over three feet in thickness, and on steep gradients entirely wanting. An examination of the analyses of Erie clays given below will impress one with the close similarity in their composition, though taken from wdely separated sections of the country; and when we consider the mechanical means by which these clays have been formed and collected, we are surprised that such a similarity should exist.

COMPARATIVE ANALYSES OF ERIE AND RED TOP CLAYS (LYING TOGETHER).

Locality	Clay	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	$(Na_2K_2)O$	Loss by Heat
Ridgetown ...	Erie	39.82	12.69	4.67	15.56	3.72	3.19	18.82
	Red Top	65.06	14.15	4.67	2.36	2.18	4.14	6.76
Exeter	Erie	37.72	10.72	3.51	16.90	7.05	3.06	21.76
	Red Top	63.56	19.91	6.24	1.91	2.42	3.85	5.64
Stratford	Erie	46.16	13.76	5.58	15.74	3.78	2.70	17.48
	Red Top	69.12	14.03	4.81	1.94	1.10	3.58	4.80
Waterloo	Erie	44.30	11.21	4.05	16.10	3.81	3.02	17.74
	Red Top	68.06	14.18	6.13	1.34	1.98	3.42	4.86
Preston	Erie	51.30	9.80	3.70	13.63	3.82	3.91	13.88
	Red Top	67.10	15.30	4.80	1.63	1.59	3.21	5.44
Picton	Erie	39.48	9.11	3.71	18.33	4.83	2.66	23.30
	Red Top	59.48	14.80	5.38	4.60	3.32	4.70	6.82
Beaverton ...	Erie	37.50	10.31	3.59	22.56	2.61	3.45	19.60
	Red Top	59.96	19.58	5.86	2.62	2.30	4.05	5.00
Peterboro	Erie	47.50	13.66	4.44	15.58	0.80	4.42	12.94
	Red Top	64.44	15.26	5.96	3.65	1.78	5.72	2.92
Renfrew	Erie	50.06	14.58	4.78	14.00	3.47	4.10	9.76
	Red Top	54.38	19.18	7.30	4.60	3.20	5.24	5.60
Prescott	Erie	49.85	13.10	6.18	14.32	3.13	4.14	10.28
	Red Top	55.34	19.80	7.62	2.18	2.40	5.67	5.50

Ordinary meteoric waters on meeting the Erie blue clay dissolve much of the calcium carbonate, carrying it away in solution. The same reactions apply to $MgCO_3$ but to a lesser degree. Thus we have the resulting weathered Red-top clay, much reduced in lime and magnesia and with a corresponding diminution in the amount of loss on ignition.

The iron which was present in the Erie clay is therefore still present in the Red-top clay, and being no longer counteracted by the high percentage of lime, it is able to burn to the ferric state, thereby coloring the brick red.

The Leda Clay.

Turning now to the eastern part of Canada we find that east of the line described above, the clay is entirely different from that west of the line. It is a stiff blue clay, which would be readily mistaken for Erie clay. Upon examination, however, it is found to be very different, e.g., the percentage of CaO is the most noteworthy point, it rarely exceeds 6 per cent., and since the percentage of iron oxide is about equal, the burning of this clay yields ferric compounds instead of ferrous ones, and the products are therefore red in color instead of white, as in the case of burned Erie clay. This Leda clay is contemporaneous in age with the Erie, but as has been pointed out above, it was laid in salt water instead of fresh. In some places it reaches a depth as great as that of the Erie clay, e.g., at Ottawa, where the foundations were being dug for the new geological museum, an exposure of blue Leda clay was very like the great depths of Erie clay in the west. I visited these excavations on two occasions, and the contractor told me that after digging twenty feet without finding rock bottom, he had bored 94 feet and still failed to find rock. The eastern part of Canada is therefore ensured an unlimited supply of red-burning clay, but lacks the white-burning clay.

I give below a few analysis of Leda clay, and a glance is sufficient to show that it differs essentially from the Erie clays of Western Ontario.

ANALYSES OF LEDA CLAY.*

Locality	Clay	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	$(Na_2K_2)O$	SO_3	Loss by Heat
Arnprior	Leda	57.98	19.00	6.18	3.78	3.82	5.68	0.35	3.18
5 miles east Arnprior	Leda	62.06	15.54	5.70	4.91	3.11	4.30	0.14	4.01
Ottawa East	Leda	58.54	17.02	5.48	6.36	2.22	5.13	0.56	3.42
Ottawa West	Leda	56.00	17.07	8.27	4.17	4.55	4.38	0.59	4.89
Hull	Leda	52.86	17.42	8.58	3.69	3.37	4.97	0.58	5.65

Saugeen Clay.

The last of our clays mentioned above, is the Saugeen. It lies unconformably upon both Erie and Leda clay, and in many places in the northern parts of Canada lies directly on the glaciated surface of the rocks. Starting at the St. Lawrence River somewhere about the mouth of the Ottawa, if we follow the river upwards to Casselman, Ottawa, Pembroke, then cut across country to Bracebridge, Paisley, Hepworth, Walkerton to Georgian Bay, then take the north shore of Lake Huron and Superior to the Soo and Fort William, then extend on to Dryden, Kenora, etc., we will have a rough line which will mark approximately the southern border of the great Saugeen clay belt.

This clay is composed of a great number of alternate bands of "fat" clay with bonds of calcareous sand, or some places, even marl. The bands of clay and sand are rarely over three-quarters of an inch thick, but this relationship is repeated so many times that banks of Saugeen clay twenty feet thick are a common occurrence and present a very unique appearance. All the Saugeen clay seen in the Province lies north of this line mentioned above, and the farther north we go, the more abundant is this clay. I have seen it from Kenora to the St. Lawrence River, and for 100 miles north of Lake

Abitibi. The great "Clay Belt" of Northern Ontario, of which we have heard so much in recent years, is composed of this clay, and the layers of sand are the immediate cause of the sandy, loamy nature of the soil of this new country, which will soon be one of our greatest agricultural districts, now that railways are built and building into that district.

In age, I would place it at the close of the glacial period, for it appears to have been formed from the flow and ebb about the edge of the retreating or melting glacier, and each two bands, i.e., a band of clay with a band of sand, together represent the accumulation for one season. During the summer or warmer months, the increased flow of water carried the clay farther out, and the sand would be deposited closer to the ice margin. In the winter or colder months, when the flow of water was lessened, a layer of clay would be deposited over the sand, and this was repeated year after year, for many years, as shown by the great number of bands in this accumulation. This process would be gradually carried back in a northerly direction as the ice-front slowly retreated and in this way we find the deposits thicker and more widespread as we go north. The few stones found in this clay—and they are extremely scarce—would be caused by small pieces of floating ice, dropping imprisoned stones upon melting.

The Saugeen clay yields a splendid red brick on burning. The percentage of Fe_2O_3 is greater than that of CaO and a good red brick results. From analysis given below it is quite evident that this clay differs entirely from either the Erie or Leda clay.

SAUGEEN CLAY.*

Locality	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	$(Na_2K_2)O$	Loss by Heat
Sault St. Marie	64.30	15.45	5.22	3.42	2.02	5 23	3.89
Spanish River	61.40	17.08	6.34	2.66	3.35	4.68	4.52
Sudbury	63.20	15.75	4.67	4.32	2.73	4.71	4.35
North Bay	64.08	17.21	5.40	2.34	2.75	4.91	3.90
New Liskeard	58.30	15.70	5.41	5.10	3.27	4.77	7.30
Sturgeon Falls	65.08	14.83	3.17	4.18	2.57	5.00	5.10
Bracebridge	63.00	15.15	6.28	3.48	2.67	5.75	3.63
Pembroke	62.30	16.51	5.65	3.16	2.68	4.91	3.60
Casselman	61.20	16.40	6.25	3.10	3.25	4.26	4.94

To sum up, then, we see that Eastern Ontario, and Quebec, has an endless supply of red-burning Leda clay, and no white-burning clay. Western Ontario has a like supply of white-burning clay, with only a very little red-burning weathered Red-top clay. Northern Ontario and Quebec has an endless supply of red-burning Saugeen clay and little or no white-burning clay.

*Note.—All these analyses were made at the Provincial Assay Office, Belleville, by Mr. A. G. Burrows, for Report of Bureau of Mines, 1906.

PRESSURE IN THE FORMATION AND ALTERATION OF COAL.

By D. B. Dowling.

Very little attention has been given to the study of the history of coal beyond, perhaps, microscopical examinations, in which traces of spores and cells of various plants have been found, and these, associated with the plant remains or impressions in the associated rocks, have been the criteria for the general deduction that most of the coal had its origin in plant remains. The alteration of this material beyond the humification stage found in peat bogs has not been extensively studied, and the results appear to have been summed up in the statement that the transformation into coal was due to pressure and heat.

The general impression that there was a great loss of gases from the mass is shown in the following quotation from Prof. Gwillim's paper *"Notes on the Life History of Coal Seams":—

"In the change from bituminous coals of, say, 25 or 30 per cent. volatile matter to 8 or 12 per cent. volatile matter; there must have been a great volume of gas disposed of. It may be possible some of this becomes a solid. In any case, what becomes of the volatile matter of a coal formation carrying in the aggregate 100 feet of coal?

"A reduction of volatile matter from 25 to 10 per cent. would mean, in such a case, 15 million tons of gas per square mile, which, figured out in volume, would be as astonishing a loss as natural gas is as a find."

This conception is based upon the experiments of heating coal in the laboratory, when the change in composition is shown by the different amounts of gas given off under atmospheric pressure. But what would happen were the coal heated under great pressure?

A probable solution is given in recent experiments on peat, which indicate not a wasteful production of gas, but a rearrangement, in which water is the principal by-product. The first experiments—which are continued to the present day—were confined to the drying of the raw material.

Subsequently an attempt was made to improve the heat value by carbonizing or charring. This produced a better fuel, but much of the volatile combustible matter was driven off, and the attempt to make fuel out of the peat necessitated the waste of gas specified in the paragraph quoted.

A later investigator, Dr. Ekenberg, added pressure to the wet mass during the charring process, and he claims that by this process there is no loss of gas, and attributes the charring or blackening results to a chemical change by which water is liberated, and hydrocarbon compounds formed containing more carbon as the pressure and temperature are increased. Under temperatures from 150 to 250 degrees Centigrade, and pressures to prevent the formation of steam, a product was obtained which, when dried and pressed, resembles coal, and has the characters found in lignite and bituminous coals.

That there was no gas evolved in this process seems at first sight unusual, but it appears to be a fact, deduced from the chemical analysis of peat, such as some of the Swedish ones—for example, one having the following composition:—

Carbon	41.8
Hydrogen	7.3
Nitrogen	0.8
Oxygen	46.9
Ash	3.1
	100.0

*Journal Can. Mining Inst., Vol. VIII., 1905, p. 239.

Supposing the above to represent 100 lbs., we add more peat until we have 61.9 lbs. of carbon, then the mass will eventually contain the following constituents in a mass of 147.8 lbs.:—

Carbon	61.9
Hydrogen	10.8
Nitrogen	1.1
Oxygen	69.4
Ash	4.6
	147.8

This, when treated so that the residue has 61.9 per cent. carbon, would mean that 47.8 lbs. were excluded. If this is water, then it represents hydrogen 5.3 and oxygen 42.4, which, deducted from the above, leaves a solid compound constituted as follows:—

Carbon	61.9
Hydrogen	5.5
Nitrogen	1.1
Oxygen	26.9
Ash	4.6

A briquet of peat-coal from similar peat is reported to yield by analysis the following composition:—

Carbon	61.9
Hydrogen	6.8
Nitrogen	1.2
Oxygen	27.1
Ash	3.0

If this were from the same peat, we would have to assume a slight formation of carbon monoxide gas to make the analysis exactly similar, but it is hardly necessary.

A higher temperature and pressure has been used by the operator, resulting in the formation of a coal richer in carbon to about 65.9 per cent. Expanding our analysis of peat to the higher percentage of carbon as before, and extracting water as before, we get for this carbon content the following theoretical analysis, parallel with the published analysis of the peat and briquet:—

Theoretical.		Peat.-Coal.	
Carbon	65.9	Carbon	65.9
Hydrogen	5.1	Hydrogen	5.8
Nitrogen	1.1	Nitrogen	1.1
Oxygen	23.1	Oxygen	24.0
Ash	4.8	Ash	3.2
	100.0		100.0

This peat-coal analysis shows a variation which could possibly be found among the briquets from the test, and seems to point to the truth of Dr. Ekenberg's statement that there was no gas formed. These briquets are certainly approaching the true coal stage; in fact, this last analysis could be almost duplicated in a coal from Gallup, New Mexico.

It is quite possible that to conduct these experiments with higher carbon content would entail very great pressures and temperatures, above the resistance of a crucible; but the question is, does this series of theoretical analyses obtained by the extraction of water lead us through the similar analyses we get from coals? One example might be calculated for a carbon content of 82.41, which is found in a certain coal from West Virginia:—

Carbon	82.40
Hydrogen	4.30
Nitrogen	1.04
Oxygen	5.20
Ash	5.06
	100.00

The theoretical composition of the peat—expanded as for the first, and taking out water for this carbon content—would be:—

Carbon	82.41
Hydrogen	3.69
Nitrogen	1.40
Oxygen	6.5
Ash	6.0
	100.00

This, in theory, is readily seen to be a very similar product, so that although we cannot apply the great temperatures, we can assume that moderate temperatures with long lapse of time when subject to great pressures, may be the equivalent of the high temperatures and pressures indicated in the above experiments, and assume that like changes had occurred in nature in the formation of the coals. No thoroughly impermeable enclosure is provided for any of the seams, and possibly no coal has been formed without some loss of gas; but there appears to be no reason to suppose that very large quantities were thus lost. If, for instance, there had been no loss of gas from the lignites, it is conceivable that these coals would be easier to briquet, or coke. It also follows that compounds formed as the result of great pressure would be less stable than those requiring lower pressure. Thus, when released from load, the lignites would not so easily throw off gas as the bituminous. If we infer that the higher the carbon content the more liability to have gas in the mine, we would be right—up to a certain point. When through small losses of gas and the using up of the oxygen and hydrogen in the production of water, this tendency is checked in the mines in which the coal is anthracite, a rapidly declining amount of gas is given off.

It is evident, therefore, that there is some relation between the pressure under which the coal was formed and the stability of the resultant compound. Up to a certain point the stability decreases with the increased pressure, after which it increases.

The most unstable compounds would then be in the coals between the lignites and anthracites; the increase in stability being more rapid through the anthracitic coals. The greatest liability for gas would seem to be in the higher bituminous or high carbon bituminous coals.

There have been accidents in the mines in the working of this hard bituminous coal which would suggest that portions of the coal were at such a critical pressure stage that when released from load the unstable compound exhibited almost the character of an explosive. There are well authenticated examples of slight shocks, such as the stroke of a pick, or a light shot—producing a "blow out" of large dimensions, with disastrous results to life. This might be caused by a disruption of the hydro-carbon compounds, whereby a new coal compound was formed of a more stable nature; but with a loss of volatile matter or gas in sufficient volume to raise the pressure suddenly and furnish the mechan-

ical force necessary to dislodge other portions of coal. With the liberation of the gas and formation of a new coal compound the latter would not be compacted, but would blow out with the gas, as dust.

It is not at all certain that gas can be generated without the solid particles of coal being expelled along with it in the form of dust of different grades of fineness.

A VISIT TO THE MINERAL DISTRICTS OF CANADA.

Paper Read Before the Institution of Mining and Metallurgy.

By William Frecheville, Past President, and Hugh F. Marriott, Member of Council.

(*Continued from last issue.*)

From Moose Mountain we went on to the copper-nickel mines near Sudbury. We commenced there by inspecting the very fine smelting works at Copper Cliff, belonging to the Canadian Copper Co., a subsidiary of the powerful American corporation called the International Nickel Co., which, besides owning most of the producing mines at Sudbury, also owns the Orford Copper Works in New Jersey and a number of the principal nickel mines in New Caledonia, which latter, however, are not being worked at present.

The smelting works at Copper Cliff have quite recently been reorganized and brought up to date, and give the impression of embodying the best that money and present technical knowledge can produce. There are three large blast furnaces with a daily capacity of 500 tons each, and it was stated that about 1,000 tons of ore were being smelted per 24 hours.

Part of the ore is roasted in heaps, and then smelted with a certain amount of raw ore, forming a smelting mixture requiring only a small and occasional admixture of quartz or limestone. The consumption of coke is said to be about 10 or 11 per cent. We understood that not long ago an attempt was made to introduce pyritic smelting, but without success.

The ore smelted contained, we understood, about 6 per cent. copper and nickel, say roughly half of each, and was concentrated up to a 30 to 35 per cent. matte. The matte is tapped into ladles and taken to converters, where it is blown up to about 80 per cent.; this rich matte is sent to the Orford Copper Works in New Jersey for further treatment. The reasons were mentioned for stopping the bessemerizing at this point, one being that, if carried further, the issues by violatilization would be heavy, and the other that such a matte can be imported into the United States as raw material.

From the smelter, a short run on the railway belonging to the company took us to the Krean Hill Mine, one of the important mines which are now supplying ore to the smelter. The Krean Hill Mine, like the other important deposits in the district, is situated at the edge of an intrusive rock of the greenstone type called norite (quartz-hypersthene-gabbro).

The ore occurs as splashes and bunches of copper pyrites and nickeliferous pyrrhotite in the norite, and it is generally supposed that these ores were original constituents of the fluid magna out of which they separated on cooling. Granting that hypothesis, the appearance of the mine suggested very clearly that this mode of formation has been plentifully supplemented by secondary action, depositing the ore along slip-planes, cracks and fissures. The run of ore-bearing ground is said to have a width of about 200 feet, and, it is said, do not yet know what width they will ultimately find profitable to take out. Underground work is going on at two levels underneath the opencut, which are served by an underlay shaft which goes down in the footwall at an angle of about 60 degrees. An electric winder is used.

The ore broken in the mine is hand-sorted, hoisted to the top of the rock-house, crushed in jaw crushers, and then hand-picked as it travels on rubber belts. About 50 per cent. is said to be picked out, the waste averaging about 2½ per cent. of copper and nickel, and the ore which goes to the smelter about 6 per cent., which is made up of about 4 per cent. of nickel and 2 per cent. of copper. According to these figures, the ore as mined should contain about 4.25 per cent. of copper and nickel.

We walked for some little distance along the outcrop of the run of ore-bearing norite and were interested to see the rock smoothed by glacial action and showing a little gossan, but not so much as one would expect to see on the outcrop of such an ore body. The gossan showed no sign on the surface of either copper or nickel, and where it was being dug into, at only two spots was a little green carbonate of copper noticed.

As illustrating the importance of the Sudbury copper and nickel industry, it may be mentioned that, in 1907, 359,076 short tons of ore were smelted, and the shipments of matte contained 6,996 tons of copper and 10,095 tons of nickel.

From Sudbury we passed through the beautiful rugged scenery skirting the northern shores of Lake Superior, and leaving this great waterway at the grain ports of Fort William and Port Arthur, we passed out of Ontario and arrived at Winnipeg. This town is the centre of the agricultural area of the Dominion; its streets are extremely wide and well paved, and palatial offices and stores stand alongside of little tumble-down wooden structures which were put up when the town was first located.

The journey through Manitoba and Saskatchewan was a long vista of open prairie covered with farms, on which, for hundreds of miles, the wheat stood in stacks ready for the threshing machine. Leaving Winnipeg, the next halt was made on the borders of Alberta, at Medicine Hat, and it was here that we had our first introduction to the extensive occurrence of natural gas, which has done so much for this continent.

Mr. Eugene Coste, who has long been associated with the industry in Canada, was with us throughout the trip, and gave us very useful information on the occurrence and development of this phenomenon. His theories are at variance with those which have generally obtained as to the origin of mineral oil and natural gas. He contends that they are of igneous origin, and not, as has been hitherto supposed, due to vegetable and animal matter. The results of his experience and his successful practice are certainly strong arguments in favor of the views which he has set forth in detail in Canadian Mining Intstiute papers.

At Medicine Hat the Canadian Pacific Railway have

sunk a hole alongside the line to a depth of 1,050 feet to the main reservoir tapped. The capacity of the daily supply was 1,500,000 cubic feet, and, using 300,000 cubic feet per day, the pressure at the mouth of the hole was 550 pounds to the square inch. From this well they are now supplying for lighting and heating purposes, firing their boilers in the railway shops, and using the gas locally for all purposes where fuel is required.

Small high-pressure mains are laid alongside the line, and the gas is charged in the train cylinders direct for burning in the carriage lamps. We also inspected a hole that had just been compelted by Mr. Coste some distance from the above. This hole was put down about the same depth to strike the same gas-bearing stratum.

Gas was turned on to full blast into the free air for our edification. Coming through a small delivery pipe in volume amounting to 1.000.000 cubic feet in 23 hours, the roar is such that the drums of the ears are endangered unless tightly closed or protected by plugs. The gas was then lit, and produced a torchlike flame 50 feet into the air.

The method of sinking these holes is by cable drills; the casing follows the boring tools closely down until the gas reservoirs are struck. A smaller pipe is then lowered into the holte and the intervening space securely plugged with rubber packing near the btootom of the hole. The gas then be shut off to be used as required, and the pressure, when the flow of gas is arrested, in some caess reaches 1,000 pounds to the square inch. The life of a hole is a very indeterminate quantity, and the supply may give out in a matter of months or last for years.

From Medicine Hat we proceeded to Frank, and inspected the landslide which took place on the 29th of April, 1903, in which a portion of Turtle Mountain broke away from the summit and was carried across the intervening valley and up the opposite hillside, burying the river, the coal mine and part of the town of Frank en route.

The mountain consists of paleozoic limestone thrust over cretaceous shales. In the latter is a coal seam, the mining of which probably caused a weakening of the base of the afterwards displaced rock, and the presence of a fault plane and other natural causes combined to effect the dislodgment.

The extreme longitudinal limit of the slide was 2½ miles. The height of the peak of the mountain over the river bed was 3,000 feet, the upper part of the surface being at an angle of over 45 degrees, so that the impetus gained in the descent was immense.

The rock mass that broke away was over 400 feet thick, and measured half a mile square. After re-deposition it covered a square mile of area. Huge boulders were transported with apparently little detrition, and the smaller pieces, though showing many signs of impact one with another, presented sharp angular surfaces, as if occasioned by a fresh break. Several curious phenomena in connection with the adjoining town are worthy of note as assisting any theories on the great distance of transport of this rock; for instance, cases are quoted in which human being were conveyed out of their houses for considerable distances compartively unhurt.

The whole appearance of the phenomenon led us to the opinion that the transported rock had practically floated on a wave of highly compressed air to the position in which it was redeposited. This theory appeared the more justified when there were noted in various eruptions simulating the form of volcanoes which had been subsequently blown up through the mass of detritus by the imprisoned air below.

From Frank we proceeded into the coal country of the Rocky Mountains on the borders of Alberta and British Columbia. We inspected the surface plant of the International Coal and Coke Co., and the Hosmer Mines, and then continued to the town of Fernie and visited the works of the Crow's Nest Pass Co.

The coal-bearing series in this district are in the cretaceous formation, which lies directly on Devono-carboniferous limestone. The formation is traversed by longitudinal faults and tilted up by the earth movements, which have formed mountain ranges. The coal varies from lignite in the eastern or less disturbed part of the district, to heard steam coal in the centre and west of the range, where greater pressure has been exerted. The town of Fernie had been completely burned down by a forest fire a month before our visit, but wonderful progress had already been made with the work of rebuilding.

The next place visited was Moyie, on the banks of the picturesque lake of the same name. Here are situated the St. Eugene lead mines, which belong to the Consolidated Mining and Smelting Co. of Canada, the head office of which is at Toronto, and which also owns the Centre Star and War Eagle mines at Rossland, and the Trail smelter. The mineral vein exploited outcrops up the mountain to a height of 1,800 feet, and is opened to a depth of 750 feet below the lake level.

The lode formation is decidedly curious, in that there is a main lode, and a parallel lode or lodes, and curious branches or cross lodes, locally called "avenues," running between the two, which also carry ore and are very material contributors to the output. The ore is concentrated in a mill on the shore of the lake, very much on the usual lines, jigs being employed for the coarser sizes, Wilfley tables for the finer, and Frue vanners for the slimes. Several Callow shaking screens are in use, which are said to be giving satisfaction.

According to the information given, they are putting through from 500 to 600 tons of ore a day, and producing about 80 tons of concentrates containing 60 per cent. elad, and 25 ounces of silver per ton. The concentrates are shipped to the Trail smelter.

Enticed by the good values obtained by the company, some adventurers acquired from the Government the mining rights under the lake, and discarding the usual method of sinking caissons and tubbing, where water is concerned, they proceeded to build a two-compartment shaft on a staging constructed some distance from the shore, and added on their sections, sett by sett. depressing the shaft into the water by means of superincumbent weights. The shaft, when we saw it, had been firmly driven into the mud bottom; the next move in the operations has not yet been decided upon.

From Moyie we went by train and steamer along the Kootenay Lake to Nelson, thence by train to Trail, where we were conducted over the well-known smelter, where both lead and copper ores are treated. The copper furnaces are 22 or 23 feet long, and 40 inches wide, and put through from 500 to 600 tons a day each. The ores are mixed as much as possible, so as to give a smelting mixture, and but little flux has to be added. The charge carries about 40 per cent. of silica. The matte from the first smelting is granulated and roasted in O'Hara furnaces, sufficient sulphur being left to allow the material to agglomerate in Huntingdon Heberlein pots.

The lead ores are also roasted in O'Hara furnaces, and then treated in Huntingdon Heberlein pots, and smelted in a blast furnace. The lead is refined electrolytically by the Bells process, being cast as anodes in

suitable form, and being suspended in a bath of hydro-fluo-silicic acid. The lead is dissolved and re-deposited in pure lead sheets, and all impurities, including silver, fall to the bottom as a black slime. Lead thus obtained is 99.99 fine.

From the Trail smelter we went on to Rossland, where we divided into several parties and visited some of the principal mines, such as the Le Roi and the Centre Star.

At the Le Roi we were taken to the 1,650 foot level, and saw a good-looking bunch of ore, on which, however, as yet, not much length has been proved. It was understood that this point was somewhere about 300 feet from the Centre Star property, and that in that mine, at about the same level, a good body of ore extends nearly up to the boundary.

The ore produced at the Le Roi mine last year averaged 0.98 per cent. of copper, 0.29 ounces of gold, and 0.44 ounces of silver, equal to an average value of $10.49 per ton. It appears that the main vein in the Le Roi became poor at a depth of about 900 feet, but that values have been found again on a parallel south vein below this depth.

In the Centre Star Mine the same experience seems to have been passed through, the main vein, on which thre were two makes or shoots of ore, becoming impoverished in depth; but values have made again on the south vein, more or less opposite to and below the ore above.

The ore bodies, where we saw them in the Centre Star Mine, were of good size, one being about 250 feet long and about 25 feet wide. The country rock is grano-diorite, and the vein filling appears to be altered country rock carrying iron pyrites, both plain and magnetic, a little copper pyrites, and some silver and a little gold.

At Rossland we were entertained at a banquet given by the local members of the Canadian Mining Institute, the citizens of Rossland, and the Rossland Board of Trade.

From Rossland we proceeded to Greenwood, and visited the mine and smelter belonging to the B. C. Copper Co. The mine is on what is known as the Mother Lode, and is exploiting a large body of ore about 150 feet wide, having a known length of about 1,200 feet. The hanging wall is of greenstone and the foot wall limestone.

The ore appears to be altered greenstone, in which spots of iron pyrites with a little copper pyrites here and there occur. The value is said to run from 1.5 to 1.75 per cent. of copper and about $1.50 in gold and silver.

That it should be possible to work commercially such an ore indicates the very favorable conditions that exist. The workings are partly opencast and partly underground, and no timbering is used, the ore being worked out in chambers, leaving intervening pillars. The ore is self-fluxing.

An output of about 1,600 tons a day is being made from the Mother Lode, and about 400 tons a day are obtained from other mines, so that the tonnage smelted amounts to about 2,000 tons a day. The smelter is situated about four miles from the mines. There are three furnaces 20 feet long by 4 feet wide, putting through a little over 600 tons a day each. About 12½ per cent. of coke is used, costing $6.50 per ton. The matte runs from 45 to 50 per cent. of copper, and is bessemerized and the black copper shipped.

The next mine visited in the district was the Granby, which conducts one of the largest low-grade mining and smelting operations in the world. The plant is now being increased to treat 5,000 tons a day. The ore dips at about 40 degrees, and several drives are made on each level, from which the stopes are carried up at an artificial angle to enable the material to be run into the trucks by gravity.

The operations here consist of blasting down the ore, which gravitates into the trucks and is drawn out of the mine by electric traction. It is then run on a down grade to the smelter, and, passing through jaw crushers, four of which deal with the entire output, it is mixed with coke and dumped straight into the furnaces.

The ore, which contains 1.5 to 1.75 per cent. copper and $1.50 in gold and silver, is entirely self-fluxing, and it is due to this natural advantage that this extremely low grade is profitably worked.

The smelter is at present doing 3,500 tons a day. There are eight furnaces, 14 per cent. of coke being added to the charge. The resultant matte is 40 to 45 per cent.; the slag, which contains about 0.3 per cent. copper, carries 45 per cent. silica. The Bessemer process completes the operation necessary to turn out marketable copper.

An interesting detail with regard to the furnaces here was the system of charging; the trucks containing the various materials are run right into the furnace, there being auxiliary wheels on the upper part of the sides of the trucks, which engage with rails on the furnace walls. They say they mine the ore in the morning and send the copper away as 99 per cent. black copper in the evening, and although this may perhaps not be strictly accurate, it substantially illustrates the unusual simplicity and celerity of the operations.

We returned to Nelson, and were taken by steamer to the Bluebell Mine, which is a low-grade lead, zinc and silver proposition. There are three successive ore bodies which, from the shape of the stopes, appear to be in the nature of large lenses. Some fine specimens of reef gold were shown us as coming from Sheep Creek in the vicinity of Nelson.

From Nelson we proceeded to the coast via Revelstoke, passing through Vancouver without stopping, but going on direct by boat to Victoria, where we were most comfortably housed in the Empress Hotel, belonging to the Canadian Pacific Railway.

The day after our arrival we attended a meeting of the western branch of the Canadian Mining Institute in the Parliament Buildings, the meeting being preceded by short addresses of welcome by the Hon. Mr. McBride, Premier of British Columbia, and the Hon. Mr. Templeman, Minister of Mines in the Dominion Government. The chairman of the western branch, Mr. A. B. W. Hodges, then read an able and interesting paper on the Granby mines and smelter, of which large enterprise he is the general manager. The meeting was in every way a bright and succesful one. In the afternoon we attended a garden party given by the Governor of the State.

We spent the next day in Victoria, and in the evening attended a reception given in the Parliament Buildings by the Premier, the Hon. Mr. McBride.

From Victoria we went on to Nanaimo to visit the coal mines there, and on the way our train was stopped a short time to enable us to take a hasty glance at the Tyee smelter, favorably situated on the seashore, with convenient wharf facilities. This smelter, which has one furnace with a daily capacity of 300 tons, is now dependent on custom ores, and at the time of our visit a cargo of copper ore from some new mines which are being opened out by a Japanese company on Charlotte Island was being smelted.

The chief coal properties on Vancouver Island are owned by Hon. James Dunsmuir, who is at present Governor. We did not, however, go to any of his mines, but inspected the surface plant of the Western Fuel Co. at Nanaimo, but did not go down the mine.

An interesting side excursion was made at the latter place to a branch of Nobel's dynamite works, which has a capacity of 500 cases a day.

We returned to Vancouver on September 25th, and, after having been shown round Stanley Park, which, except for California, has the largest trees in existence, a farewell luncheon was given us by an influential gathering of Vancouver citizens.

In the evening we left Vancouver at 5 o'clock and started on the homeward run to the east, halting the next evening at Banff, where we spent the following day, and had an opportunity of seeing the grand mountain scenery which surrounds this most beautiful spot, of bathing in the sulphurous waters of the hot springs, and of visiting the Bank Head Collieries near by, which are being worked by the Canadian Pacific Railway. This is an anthracite mine, and forms a northern extension of the coal country referred to at Fernie. A large proportion of the product is made into briquettes by mixing the fines with 9 per cent. coal tar pitch.

From Banff we continued east to Calgary, which is situated in the prairie country, within sight of the Rocky Mountain range. Here we were given a glimpse of the real Wild West in relation to the cattle-raising industry. Mr. P. Burns, whose names in foremost on the ranches of the West, had gathered together the champion riders among the cowboys, and we witnessed some remarkable feats of endurance in the struggle for mastery between these seasoned horsemen and the "outlaws," which name is given to the incorrigible buck-jumping horses. We were also given a realistic exhibition of the method of lassoing, throwing and securing wild steers by these same cowboys, and a fitting conclusion was put to an exciting entertainment by the unrehearsed effect of a liberated steer charging the assembled company, fortunately without serious results.

Thus our most instructive, entertaining and enjoyable trip came to an end. The majority of the members continued eastwards in the special train, while others branched off in various directions to their work or to visit other camps.

The impressions we received of Canada as a whole were most favorable, and this remark applies also to the country as a field for mining enterprise.

It appears to us the natural resources offer abundant opportunity for development, in which English capital might be profitably employed. Results in the past, it is true, have not been uniformly encouraging, but this was probably more due to the methods adopted than to an absence of conditions for profitable working.

American capital appears to have been more successful than English capital in Canadian mining, and it is not difficult to understand this when it is considered that one can get on the train at Montreal or Toronto in the evening and be in New York the next morning.

English capitalists would, we believe, stand a much better chance of securing some of the good things as they come along if, instead of waiting to have things brought to them in London, they had an agent or representative resident in Canada. New developments and discoveries are, in our opinion, sure to occur from time to time, and we think this prospect, together with the chances of participating in the development of already existing enterprises, should be sufficient inducement to English capital to give more attention to Canadian mining than hitherto.

We cannot conclude these notes without paying a very warm tribute of thanks and kindly feeling to our Canadian hosts and brother engineers for their great kindness and hospitality. They treated us well, made us welcome, and gave us a unique opportunity of obtaining a birds'eye view of the present state of the Canadian mining industry.

MINE ACCOUNTING.

Written for the Canadian Mining Journal by John G. Grant, B.A.*

I.

I have been asked by the Canadian Mining Journal to write a series of articles dealing with the simpler phases of accountancy, showing their application more particularly to bookkeeping for mining companies.

In the effort to abbreviate and simplify my articles, some ideas which appear of considerable importance to my readers may be slurred over or entirely neglected. For this reason a careful and studious reading of these papers, accompanied by honest criticism, will be heartily welcomed, and such criticisms will receive careful attention and an answer either by letter or by inclusion in some succeeding article.

The great majority of enterprises to-day in Ontario, involving a considerable amount of capital, are incorporated under the provisions of the Ontario Companies Act. A good working knowledge of this Act is, therefore, almost, or quite, indispensible to the modern business man in this province. With this idea in mind, we will follow a company from its inception to the commencement of operations, through the Companies Act touching on the more important requisites. It must be noted that a statutory requirement is never a matter of choice, but a hard and fast rule, a transgression of which will always be accompanied by some penalty provided for by the Act.

In determining the amount of capital stock to be asked for in the petition reasonable care should be taken. A company with a huge capitalization, unless it can be shown that an enormous working capital is necessary, or the value of the properties to be purchased is very great, becomes a subject of natural suspicion in the minds of foreign and home investors. But, notwithstanding this fact, the capital must be large enough to provide for the purchase price of the property, the commissions on the sale of stock and still leave sufficient working capital to buy the necessary plant and develop the property until it is on a revenue earning basis. It is customary and conservative to set aside unsold a certain proportion of the capital stock as treasury stock by the sale of which the working capital can at any time when the need arises be supplemented. In the interval while it remains unsold no dividends will be paid on it, thus raising the average dividend on the other stock.

Having fixed on the amount for which the proposed company is to be capitalized, the Lieutenant-Governor, through the Provincial Secretary, is petitioned to grant letters patent. The petition must contain the proposed name of the company, the objects for forming the com-

*Chartered Accountant, Toronto, Ont.

pany, the address of the proposed head office in Ontario, the amount of capital and number of shares, the name in full, calling and address of each of the applicants, of whom there must be at least five, and the names of at least three provisional directors. This petition must be accompanied by a memorandum of agreement showing the number of shares subscribed for by each applicant following his own witnessed signature. Each petitioner must be a bona fide holder of shares mentioned in the memorandum of agreement. Accompanying the petition there must be a marked cheque payable to the Provincial Secretary, covering the amount of the fee for letters patent. A schedule of the rates charged at present is as follows:—

SCHEDULE OF RATES.

Minimum Amount of Proposed Capital.	Maximum Amount of Proposed Capital.	Fees.
Up to	$ 40,000	$100.00
$ 40,000	100,000	100.00 and $1.00 for every $ 1,000.00 or part from $ 40,000,000 up.
100,000	1,000,000	160.00 " 2.50 " 10,000.00 " " 100,000 00 "
1,000,000	Up	385.00 " 2.50 " 10,000 00 " " 1,000,000 00 "

After the company obtains the letters patent applied for, it is in a position to offer to the public for subscription its shares of capital stock. It has been found expedient in some cases to advertise the offering of such stock by means of publishing prospectuses in the newspapers or by pamphlets distributed through the mails. Too much care cannot be taken in the preparation of such advertisements. A prospectus must contain the names of the signers of the memorandum of agreement, with the number of shares subscribed for by each, the number of shares necessary to qualify as a director and provisions (if any) for their remuneration; the names, addresses, and calling of directors; the minimum subscription on which the directors may proceed to allotment; the amount payable on application and allotment for each share; the amount allotted at any previous time; the number of shares issued or to be issued as fully paid up which have been paid for other than by cash; the names and addresses of the vendors of the property to be operated by the company and the manner of payment for the property; the amount paid or payable as commission; the amount paid or to be paid for preliminary expenses; the promoters' remuneration; particulars as to any special contract entered into and the place where the contract is fyled; the name and address of auditors; and the interest in the company held by directors. When the prospectus is published in a newspaper the first requirement re the subscribers to the memorandum of agreement may be omitted. All moneys resulting from such advertisements shall be held in trust until deposited in a chartered bank to be held there in trust until the company may commence business.

After the minimum subscription has been received a declaration must be fyled with the Provincial Secretary that shares have been allotted to an amount not less than the minimum subscription mentioned, and that every director has paid in cash a proportion equal to the proportion payable on application and allotment by other subscribers. The Provincial Secretary will then give the company a certificate entitling them to commence business.

At least one month after the certificate has been received, and not less than three months after, a general meeting must be held, at which a report certified by at least two directors shall be presented. This report must contain the total number of shares allotted as fully or partly paid up otherwise than in cash, and the consideration for such allotment; an abstract of receipts and payments on capital account and a statement of preliminary expenses; the names and addresses of the directors, auditors, manager, and secretary, and the particulars of any special contract requiring ratification or discussion. The statements relating to cash and capital account should be certified by the auditor and fyled with the Provincial Secretary. A list showing the names of all shareholders' addresses, etc., and number of shares held by each should be accessible to any shareholder during the meeting.

To take care of all these transactions dealing with the capital stock certain books must be kept. One of these is a plain ruled book called the Minute Book, wherein are kept the minutes of the above-mentioned meeting and all subsequent meetings, both of directors and shareholders. In this book should be pasted a copy of the letters patent. Books ruled as below must be kept to record the names of all persons who are or have been shareholders, the address and calling of each shareholder, and the name, address and calling of each directors, with date of beginning and ending of his holding office as director:—

LIST OF SHAREHOLDERS

DATE	NAME	ADDRESS	CALLING	Folio

List of Directors

DATE OF ELECTION	NAME	ADDRESS	CALLING	DATE OF RETIREMENT

A book must also be kept to record any transfers of shares taking place, as a transfer is not valid until entered in the books of the company. Below is a simple ruling for such a book:—

REGISTER OF TRANSFERS

Folio	NAME OF TRANSFEROR	DATE	SIGNATURE OF TRANSFEROR	AMOUNT OF STOCK	Folio	NAME OF TRANSFEREE	ADDRESS	CALLING	SIGNATURE OF TRANSFEREE

A Stock Ledger to show the number of shares held by each shareholder and the amount paid in and remaining unpaid by each is also required. The ruling of the Ledger is shown below: —

NAME
ADDRESS
CALLING

DATE	PARTICULARS	NO OF Shares Acquired	FOLIO	NO OF SHARES TRANSFERED	NO. OF SHARES HELD	CALLS						
						DATE	RATE	AMOUNT CALLED	FOLIO	AMOUNT PAID	DATE	BALANCE UNPAID

To this Ledger are posted all entries from the List of Subscribers and the Register of Transfers, and all payments of cash on account of stock subscribed for and called. The headings of the different columns are sufficiently explanatory in themeslves to make the entries quite simple.

These four books, with the Stock Certificate Book, must be kept in the head office of the company in Ontario.

The certificates of mining companies issuing shares at a discount must have printed on them in red ink "Not subject to call," or "Subject to call," as the case may be. The words "No personal liability" must also appear on their seal. To issue shares at a discount a by-law must be passed and confirmed by a majority of the shareholders at a special meeting fixing the rate and conditions of the issue. Within twenty-four hours a copy, verified by affidavit of President and Secretary, must be sent to the Provincial Secretary by registered mail or fyled within five days in the office of the Provincial Secretary.

Returns must be made before Feb. 1 in every year, including particulars as follows, covering a period up to Dec. 31 next preceeding the date of the report. The returns shall include the name of the Company, the manner of incorporation, the board of directors ad-

dresses, etc., the date of the last annual meeting, the place of the head office, the amount of the capital and how divided, the number of shares subscribed for and allotted, the number of shares issued, fully paid for, other assets, the amount of calls, amount of shares forfeited, the rate of discount on sale of stock, whether a sworn copy of by-law providing for the sale of stock at a discount was sent to the provincial secretary and date of same; and, lastly, an alphabetical list of shareholders. A copy of this report shall be pasted up in the head office to be left until replaced by the next report. The report must be sworn to by the president and secretary. I give here a list of fees for filing this report together with one or two other fees which are to be paid.

Filing annual reports of a company with capital of up to $50,000	$2.00
Filing annual reports of a company with capital of $50,000 to $100,000	3.00
Filing annual reports of a company with capital of $100,000 to $1,000,000	5.00
Filing annual reports of a company with capital of $1,000,000 up	10.00
Filing by-law providing for sale of stock at discount	2.00
Filing certificate to enable company to commence business	25.00

In order to show more clearly the bookkeeping relating to the sale of stock we will assume that all calls have been made and paid and the cash received and transferred from the trust company to the bank.

A special case book recording the receipts or capital account should be kept, with two columns, one headed *cash received* and the other headed *discounts*. The sum of the cash and discounts opposite each name is posted to the proper account in the stock ledger into "amount paid" column, balancing the accounts. The total of the cash column is entered in the General Cash Book and from there posted to the credit of capital account. The total of the discount column is put into the proper accounts by means of the following journal entry:

Discounts on sale of stock, Dr.

To capital account

"Discounts on the sale of stock" acount is charged with the total discounts allowed and capital account is credited with a like amount. Capital account will thus be credited with the total subscribed and paid up stock. The debit to discount on the sale of stock account must not be confused with the ordinary business discounts, but must be kept separate. It may be treated in either of two ways. It may be included in preliminary expenses and written off over a period of years. But this is not necessary for as it will never become a realized loss unless the company goes into liquidation, it may be carried as an asset shown in the balance sheet as a deduction from the subscribed and paid up stock.

If the purchase price of the property was partly in cash and partly in paid up stock the following entries must be made—*property account* is charged with cash paid through the *General Cash Book*. *Property account* is also charged with the amount of stock transferred to the vendors and *capital account* credited with a like amount by means of the following journal entry:

Property account, Dr.

To Capital Account

The bookkeeping we have already done gives us the following results. The stock ledger shows what stock is held and by whom and what is unpaid on the stock if any. The general ledger shows a debit to *property account* for the purchase price of the property; a debit to *discounts account* for the discounts allowed on the sale of stock, and a credit to *capital account* for the total amount of subscribed stock. The General Cash Book shows a debit balance for cash on hand and in bank.

We will let the banks stand as they are while I endeavor to show in my next article how transactions taking place at the mines are recorded and what books are necessary there.

While the main principles of the Ontario Companies Act are common to the several other Companies Acts throughout the Dominion there are certain points of difference which will receive due notice in a following article. There will also be shown the requirements necessary for an extra-provincial company to commence business in Ontario, etc., and for foreign companies to commence business in Canada.

(To be continued).

SINKING OF WABANA SUBMARINE SLOPES.

By R. E. and A. R. Chambers.

Published as an advance paper of the Canadian Mining Institute.

In June, 1893, the first landing on Bell Island was made by one of the writers, accompanied by the Butlers of Topsail, Nfld., who then owned the property, for the purpose of examining the iron ore beds.

After a lunch of flatfish and fresh lobsters procured from a nearby fishing boat and cooked on heated stones on the beach, an examination of the outcrops was made.

It could be seen at a glance that the property was valuable. Fifteen years of continuous working have produced striking changes: Then, the north side of the island a forest of fir trees, requiring a compass to guide one; the south side dotted by scattered primitive farms; now, the smoke from many boilers providing steam for the vast machinery employed, the rattle of drills, the sharp exhaust of many engines, groups of houses where live part of the 1,500 employees, attract the eye and ear, and replace the silent forest. The roar of loading ore, the many-toned whistles of steamers, the hum of moving cars are heard from the homes of the old settlers, part fishermen, part farmers.

Such is the change wrought by the working of the ore upon the island. Nor is the change confined to here. Sydney, a quiet town, the citizens exchanging kindly greetings on the sunny grass-grown streets, is now transformed to a bustling cosmopolitan city, overshadowed by the giant works of the greatest steel plant in Canada. Across the harbor a group of huge furnaces and machine shops encircled by a network of many miles of track, and surrounded by a busy town of 7,000 people, replace at Sydney Mines a former barren plain.

The ore deposits and plant on the land at Wabana have been fully described in previous articles, so that a further reference is not here necessary; but recent developments carried on under the direction of the writers, in connection with the submarine areas, have proven to have an important bearing on the size of this ore field, and point to changes greater than those above referred to.

It has been shown that the ore upon the land is but a fringe of the greater deposits beneath the sea. The fact of a quantity equalling the entire requirements of the Scotia furnaces having been steadily mined from the submarine areas during the last six months is good proof of the practicability of working the ore.

In view of the importance of these results, a short account of the developments may not be uninteresting.

Historical.

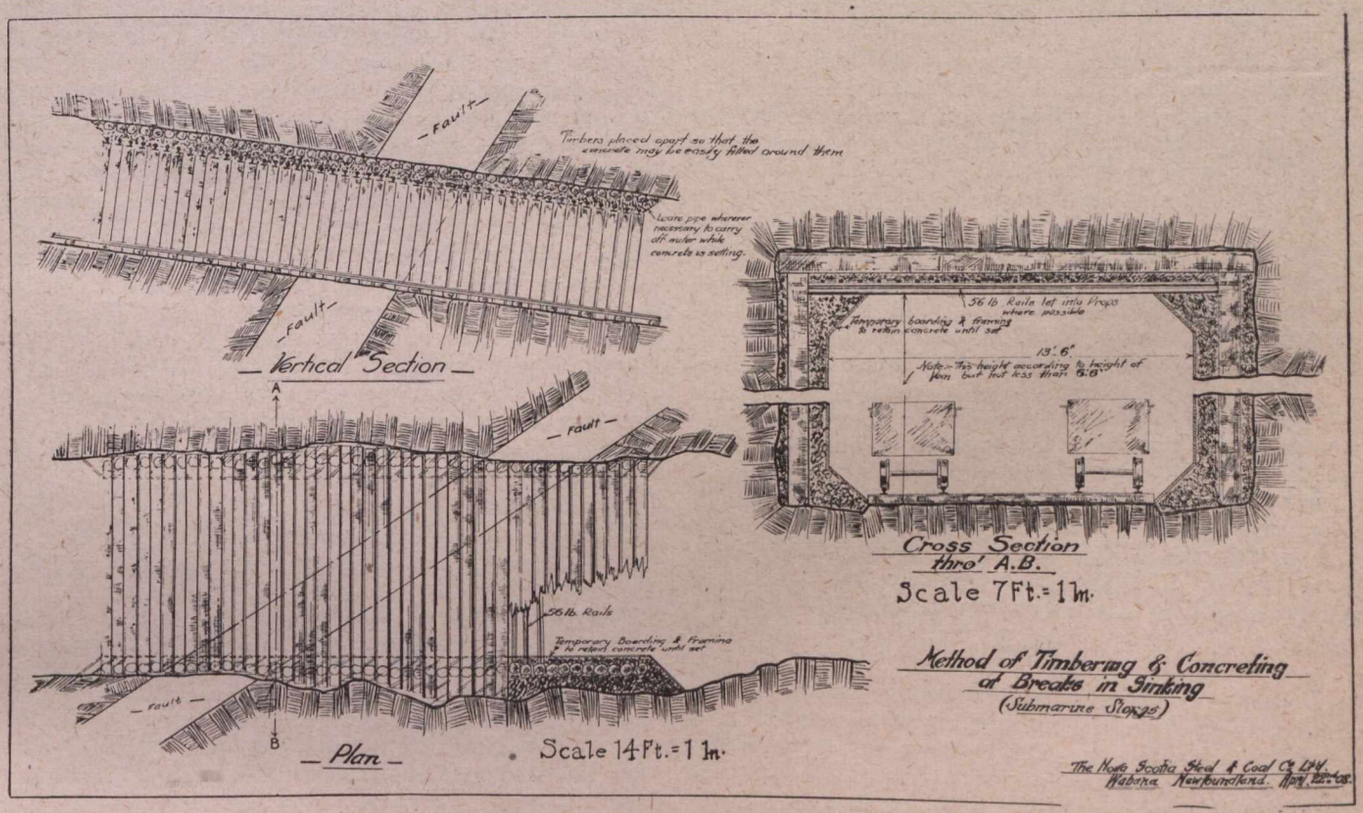
On the organization of the Dominion Iron & Steel Co. a sale was made by the Nova Scotia Steel & Coal Co. to them of the bed of ore upon the land then being worked by the latter, known as the lower bed, reserving for themselves the upper bed on account of its superior quality. This sale included a submarine area of three square miles adjoining the shore. Subsequently outlying submarine areas were acquired by the Scotia people, which from the great depth of cover, it was thought would be quite workable over a large area. On account of the known persistence of the beds in this district these submarine areas would probably contain all the beds known to exist on the land.

Upon the submarine areas each company owns all the beds upon their respective claims, whereas on the land the lower bed is owned by one company and the upper bed by the other.

As the work progressed additional areas were procured, so that at the present time there are thirty-two square miles owned by the Scotia Company and five and a half by the Dominion.

An agreement was made by which slopes could be driven by the Scotia Company through the submarine areas of the Dominion Company. The point selected was the continuation of the No. 2 Slope, already being worked on the upper bed. At the shore line here there was cover of 68 feet, which was greater than at any other point east or west. The dip of the vein being 8 degrees to the north, or direction in which the work progressed, made it possible to commence the work with the plant then installed until the practicability of the enterprise should be determined. It was known that at distances of about 250 and 1,000 feet respectively serious faults would be encountered, and it was not considered advisable to make any expenditure for plant until these should have been passed.

Work was commenced on May 21st, 1906. In August the first fault was encountered. Fortunately, although this dislocation amounted to an upthrow of 29 feet, with only 85 feet of strata intervening between the workings and the bottom of the ocean, the quantity



of water struck was trifling.

From a study of the rock structure upon the land it was pretty evident that this upthrow would be followed by a corresponding downthrow after driving about 800 feet, running northeast and southwest, approximately at right angles to the fault first encountered. It was consequently decided to continue the slope in the strata underlying the ore in order to maintain as uniform a grade as possible. The wisdom of this course was verified by encountering the ore beyond the second fault at the distance and height expected, and of greater thickness. This fault was more serious, containing 4 ft. of clayey decomposed rock, and an increased flow of water. The soft ground was handled by careful spiling and the water could easily be handled by two No. 6 Cameron pumps, the quantity not exceeding 80 gallons per minute.

Beyond this second fault no serious difficulties were encountered for a further distance of 1,800 feet, at

which point a downthrow fault of 26 feet was reached. The cover had increased to a total of 293 feet, and in consequence a greater feeling of security was felt in handling any difficulties which might occur. With the increased depth, however, was a corresponding increase in firmness, and the clay encountered in previous faults was not met here. The slope was continued in the strata overlying the ore, but with an increased grade for a distance of 400 feet, when ore was again entered with a normal thickness, and a normal dip of 12 per cent. The grade for the 400 feet was made 20 per cent., which by trimming will be subsequently reduced to 18 per cent. For this 400 feet the effects of the fault were felt in the increased tenderness of the roof, necessitating timbers being placed skin to skin, and in the amount of water dripping from above. The total quantity of water was, however, in no way formidable. After re-entering the ore bed beyond this fault, no difficulties have been encountered to the date of writing. The bed has the normal dip of about 12 per cent., the ore has a section of 9 feet, and the quality is fully maintained.

On entering the Scotia areas at a distance of nearly 4,000 feet from the shore the conditions are as favorable as could have been hoped for, and more so in that the quantity of water being handled is very small compared with what was expected.

The advances are as follows:—

Slope commenced May 21st, 1906. Distance driven to December 31st, 1906, 704.6 feet; distance driven to December 30th, 1907, 1,916.1 feet; distance driven to December 24th, 1908, 3,965 feet. The month of least advance was August, 1907, in passing first fault, or 42.5 feet. The month of greatest advance was November, 1908, or 247.81 feet. In the four weeks from the 16th of November to the 14th of December an advance was made of 270.1 feet. In the week ending December 7th, 1908, an advance was made of 72.5 feet. This gives a record of 11¼ feet per day for a month, and 12 feet 1 inch per day for a week. The size of excavation for this driving was 13 feet to 15 feet wide by 8 feet high.

A system of bonus payments for rapid advance greatly helped in attaining above results.*

Plant.

Boilers.—The power used in sinking cannot be considered apart from the mining plant, as part of it is used for each purpose. The boiler plant consists of 5 batteries of Sterling water tube boilers of 234 h.p. each and 16 upright tubular boilers of 42 hp. each.

Air Compressors.—One Nordberg duplex compressor, cross compounded air and steam, jet condenser using fresh circulating water, direct connected to low pressure crosshead of the compressor; steam cylinders, 18—32x42; air cylinders, 19—29x42; capacity, 2,500 cubic feet of free air per minute. One Walker compressor of same type; steam cylinder, 22, 42x48; air cylinder, 23½, 38x48; capacity, 3,500 cubic feet of free air per minute; the exhaust steam is conducted to a surface condenser, using salt water from the sea for circulating water. One straightline Norwalk compressor, compound steam, compound air, with a jet condenser using fresh water; steam cylinder, 14—22x24; air cylinder, 14½—22x24; capacity, 1,200 cubic feet of free air per minute. The total capacity of air compressing plant is 7,200 feet of free air per minute.

*Note.—Since above was written an advance of 74 ft. per week has been made.

Hoisting Engines.—In the early part of the work the hoisting was done by the engine connected with No. 2 Slope, being a 14x18 double cylinder, Flory single friction drum. As the work advanced it was necessary to supplement this by the addition of a 10x12 double cylinder, double-drum Lidgerwood hoist, placed at the mouth of a shaft sunk near the shore for this purpose, and by an 8¼x10 double cylinder single friction drum operated by compressed air, placed in a crosscut from the advancing slopes.

Ventilating Plant.—This consists of a 4-foot and two 3-foot Sturtevant fans. The 4-foot fan is direct connected to a vertical air-driven fan engine, and is located near the upper parts of the slopes, just at the bottom of the present workings of the No. 2 Mine, of which these slopes are a continuation. This fan is placed in the air course, and is operated exhausting. The two 3-foot fans are placed as described below.

The intention was to sink the slope by double entry. In practice, however, it was found that the tendency was to place most importance upon the slope farthest advanced, with the result that it finally exceeded the secondary or ventilating slope by a distance of 2,900 feet. To provide for ventilating this long single slope recourse was had to spiral riveted galvanized iron pipe, connected with two Sturtevant blowers, with suitable by-pass connection, so that they could be used either as blowers or exhausters. One of these was placed at the upper end of the pipe, and the other reinforcing it about 1,000 feet farther down. The first pipe used was 15 inches inside diameter, and was found to be too small to give entirely satisfactory results. Below the lower fan 18-inch pipe was installed, which still continues to give a plentiful supply of air to the face of the slope. As the slope advances new lengths of pipe are added. On account of the blasting the pipe cannot be laid nearer than within 150 feet of the face, but no inconvenience whatever is felt in working at the face for this reason.

Pumps.—At the bottom of the old mine and near the top of the submarine slopes is an 18x8x24 duplex Jeansville pump of their pot valve anthracite pattern. This pump can be operated by either steam or air. The cylinders are so proportioned that it can be moved to a greater depth, where the head will be greater, if required. The water is delivered through a 6-inch pipe to a drainage tunnel running to the shore.

After passing the second fault the increased water was handled by two Knowles sinking pumps 12x6x13 and 10x5x13. These delivered the water to the shore direct, or to the lodgement of the Jeansville pump, as desired. These were afterwards replaced by a 12x5x12 duplex Jeansville anthracite patttern pump, subsequently to be moved to a greater depth. The working face was kept dry by two No. 6 Cameron pumps working alternately, and latterly by a No. 8 Cameron, the water not exceeding 50 gallons per minute.

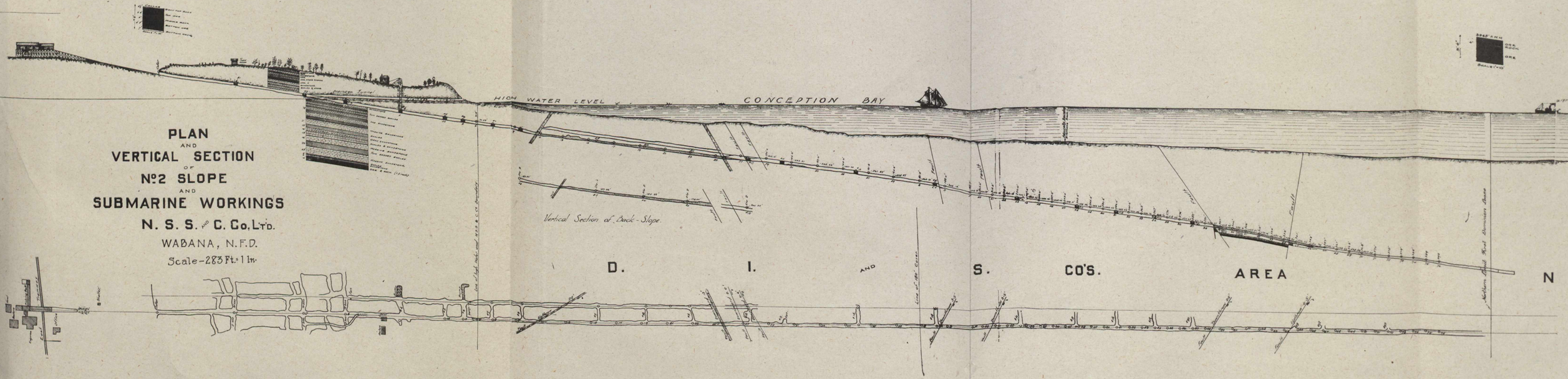
Dams.—To protect No. 2 Mine from possible inundation sites for mine dams were constructed at a point situated vertically below high water mark. When approaching this point the face was narrowed to 6 feet, and then gradually widened again, forming a V. No reduction was made in the height. The sides, top and bottom were lined with concrete. A small pipe was placed in the roof as an outlet for air when pressure should come on the lower side of the dam, and capacious air and water pipes were built into the floor. Timbers to fill the openings were made of 10x10 pine

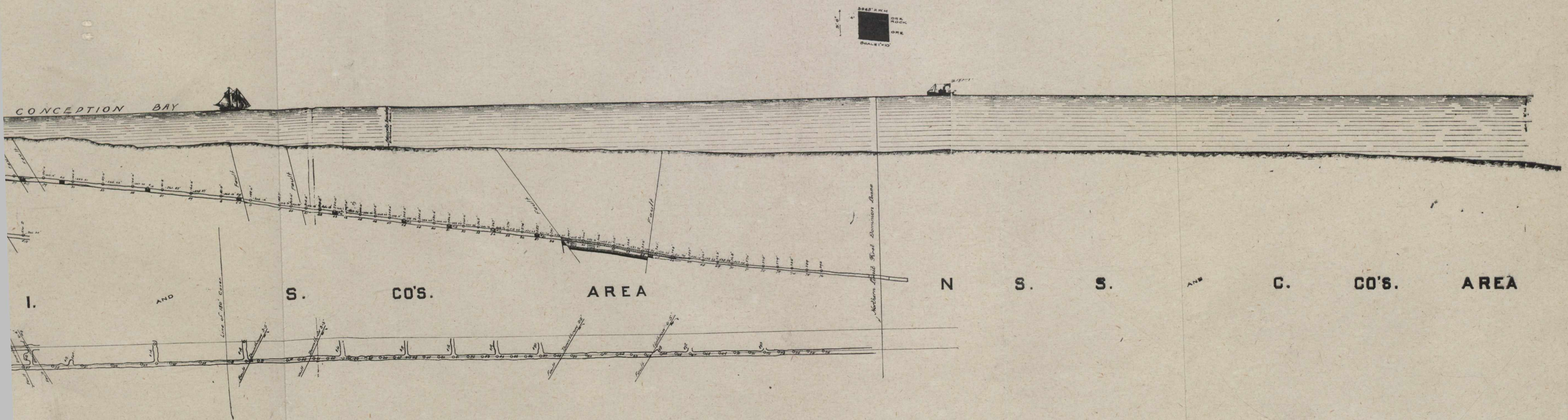
PLAN AND VERTICAL SECTION OF Nº2 SLOPE AND SUBMARINE WORKINGS

N. S. S. & C. Co, Ltd.

WABANA, N.F.D.

Scale - 283 Ft. = 1 In.




CONCEPTION BAY
I. AND S. CO'S. AREA
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Fault
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Fault
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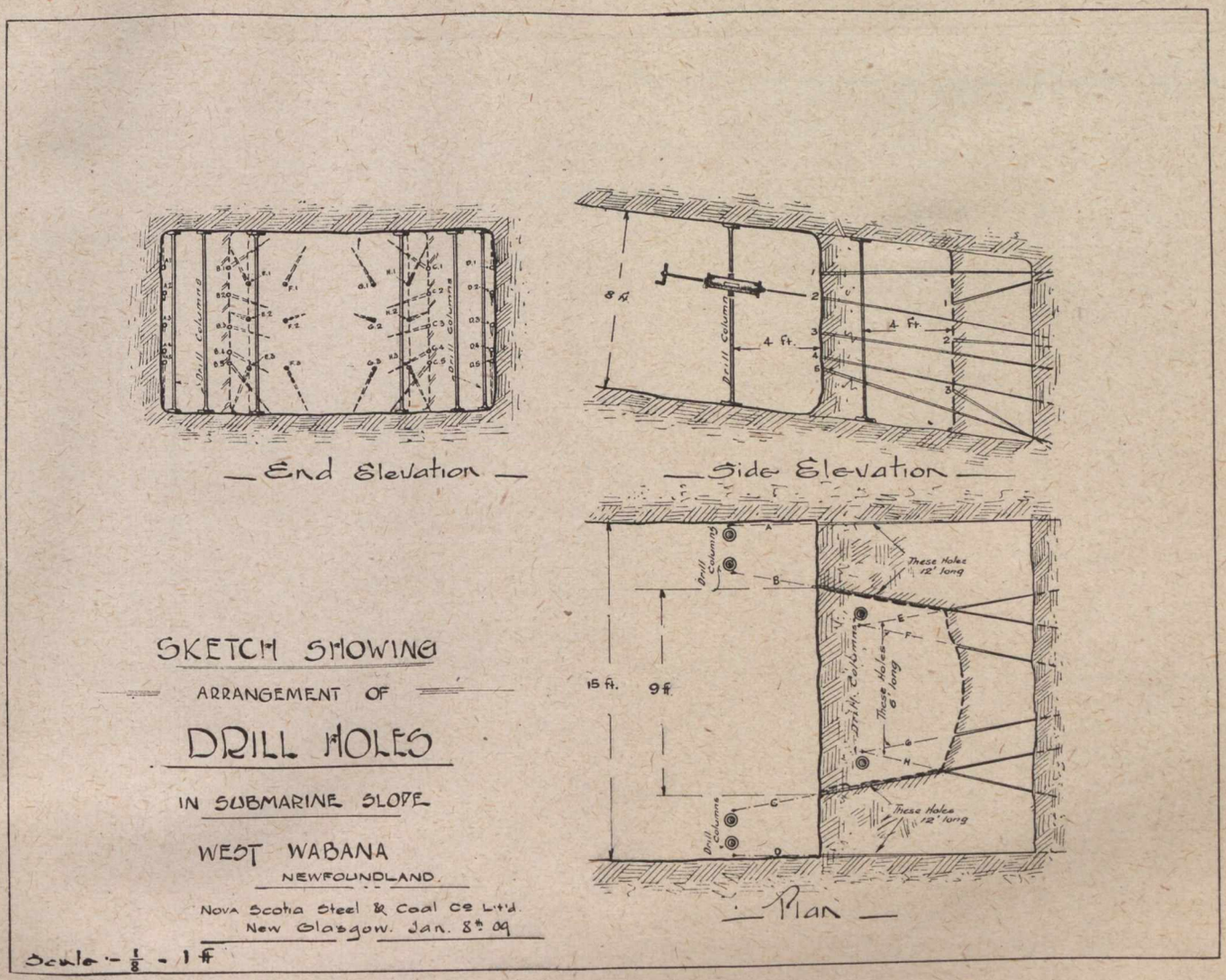

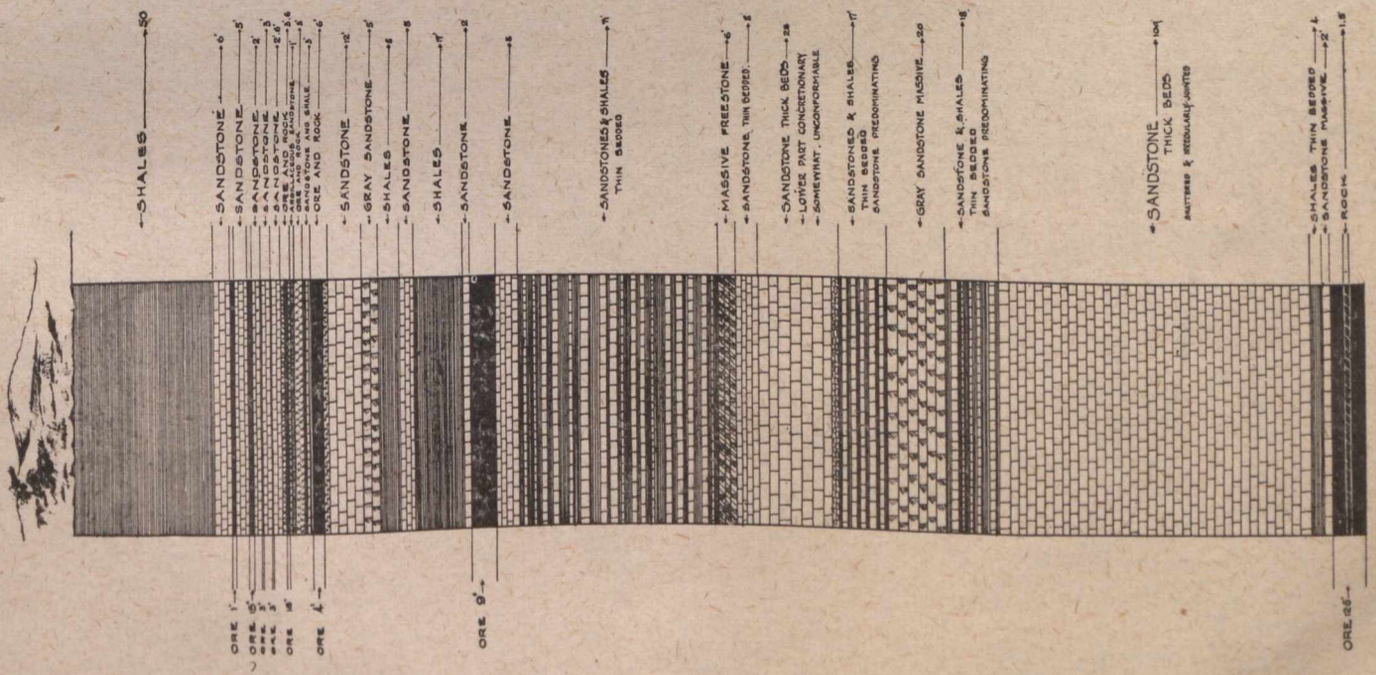

Geological Section through Highest Horizon of the Ore Bearing Strata at Wabana, Newfoundland.

SUBMARINE AREAS OF THE NOVA SCOTIA STEEL AND COAL COMPANY, LIMITED.

D. I. & S. Co. L'T'd.

SUBMARINE AREAS OF THE NOVA SCOTIA STEEL AND COAL CO., L'T'D.

SUBMARINE AREAS OF THE DOMINION IRON AND STEEL Co. L'T'D.

DOMINION IRON AND STEEL Co

NOVA SCOTIA STEEL AND COAL Co

NOVA SCOTIA STEEL AND COAL COY. L'T'D

Vertical Section through Bell Island & Submarined Areas

Plan of WABANA

— SHOWING —

LAND & SUBMARINE

MINING AREAS

Nova Scotia Steel & Coal Cy Ltd.

Scale - 58⅓ Ch.= 1 In

tapering to 6x6 and piled at the mouth of the slope in the same position they would occupy in the dam, and carefully protected from the weather.

Piping.—The air line is 8 inches as far as the workings in No. 2 Mine and to the large Jeansville pump, and 5 inches for the rest of the submarine slope. The water discharging line is 6 inches, being double from the large pump to the surface.

Testing Air Pipes.—The air pipes of the sinking and working mines are periodically tested, as follows: All pipe ends are carefully closed as near to the drills as possible. A pressure gauge is connected to the section to be tested. The section is then filled from the mains, and the supply valve closed. The air in the line is then released until the gauge reads 50 lbs. The time is taken and the pressure allowed to drop by leakage until it reaches 40 lbs., when the time is taken. The loss in cubic feet of free air will be approximately half the volume of the pipe tested. This divided by the time will give the loss per minute. The amount of pipe in each section not being often changed, this can be easily kept track of. The conditions, with the exception of the time, will be practically constant. The pipe fitter is thus constantly familiar with the condition of his pipes. Corrections for temperature would be necessary for accurate results, but in practice are not needed.

Cars.—The cars used are of steel, of 30 cubic feet capacity, holding from 1.7 to 1.8 tons of ore, the gauge 2 feet.

Tracks.—The tracks are of 28 lb. rails, except near the face, where an 18 lb. rail is temporarily used.

Protection from Runaways.—Every tramming section of the slope is protected by a heavy swinging gate, the posts of which are securely hitched in the floor and roof and heavily braced to the walls. Each gate is operated by a boy.

The face is protected by two ordinary swinging Sampson posts placed from 50 to 100 feet back and moved alternately as the work progresses.

A safety switch is also placed a few hundred feet below the brow of the deckhead.

Telephone System.—Telephones are installed in the slopes, connecting through a central office with all parts of the works, the office and the houses of the manager and underground manager.

Inspection.—There is a daily inspection of cars, ropes, pulleys and all machinery.

Method of Working.

Three eight-hour shifts are worked. When the air is cleared of smoke from the last shot, the drillers and loaders proceed to the face. The drillers and their helpers begin to assemble their drills and columns, while the loaders employ themselves in throwing back the ore from the face. The drills, of which there are two on this shift, are then set up four feet from the face and about twenty inches from the rib or side, and each puts in five 12-foot centre cut holes, B 1, 2, 3, 4, 5, and C 1, 2, 3, 4, 5, respectively, completing the round in about 6 hours. The holes are blown out with compressed air when the shift is completed. After having cleared away the face for the dillers the loaders, six in number, clear off the track and run in a trip of three cars. They load up the ore that has been thrown up the slope by the previous blast, which sometimes is as much as 100 feet from the face. When the ore is reduced to a heap behind the drillers one car only is used, and the loaders relieve each other car about, three at a time. The loaders generally finish at the same time as the drillers. Forty to fifty tons is an average shift's work.

The blasters then load the holes drilled with 7 lbs. of 50 per cent. Acadia dynamite in each, tamping them securely with paper cartridges of clay prepared for the purpose. After the wires and blasting machinery are tested for strength and circuit the round is fired. If the work has been done correctly, the centre cut will be taken out as shown in the sketch, and the ore thrown well up the slope. Owing to the heavy burden on these holes they will be only about half shot out. A little high pressure air is turned on at the face immediately after the blast, and the exhaust fans described above speeded up. In the course of a short while the air at the face is quite clear, and while still a little warm, work can be resumed.

The next shift then begins, loaders clearing face as before.

The usual drillers now set their bars four feet back from the face and as close to the rib as possible, and drill holes A 1, 2, 3, 4, 5, and D 1, 2, 3, 4, 5, 12 feet deep. In addition to these two spare drills are set up in the cut and drill holes E 1, 2, 3, F 1, 2, 3, G 1, 2, 3, and H 1, 2, 3, respectively, 6 feet deep. As the extra drills do not come on the same shift each time, there are two spare drillers on each shift, and when not employed at this work they are kept busy repairing and advancing ventilating pipes, swinging Sampsons, etc., and other odd jobs.

The order of blasting is now more elaborate than on the previous shift, and on the care taken in this work greatly depends the advance to be gained.

They first load and fire first holes F 1, 2, 3, and G 1, 2, 3, 3 lbs. to a hole. Next they fire the old bottoms of holes B 1, 2, 3, 4, 5, and C 1, 2, 3, 4, 5, with 3 to 5 lbs. each, according to necessity. The third round is E 1, 2, 3, and H 1, 2, 3, 5 lbs. to a hole, and finally A 1, 2, 3, 4, 5, and D 1, 2, 3, 4, 5, are fired, 5 lbs. to a hole. This makes a total of about 200 lbs. of 50 per cent. dynamite to an advance of 8½ to 9 feet, according to the success of the work done.

The method of using short bars and setting up the drills on top of the ore heap was tried for some considerable time at first, but it was found that while saving a good deal of time in handling the ore, in the long run it did not pay.

The storage, thawing and distribution of the explosives for both the mines and the submarine slope is carried on at a central station, which comprises a small magazine, thawing house, with detached boiler-room. and a shed for testing detonators, located at convenient distances apart.

The thawing is carried on in a small stone building, brick lined and wood faced inside, with an air space between the brick and stone, and the building is provided with a large entry for the reception and disposal of the explosive. The heating system is the ordinary hot water system as used in dwellings. The radiators are placed in wooden boxes to prevent accidental contact of the explosive.

The various blasting crews, wiremen, thawer, magazine storekeeper and detonator tester are all under the supervision of an explosive inspector, who constantly inspects all operations connected with the use and disposal of all explosives, and who immediately reports to the underground manager any unusual occurrence, and, if possible, the cause of the same.

Credit is due to the following officials of the company at Wabana, as well as their subordinates generally:—

Frank Burrows, who succeeded one of the writers

as resident manager upon his taking up the designing of the permanent equipment for these slopes.

Laughlin McLean, who in the capacity of underground manager has been connected with the work from the beginning, and whose energy contributed greatly to the success.

John Cunningham, acting for the greater part of the time as mechanical superintendent, and for a short while David Fraser in the same capacity.

T. G. McKenzie, who is in charge of the surveys, and W. L. Hunter and E. Rees as draughtsmen.

Results.

As a result of the work above described it has been proven that, as anticipated, an enormous field of ore, under Conception Bay, multiplies many times the ore previously known.

There have been mined from about 1½ square miles upon the island about 7,000,000 tons, and there remains yet ot be mined about 25,000,000 on this land area in the beds of both companies.

One of the beds has been followed without deterioration in size or quality for three-quarters of a mile, under the sea, into the areas of the Scotia Company. It is probable that the other beds extend there also.

The claims of this latter company cover an area of about 33 square miles, the greater part of which is probably underlaid by iron ore.

Recent Progress in the Mineral Industry in the Thunder Bay and Rainy River Districts.

Before dealing with the progress made in the mineral industries in these two districts during the past year, it might prove of interest to readers of the Canadian Mining Journal to commence with a brief resume of the past history of the districts as regards mining. This synopsis must of necessity be exceedingly short, the purpose of this article not including anything in that direction of any great extent.

With what degree of justice the district of West Algoma can lay claim to having given the first impetus to the mineral industry of the entire province it is impossible for me to prove at the present moment, but this much may be positively asserted, that the mining history of this district dates farther back by many years than that of any of the mining camps of Ontario, either now being worked or which had been active in the past.

To quote a single example, the discovery of silver in the Thunder Bay District dates back to 1866-67, at which time the Shuniah and Thunder Bay mines were first opened up. In the following year the famous Silver Islet vein was added to the mineral discoveries of the district.

Two years later, in 1870, another of the precious metals, gold, was discovered in Moss Township, near the western boundary of Thunder Bay District, the first exploitation being at the Huronian Gold Mine, which attained some fame later on. This mine has the distinction of being the only mine in Ontario which has produced gold in the form of sylvanite, a telluride of gold, in any appreciable quantity. For the next few years after the discovery of this mine, our prospectors must have rested upon their laurels, for we hear of no new discovery of mineral being made until 1879-80, at which time, during the progress of the construction of the C. P. R., gold was found on Hay Island in the Lake of the Woods. Although this discovery should have given the frontiersmen of our province an incentive to prosecute further search for the same precious metal, we hear of no new discoveries being made until 1887, in which year the Gold Hill deposit was brought to notice.

In the meantime some further important finds of silver were made by Indians, and disclosed by them to the white men, as, for example, in 1882, the Rabbit Mountain, in 1883, the Palisades, a year later, the Silver Mountain, and 1885 the Beaver Mountain Mine. Although at this period the attention of prospectors was generally devoted to gold and silver in preference to other metals, yet in the year 1887 another Indian added the so-called Atikokan iron range to the mineral discoveries, and about five years later the Matawin iron range was discovered, although the southeast margin of this range had already become known a few years previously, attracting, however, very little attention at the time.

After this a brief interval occurred during which the search for and discovery of minerals was at a standstill, until, in 1894-5, gold was found in the Rainy Lake, Sawbill Lake, and Island Falls region. This aroused considerable excitement, lasting for several years, and, had it not been for ignorance and stock-jobbing, the common but unwholesome concomitants of legitimate mining, we might to-day have the gold mining industry of this district in a flourishing condition. The ltle gold boom created by these finds found an echo in the Lake of the Woods and the Manitou districts, in the former of which activity lasted for some years, while in the latter the earlier activity was continued longer, owing principally to the discovery of the phenomenally rich vein at the Laurentian Mine.

Some three years ago the discovery of hematite in the Township of McTavish, in a locality now known as the Loon Lake District, caused considerable excitement for some time. As a matter of fact this was only a rediscovery of ore that had been first found in the earlier times when silver mining was at its height; at that date, however, it was regarded as being of little importance, silver being the only metal which was being searched for and desired.

In this connection it may be mentioned that the author, soon after his landing on the shores of Thunder Bay, about 20 years ago, recognized the identity of this rock-formation, here called the Animikie, with that in which the iron ore deposits of the Mesabi, Gogebic and others are located. He drew attention to this fact in a number of papers, notably in the one entitled "The genesis of the Animikie Iron Range." How slight, however, was the attention paid by the iron mining public to these publications may be gathered from the complete inactivity which to-day prevails in the direction of prospecting this formation for hematite deposits. The blame for this condition of affairs rests, however, not only upon the shoulders of the iron miners, but perhaps still more heavily upon those of our engineers and geo-

logists, who, either as the result of imperfect examination, or failure to recognize the character of these rocks, have completely ignored the fact of their identity with the rock formation of the American iron ranges. And for this reason the Animikie iron still awaits the work that shall awaken it from the slumber of ages.

I am compelled to register a somewhat similar complaint with regard to our Matawin range. Perhaps the largest low-grade iron range in existence on earth, which still lies idle as a silent witness to the lack of foresight on the part of our iron men. Not one of them has given a thought to the possibility of mechanically converting a large part of these deposits from a low-grade, non-bessemer ore into a very high-grade concentrate of the most desirable quality for steel pig. It reflects very little credit upon our Canadian iron men especially, that they have not made any effort to remedy the existing condition that, in our whole country, we do not possess one single good-sized body of ore, of which we confidently may assert that it is of bessemer grade.

In Sweden, Norway and Finland, where similar deposits exist, they are extensively worked and the ore is concentrated and converted into high-grade briquettes almost free from deleterious elements. Similar works exist even as far north as the Arctic Circle, where German capital, always on the alert to improve home industry by securing raw material in the cheapest possible market, has immense works under construction, of which one example is at Sydvaranger, where a plant is being built capable of converting 1,800,000 tons of 38 per cent. magnetite into 800,000 tons of ferric oxide briquettes. Why should not we in Canada follow this example and treat our Matawin iron ore as we see being done by those other nations, since it is to us of far greater importance, owing to the fact that we possess no high-grade ores and are in consequence compelled to go to the United States for raw material which we could provide ourselves in any quantity and for centuries to come?

But I fear that the editor of this journal will now be asking what recent progress I have to report in the mining and winning of the various kinds of ore? What must my reply be? The financial depression of last year has borne so heavily upon the mining industry of our two districts that I can say very little indeed about their progress in this regard; if, however, I am permitted to include the prospecting for and discovery of new ore deposits in this report, then I am able to announce some progress. Why, indeed, should not this be included and termed progress? Every little addition to our knowledge in this respect, and every stroke of hammer and pick means a step forward towards the ultimate goal, the economical winning of these ores, and hence is to regarded as progress in mineral industry.

Iron.

Since the Atikokan Iron Co. blew out their furnace at Port Arthur last year no iron ore was mined or shipped in either of our two western districts, but this inactivity in no way discouraged the work of the prospectors who were seeking for iron ore. These men were especially active along the line of the new Transcontinental Railway, where, first in the neighborhood of Buda, and later along a tract extending westward as far as Ignace, bog iron ore was discovered two years ago. Exploration was most successful at places where the ground was low and favorable for the formation of little ponds and lakes, into which the waters charged with iron, flowed and deposited their contents therein. The latter settled among the peat-forming plants and these combined with the sand, which was similarly carried in, to form little beds of a brown, ochery, hydroferric oxide. Although, on account of the width of the area over which the deposits were found, a great number of claims have been taken up, nothing has yet been done to demonstrate the existence of this ore in larger beds, such as would be needed to make its operation a commercial success.

I learn that somewhat better results have been obtained farther north, along the line of the same railway, north of Sturgeon Lake. Here it is said that extensive beds of magnetite have been rediscovered. I use the word "re-discovered" because specimens of this ore have been repeatedly sent down from this region, many years ago, and reached my laboratory through the employees of the Hudson's Bay Co. or other fur traders, they having received them from trappers. In this region a very large number of claims were also taken up, from which, since they are situated only a very few miles from the line of the national transcontinental railway, the owners expect to ship ore down to the lake ports as soon as the road is completed.

Further prospecting for iron ores has been carried on along the southern extension of the Matawin range, where some American parties were using the government diamond drill to prosecute the work, but no results are at present available. At the western extension of the Atikokan Range some activity has been witnessed during the past year, the Oliver Iron Mining Co., of Duluth, having had three diamond drills at work in the search for magnetite, but as regards their success in their operations I have been unable to learn anything.

The same must be said regarding the results of some work which has been carried on by the government diamond drill a few miles farther west, near the outlet of Steep Rock Lake. This drill has been working upon an outcrop of ore which was considered to belong to the deposits of brown hematite of which a considerable number of floats were found scattered over that region some years ago. These floats were apparently an iron of great purity, containing hardly any phosphorus, sulphur or silica, but sometimes having an apreciable amount of manganese.

Some sporadic prospecting has been going on along the margin of the Animikie rocks, northeast of Port Arthur, in the hope of discovering red hematite, and the results here seem to have been identical with those reached in the vicinity of Loon Lake.

Silver.

The only signs of activity in mining for silver were those displayed in an attempt to open up the old Beaver Mine, and to build in connection with it a new stamp mill for treating the ore which the owners anticipate discovering in the mine and also in the old dump. The mine is now closed.

Gold.

In the numerous localities throughout our two districts, where gold occurs, the year 1908 has witnessed but little activity, with the exception of a considerable amount of prospecting work along the shores of Sturgeon Lake, where a large number of prospectors enlivened the stillness of these northern waters with drill, pick and hammer. If the numerous rich samples which came from that region are any criterion, the results must have been gratifying to the workers, a fact which is still further borne out by the large number of claims that have been taken up there during the past summer.

As yet another exception to the general inactivity I might quote the Manitou country, where, in the early part of the year a considerable incentive was supplied to the large number of claim owners by the knowledge of the great richness of the Laurentian Mine. They were thus encouraged to prospect their possessions and, wherever veins of some promise were found, to commence development work. This work has to some extent been carried on, but I believe that lack of capital has been the only reason why more has not been heard of results in this direction, and better results been attained.

In the well-known gold-bearing area around Mine Centre, on Rainy Lake some good finds of rich ore are reported to have been made last summer, and I am hoping that these, together with the rich veins already known to exist, will shortly make Mine Centre once more the busy mining camp which it was several years ago.

In order to acomplish this, here and elsewhere, it is above all things necessary that the stock jobbing habit, of which I have so often complained, shall be completely done away, and that the monies realized from the sale of mining stock shall be put into the mine and not diverted into the pockets of speculators, promoters and others. Had this been done in years gone by, West Algoma would be able to show to-day a good many paying gold mines.

F. HILLE, M.E.

Port Arthur, Jan. 1, 1909.

THE BRITISH MINT IN 1663.

The indefatigable Mr. Samuel Pepys, whose diary became an involuntary contribution to the history of his times, has left on record a surprisingly accurate account of routine and methods that obtained in the British Mint in the seventeenth century. The entry dated May 19, 1663, in Mr. Pepys' diary includes lengthy notes on the assaying, testing, and coining operations then in vogue.

On this May morning Pepys and his friend, Sir John Minnes, paid a visit to the Tower. Here they were shown the method of making the coin of the realm. So much was Pepys impressed with what he saw that he carefully noted every step and made transcriptions in his diary. Part of Pepys' entry must be quoted here: "After dinner went to the Assay Office and there saw the manner of assaying of gold and silver, and how silver melted down with gold do part, just being put into aqua-fortis, the silver turning into water, and the gold lying whole in the very form it was put in, mixed of gold and silver, which is a miracle; and to see no silver at all but turned into water, which they can bring again into itself out of the water. And here I was made thoroughly to understand the business of the fineness and coarseness of metals." With the remark that "the most observable in the making of money which I observed to-day is the steps of their doing it," Pepys proceeds to outline these steps. For the benefit of the reader, it has been thought best to paraphrase part of his description. This robs it of much of its flavour; but the immediate object of this short article is not literary, but technical.

1. Mr. Pepys explains the first steps with great minuteness. "Before they do anything they assay the bullion." To assay gold bullion, equal quantities [here Mr. Pepys is inaccurate] six and one-half ounces Troy of both gold and silver were wrapped up in lead foil. If silver alone were to be assayed, a like quantity was taken. The assays were then placed in "little earthen cupps made of stuff like tobacco pipes, and put . . . into a burning hot furnace, where ,after a while, the whole body is melted, and at last the lead in both is sunk into the body of the cupp, which [meaning the lead] carries away all the copper or dross with it, and left the pure gold and silver embodyed together," or "the silver alone in these when it was put alone in the leaden case."

The process of "parting" was now in order. "To part the silver and the gold in the first experiment, they put the mixed body into a glass of aqua-fortis, which separates them by spitting out the silver into such small parts that you cannot tell what it becomes, but turns into the very water and leaves the gold at the bottom . . . with the silver wholly spit out, and yet the gold in the form that it was doubled together in when it was a mixed body of gold and silver, which is a great mystery; and after all this is done to get the silver together out of the water is as strange." Thus Mr. Samuel Pepys, in the year of our Lord, 1663, marvels at the mysteries of science. The solution of silver in nitric acid and the subsequent precipitation of that silver in the form of a chloride fill him with wonder. Also his curiosity is aroused. Accepting the disappearance and re-appearance of the silver as inexplicable, he determines to learn all that he can of the objects and logical relationship of succeeding operations.

Elucidating matters further, Mr. Pepys continues: "The piece of gold that goes into the furnace twelve ounces, if it comes out again eleven ounces, and the piece of silver which goes in twelve and comes out again eleven and two pennyweight, are just of the alloy of the standard of England. "If either the gold or the silver came out above these weights, "they are so much above the goodness of the standard, and so they know what proportion of worse gold and silver to put to such a quantity of the bullion to bring it to the exact standard." Conversely, if the assay proved the bullion to be beneath the standard, a suitable proportion of fine metal was added. Incidentally, the diarist alludes with pride to the fact that in the matter of standards that of Seville was the best, and that of Mexico worst, adding, "and I think they said none but Seville is better than ours."

Melting the standardized bullion into long plates was the next step. "If the mould do take ayre, then the plate is not of an equal heaviness in every part of it, as it often falls out."

Then, "to bring them to an even thickness all along and every plate of the same thickness," the plates were drawn between rollers. "It is very strange," observes Pepys, "how the drawing it twice easily between the rollers will make it as hot as fire."

In another pair of rollers the plates were drawn more exactly to a uniform thickness.

Then, fifthly, they were cut into round pieces, "which they do with the greatest ease, speed, and exactness in the world."

Next these pieces were weighed. Such as were overweight were filed down. Those that were underweight were set to one side, doubtless to be re-melted.

In passing the rollers the plates were bent and crumpled, and the round pieces often inherited these defects. "Therefore," writes Mr. Pepys, "they have a way of clapping 100 or 200 together into an engine,

which with a screw presses them so hard that they come out as flat as is possible."

The eighth step is brevity itself. "They blanch them."

Ninthly, "they mark the letters on the edges, which is kept as the great secret by Blondeau, who was not in the way, and so I did not speak with him to-day." It may be explained here that Peter Blondeau, a Frenchman, was the inventor, or the improver, of the method of coining by the screw-press. He was brought from France to London in 1649 expressly to improve the coinage. By the jealousy of the Company of Moneyers, his work was delayed for four years.

Lastly, the coins were milled. Mr. Pepys dwells upon this operation with such quaintness that he demands fuller quotation: "The mill is after this manner: one of the dyes [dies], which has one side of the piece cut, is fastened to a thing fixed below, and the other dye . . . to an engine above, which is moveable by a screw, which is pulled by men; and then a piece being clapped by one sitting below between the two dyes, when they meet the impression is set, and then the man with his finger strikes off the piece and claps another in, and then the other men pull again and that is marked, and then another and another with great speed. They say that this way is more charge to the King than the old way, but it is neater, freer from clipping or counterfeiting, the putting of words upon the edge being not to be done (though counterfeited) without an engine of the charge and noise that no counterfeit will be at or venture upon, and it employs as many men as the old and speedier. They now coin between £16,000 and £24,000 in a week."

. . . . .

The screw-press, fed by one man, a coin at a time, and actuated by three or four laborers; the crude assay equipment; the disproportionate weekly addition to the nation's wealth—all these things sound unreal when compared with the modern mint. Yet, in its day, the screw-press was considered a formidable affair, and the mint of 1663 no doubt aroused more genuine wonder than can be excited by any mint of to-day.

BULLETIN 359.. UNITED STATES GEOLOGICAL SURVEY.

This bulletin deals with the magnetite deposits of the Cornwall type in Pennsylvania. These deposits occur near the edges of the belt of Mesozoic rocks which enters Pennsylvania along the Delaware River above Trenton, N.J., and extends across the State in a general southwesterly direction to the Maryland line.

Of the many formations which are comprised in the whole of the Pennsylvania Paleozoic section only the Cambrian quartzites, Cambro-Ordovician limestones, and the Ordovician shales occur in the region here under discussion. In the bulletin these are designated as sandstone, limestone, and shale, respectively. These formations extend over a belt of country from 10 to 20 miles wide, lying southeast of the Allegheny Front.

The Mesozoic strata, made up principally of coarse-grained red sandstone and red shale, are distributed in a belt from 8 to 12 miles wide, extending from the Delaware River southwesterly to the Schuylkill, thence westward to the Susquehanna, and again southwestward to the boundary between Pennsylvania and Maryland.

The zone comprising the various Mesozoic basins is characterized by intrusions of diabase or surface flows of basalt, both of which are commonly called trap rock.

The ore deposits described in the following pages are intimately associated with the intrusive masses of diabase, and most of them are contained in calcareous strata either in Paleozoic limestone, outcropping near the edge of the Mesozoic belt, or in the beds of limestone conglomerate that locally mark the base of the Mesozoic section.

The ores are essentialy magnetite, but they contain pyrite in amounts which make it necessary to roast them before they can be used in a blast furnace. Some specular hematite occurs in certain of the mines, but the amount of this mineral is relatively unimportant.

The ore occurs in large and small masses of varying form, either entirely inclosed by stratified sedimentary rocks or lying in such rocks where they come in contact with masses of intrusive diabase.

The iron content of these ores is extremely variable, but as the ore is mined probably averages not far from 45 per cent. Rather constant chemical characteristics are low phosphorus, high sulphur, silica, lime, and magnesia, and the presence of copper. Small amounts of cobalt have been found in some samples.

These deposits lie, in York County, in the Mesozoic strata, and in most of the other localities in limestones or limy shales of the Paleozoic age.

The geologic features of the various deposits which have been studied are thought to warrant the following general suggestions to those who in the future may make practical explorations for new ore bodies in this field:—

1. Ore bodies are to be sought only on or near the walls of masses of diabase.
2. Large masses of diabase are more favorable for ore deposits than smaller masses.
3. Cross-cutting intrusions and highly inclined sills are more favorable than sills of low inclination.
4. Limestones and limy shales are far more likely to be replaced by ore than clay shales or sandstones.
5. Particularly favorable locations for ore are found in masses of limestone that lie between bodies of diabase and beds that are in a marked degree less susceptible than limestone to the metamorphosing influence of igneous rocks.
6. The most promising situations will be found at places where the largest number of the above-stated favorable conditions occur in combination.

EXCHANGES.

Industrial Progress, January, 1909, Vol. 1, No. 1.—This new periodical, beautiful typographically and profusely illustrated, summarizes, by means of extracts from current magazines, progress made in power installation, mining machinery, pumping machinery, ventilating fans, etc., etc. The address of Industrial Progress is P.O. Box 1580, Milwaukee, Wisconsin.

The first article, "The Hydro-Electric Development of the Great Northern Power Co., Duluth, Minn." should be of particular interest to Canadian users of power.

Mining and Scientific Press, January 23, 1909.—A bill has been introduced into the California Assembly for the appointment of an inspector of mines. The Mining and Scientific Press, while it recognizes that the movement indicates growing interest in mining, alludes to the danger of premature action. The bill in

question endows the inspector with no postive authority. One section provides that the proposed official be liable for damage suit in case any person is "aggrieved, injured, or damaged by reason of the failure of said inspector to perform the duties herein required."

"The appointment," our contemporary remarks, "of a mine inspector without power would be to create a ridiculous supernumerary, to be fed at the public crib; to endow him with authority unrestrained by specific regulations enforceable under adequate penalty would be to let loose an autocrat who would inevitably discover a money-value for mildness in his edicts."

The Engineering and Mining Journal, January 30, 1909.—The Engineering and Mining Journal discusses the copper situation in this issue. Production of copper, it asseverates, is going on at a greater rate than ever before. Consumption is still below the normal. Yet there has been gross exaggeration of the stock of unsold copper. That stock is much smaller than has been supposed. "The world's stock of copper is not yet so big as to be a great drag on the market for a long time after consumption regains its normal rate. The question is simply how long we have got to wait for manufacturers to begin to buy."

The Iron and Coal Trades Review, January 22, 1909.—In summing up the situation of the American iron and steel industry, the Review asserts that the expectations and plans of American producers have been much modified by the past lean year. "It remains probable that a large part of the American productive capacity is likely to stay idle for a considerable period. Producers seem content with the condition . . . since there seems to be little desire to reduce prices in the hope of stimulating demand. A year's experience has shown that the policy of maintaining prices by a general understanding has a sounder basis than a mere verbal understanding through conference between the leaders. There is much more fear of unbridled competition than ever before."

BOOK REVIEWS.

Untechnical Addresses on Technical Subjects. By James Douglas, LL.D. 12 mo. v+164 pages. Cloth, $1.00. Second edition, with additional addresses. John Wiley & Sons, 43-45 East Nineteenth Street, New York.

The name of Dr. James Douglas is familiar to most of our readers. Several of his articles have appeared in the Canadian Mining Journal. For years he has contributed largely to the best technical literature of the day. As the administrator of large mining and metallurgical interests he has been phenomenally successful. One of the chief causes of his success has been the fact that he has always been keenly in sympathy with modern methods, and has constituted himself the apostle of the open door in the practical arts.

A long life of arduous professional and administrative work, profound reading, wide observation, cannot, alone, fit a man to write as Dr. Douglas writes. To these Dr. Douglas adds a rare qualification, a lofty conception of the duties and privileges of citizenship. This is the dominant note in the small volume under consideration. The author's own words express best his own ideals. Addressing the students of the Michigan College School of Mines, in 1904, on the subject of wastes in mining and metallurgy, he concluded with these words: " . . . it will elevate your whole conception of the dignity of your profession and your work, if you regard yourselves, which indeed you should be, as the preservers of the gifts with which a beneficent Providence has stored our world; for next to being a creator, the highest function a man can attain to is being a saver—a saviour."

But Dr. Douglas is not merely an idealist. He writes of the broader national and international aspects of transportation, industries, and education. He correlates these activities. He traces the prodigious achievements of the nation down to the individual. He follows the efforts of the individual up to the total achievement of the nation. His essays are imbued with philosophical discernment and with practical sense.

Of "Untechnical Addresses" there are five, namely, "The Characteristics and Conditions of the Technical Progress of the Nineteenth Century," "The Development of American Mining and Metallurgy and the Equipments of a Training School," "Wastes in Mining and Metallurgy," "Some of the Relations of Transportation to Mining and Metallurgy," "Secrecy in the Arts."

All of these addresses are worth reading. To the student they will prove inspiring. To all classes of readers they will bring information set out in straightforward English and pleasantly seasoned with the ripe wisdom of a long and useful career.

CORRESPONDENCE.

ON THE ORIGIN OF COBALT-SILVER DEPOSITS OF NORTHERN ONTARIO

Discussing, in a recent number of the Mining Journal, an article on the above subject, Mr. J. B. Tyrrell criticizes especially the description of some of the veins, the suggestion as to the origin of the silver, and the use of the term vein for certain fissure fillings.

Our descriptions do not agree because we were not describing the same type of vein. The difference of opinion concerning the origin seems to be one of terminology rather than of processes. I hope, therefore, to satisfy these criticisms by presenting more detailed description of the veins, and of the processes involved in their formation.

Since Mr. Tyrrell has suggested the use of the term "dyke" for some of the fissure fillings, and shows a preference for the term pegmatite, I add a few remarks in support of the term "aplitic vein."

Varieties of Argentiferous Veins in Diabase.

For purposes of discussion, it is of advantage to have in mind the chief types of argentiferous veins found in the diabase, and of these there are at least six fairly distinct ones.

Type 1. The fissure filling is chiefly cobalt and nickel arsenides with varying amounts of calcite. Silver occurs as a later crystallized constituent, disseminated through these minerals. These veins are but a few inches in width.

Type 2. The filling is chiefly silver or its compounds. These are generally very narrow and in some cases little more than films on the joint planes.

Type 3. The filling is chiefly coarsely crystalline calcite, with silver minerals in the cleavage cracks.

Type 4. The filling is fine grained aplitic material, chiefly feldspars with some quartz and calcite. The

silver is intimately associated with the calcite which is irregularly dstributed.

Type 5. The filling changes more or less gradually from fine grained portions like type 4, to coarse grained portions, chiefly calcite.

Type 6. The filling is partly fine grained, like type 4, distinctly marked off from coarse grained calcite portions.

These are not the only types found in the diabase, but they indicate the chief varieties examined by the writer. In some cases the filling at different parts of the same fissure is not of the same type.

Type 4, 5 and 6 are especially prominent in the Elk Lake area. The aplitic veins of type 4 are of nearly the same grain from wall to wall, indicating that the fractured diabase was still quite hot when these fissures were filled. In some cases the walls are not distinct, indicating in these instances that the diabase mass had cooled but little, if any, below its melting point—these are typical "contemporaneous veins." Type 5 indicates a gradual change in composition of the fluid filling on cooling, the feldspars being deposited, for the most part, before the calcite. Type 6 indicates a reopening of the fissure after it had been sealed with aplitic material.

Differentiation in the Diabase Magma.

Mr. Tyrrell's statement that the idea of "concentration of the ores by magmatic differentiation" is "distinctly at variance" with my descriptions of order of formation of the vein minerals, implies a use of the term magmatic differentiation which I did not suggest.

The diabase has been fractured by stresses developed on cooling and the fissures filled with various minerals, some of which are of the types described above. Some clue to the origin of the solutions which intruded the fissures is afforded by an examination of the various rocks with which the ore deposits are associated.

In all parts of the district the silver veins are associated with diabase sills which are similar in compostion and apparently of the same age. In the diabase there are small intrusive masses which are more highly feldspathic. These are apparently the result of contraction, fracturing, and resealing of fissures, due to cooling of an originally homogeneous magma, which had a chemical composition differing but little from that of the diabase.

These has been apparently no igneous activity since the complete solidification of the diabase magma. I have suggested, therefore, that the silver and cobalt were present in that hot solution, which was composed largely of the constituents of silicates, etc., with some water vapour and other gases. When, on cooling, the greater part of the magma had solidified the minor, still fluid portion contained a higher percentage of salic components (forming feldspar and quartz), water vapour, carbon dioxide, silver, etc. Such differentiated fluid materials were tapped by the opening of fissures in the cooling solid mass. According to local conditions of pressure and temperature, and the mobility of the materials, they escaped through or were deposited in those fissures. The feldspars were apparently deposited, for the most part, at high temperature in the diabase fissure. Other constituents in some cases escaped to the surrounding rocks. Some deposition was doubtless caused simply by loss of heat, some by mixing with the ground waters. According to the character of the rocks penetrated by the metalliferous solutions, and the nature of the fissures in them, the ores were there more or less concentrated.

The type of differentiation suggested as the cause of primary segregation of the silver is evidently not the same as that differentiation which is supposed to have been such an important factor in the formation of the Sudbury nickel deposits and some magnetite deposits. In the suggestion concerning the silver ores it is implied that the silver was in solution after most of the magma had solidified. In the primary concentration of the Sudbury ores there was apparently such fractional crystallization that ores separated in the solid form from a molten magma, and by gravitation and other forces were collected before crystallization of the other constituents took place.

Veins and Dykes.

I fail to see any advantage in using the term dyke in the sense suggested by Mr. Tyrrell. If the fissures were all of the composite nature described above as type 6, and if the metallic minerals were entirely confined to the coarse calcite portion it would be convenient to speak of the metalliferous and non-metalliferous portions by different names. But the veins are not all of this type, and some silver is found in the fine grained aplitic portions.

The use of the term "dyke" implies a mode of formation and a shape which are not well exemplified by these veins.

Aplitic and Pegmatite Veins.

There seems to be due an explanation for the double nomenclature applied to the highly feldspathic veins.

In masses of igneous rocks of various kinds there are frequently found veins which differ from the main mass in being lighter in color, and which are highly siliceous and aluminous in composition. Dark colored ferromagnesian minerals are present in small quantities or are entirely lacking. Many of these veins are apparently formed by intrusion of more acid products of differentiation in the magma.

The most common veins of this kind occur in granites, and they are known as aplites or pegmatites according to their texture.

The aplites are typically fine-grained and have quartz grains more or less round in outline.

The pegmatites are typically coarse to very coarse grained, and show peculiar regular intergrowths of quartz and feldspar known as graphic structure.

In the granites these veins consist almost entirely of alkali feldspars and quartz. In other rocks the composition varies according to and is determined by that of the parent mass.

Most of the feldspathic veins in the diabase examined by the writer are fine grained. Several specimens from James Township and Anima-Nipissing Lake, examined microscopically, show textures similar to that of aplites. The chief minerals present are feldspars, quartz, calcite and chlorite, plagioclase, feldspars predominating.

It would perhaps be useful to employ a more definite term in referring to these veins, which have not the same composition as the aplites occurring in granites. Similar veins in gabbro masses in the North Urals have been described by Duparc.* He has named them plagiaplites, a term which might well be used by us.

While most of the feldspathic veins examined by the writer are aplitic, there are doubtless in the district

*Arch. Sc. Phys. et nat. Geneve, 1902, 6 fevr.

veins of similar composition which have textures more like that of pegmatites.

R. E. HORE,
School of Mining, Kingston, Ont.

Bridgewater, N.S., Jan. 6, 1909.

Editor, Canadian Mining Journal.
Toronto, Ont.

Dear Sir,—I have read with much pleasure in your issue of Jan. 1 an article by Professor H. E. Haultain, entitled "The Mill Test for Gold versus the Assay; a Comparison in the Methods for Non-Technical Men."

The great advantage of having such papers before us is that it brings out the ideas of practical men and enables us to get at the best methods by comparing the results of our individual experience.

I do not know to what class of ore the writer refers, but, if he includes free-milling gold ores generally, I must strongly disagree with him as to the accuracy of his deducations. I refer particularly to the free-milling gold ores of Nova Scotia on which I have had continuous experience along these very lines for the past twelve years.

In the first place I do not think it fair to assume in comparing the relative merits of the two methods, that one is made carelessly and the other carefully, unless it is so stated at the beginning of the paper.

There is no reason why the mill test should not be in as competent hands as the assay.

Professor Haultain says, "The accuracy of the recovery of the gold from the plates depends on the skill and care of the man in charge." Does not the accuracy of the assay also depend on the skill and care of the man in charge?

He also says, "The very greatest care is needed before and after a test to clean out the box (mortar) and this cleaning out is a troublesome affair and even under the best conditions cannot be thoroughly done." I know that this can be thoroughly done, even as thoroughly as the mould can be emptied of its charge. Of course there is no question as to the loss in the tailings from the mill, but surely a careful mill test would hardly be complete without a careful sampling and assay of the tailings

I fully endorse Prof. Haultain's statement regarding the importance of correct sampling. But sampling has its limitations. I do not agree with him that when you are dealing with free-milling gold ores a spoonful can always represent a car load, even with proper methods and proper care.

In comparing the accuracy of the mill test and the assay, why should the writer assume that the sample for the former is taken at random and for the latter carefully?

During the past three or four years I have been carefully following the work of one of our largest gold mines by assays of the ore as exposed in the working faces of the mine. It was found that although these samples were taken as carefully as possible, always taking large samples, usually in duplicate, the results did not accurately represent the value of the ore. They did, however, serve, in most cases, as an excellent guide. On the other hand a small 5-stamp mill installed about a year ago, particularly for this purpose, gave excellent results.

I wish it to be clearly understood that I do not underestimate the importance of careful sampling and assaying as a guide to future work; but where at all possible this should be followed and the results checked by mill tests.

In conclusion I wish to refer to a paper by Professor H. Richards and E. E. Bugbee, of the Mass. Inst. of Technology, entitled "School Laboratory Work: A Free-milling Gold-Run." (Transactions A. G. M. E. 1904, pp. 478-486). The comparison of the assay versus mill-run as a basis of valuing a free-milling gold ore is very clearly shown in this case, where both are carried out with equal care and accuracy, as can always be done if it is insisted on.

Their results are exactly in line with my own experience on the same class of ore, except that in sampling the working faces of a mine the same degree of accuracy could not be obtained as in the case referred to. For the benefit of those who will not be able to refer to Prof. Richards' paper, I will quote a portion of his concluding remarks.

"As the value of the ore obtained by the mill run is much more accurate than that obtained by the assay * * * In fact one of the objects of this work is to show the student *the impossibility of valuing a free-milling gold ore by sampling and assaying.*"

Very truly yours,

E. PERCY BROWN.

PERSONAL AND GENERAL.

Mr. J. B. Tyrrell and Mr. J. C. Murray, of Toronto, left on a week's trip to Gowganda on Feb. 2nd.

It is reported that Neil J. Gillis, M.L.A., will be appointed Deputy Inspector of Mines of Nova Scotia.

Mr. Frank Shepherd, of Nanaimo, has been appointed inspector of coal and metalliferous mines for British Columbia.

Mr. Frank C. Loring has been appointed to the position of consulting mining engineer to the Wetlaufer Lorraine Silver Mines, Limited.

Mr. Geo. Gray, of Stellarton, assistant general manager of the Acadia Coal Company, was nominated by the Liberals of Picton as the candidates for the provincial election to be held February 16th, but owing to business reasons was unable to accept.

Mr. Thos. Reid, indentified as sales manager of the John Bertram & Sons Co., Limited, for many years past has moved his headquarters to Montreal where he will be associated with the Canadian Fairbanks Co., Limited, the general sales agents of the Bertram Co. On account of the importance of the Montreal machine tool market this move is evidently an advantageous one to both the Bertram Co. and the Canadian Fairbanks Co.

INDUSTRIAL NOTES.

J. M. Pipe and Boiler Insulation Catalogue, No. 100. H. W. Johns-Manville Co., 100 William St., New York.

This well-illustrated catalogue shows the many uses of asbestos and magnesia products. The firm of H. W. Johns-Manville Company has had fifty years of experience in the manufacture of asbestos and magnesia products. Pipes, boilers, and furnaces absolutely require coverings in order to avoid the loss of radiation and condensation, and thereby reduce the cost of fuel, which is a very large item in modern manufacturing.

This catalogue deals with coverings for high and medium pressure pipes, cold water pipes, hot air furnace pipes, with some special coverings for pipes used for brine and ammonia. It is just as important that boilers, domes, and cylinders should be covered as that pipes should be protected in order to prolong the life of the metal. For such use sheets and blocks of various thicknesses according to the pressure, etc., are recommended. The sheets and blocks are finished with half-inch coat of asbestos or magnesia cement filling. There is included in the catalogue a price list for the coverings, blocks, cements, etc.

After exhaustive trials with five different types of rescue apparatus—British and foreign—at the Howe Bridge Rescue Station, near Atherton—the largest yet erected in the United Kingdom—the Lancashire and Cheshire Coal Owners' Association have adopted the improved Fleuss-Siebe-Gorman, and Messrs. Siebe, Gorman & Co., Ltd., of "Neptune" Works, London, are now engaged in manufacturing the necessary equipment for this station and surrounding collieries.

The Wood Drill Works, of Paterson, N.J., has issued a twelve page booklet entitled "Wood" Rock Drills, giving some valuable information and full description of the machines, showing their adaptability to tunnel driving, drilling in concrete, and open cut work; with detailed costs in driving the Tieton tunnel of the U. S. Reclamation Service at North Yakima, Wash., also on other engineering works, with a number of fine testimonials. The booklet is printed in three colors, and can be obtained from the A. R. Williams Machinery Co., Toronto.

Through the Allis-Chalmers-Bullock, Limited, Montreal, we have received Bulletin No. 1063, issued by the Allis-Chalmers Company. Gas engines and generators are the topics touched upon. After tracing briefly the advantages of the producer and gas engine, the distinctive features of Allis-Chalmers gas engines are outlined. The valve gear, ignition system, air starting device, and lubrication, are described. Engines from 300 to 5,000 h.p. are manufactured by the Allis-Chalmers people.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

The output of the Dominion Coal Company's collieries for January was about 200,000 tons, compared with 314,000 in January of last year. The output for February is expected to be about the same as that for January. The mines are now working about two-thirds time.

The Mabou Colliery, which for some time has been in the hands of the Government, pending an adjustment of the finances of the company, has been allowed to fill with water. A feeder has been coming in, presumably from the sea, and it has been found cheaper to allow the mine to fill than to attempt to keep it pumped out. Whenever conditions will permit of the operation of the mine there will be no difficulty in unwatering the workings and coping with the feeder.

Naked Lights vs. Safety Lamps.

We are glad to see that the Maritime Coal & Railway Company have put in safety lamps in their Chignecto Mines, since the burning accident previously referred to in the these columns. We also undertsand the Inverness Coal & Railway Company are abandoning the use of naked lights. This is as it should be, and it may confidently be expected that before very long no naked lights of any description will be used in Nova Scotian coal mines.

In the United States the year 1908 achieved the ghastly record of the highest death rate in coal mines the world has ever seen. The present year bids fair to equal its predecessor. Hardly a day passes but the newspapers record a coal mine disaster. It may be that the disaster involves a mere half dozen men, or the death roll may extend to hundreds. The thing has become so common that one hardly notices the figure. We read it and think no more about it, and oftentimes it is difficult to know whether the account one is reading is that of a new explosion or the one that happened yesterday.

We read after these explosions that the mine was "reported safe," whatever that may mean; or vague hints are given of the possible connection between a seismic disturbance in Calabria, with an explosion in a naked light colliery in, say, Virginia, U.S.A. Is it not time to cease such cant and quasi-scientific blatherumskite! and put the blame for mine explosions where, in nine cases out of ten, it properly belongs, namely, to the account of naked lights and careless shot-firing.

We have in mind a case that came under our personal observation. A rent appeared in the pavement of a coal seam. The opening extended for a distance of forty feet, and emitted gas in such quantities that the intake air was fouled up to the fan-drift against an incoming air pressure of 200,000 cubic feet of air per minute. Safety lamps were used in this mine, and although some of the gauzes became red-hot and the men had to flee for their lives without their clothes, so rapidly did the gas come upon them, no explosion occurred, and nothing was injured. But what would have been the tale had naked lights been in use, or had one naked light been present? No one would have lived to tell it. Another case occurred in a seam that for years had been worked with naked lights. One day two men were working an electric coal-cutter alongside a fault. A pocket of gas must have been present in the vicinity of the fault, which the sparking of the motor ignited, and both men were killed. A gentleman recently giving evidence before the Royal Commission on Safety in England explained his antipathy to naked lights by relating that for 25 years his father had worked in a mine where naked lights were in use, but one day the mine exploded, and every person below, the witness's father included, lost his life.

In the "Colliery Guardian" for the 15th January this year is the account of an explosion that killed three men at Blaenavon, Wales. For four years the Inspector of Mines, Mr. Martin, had urged upon the management of this colliery the risk they were running in using naked lights. Even after this accident the manager said he was prepared to take the responsibility of working the mine with naked lights.

If an Inspector of Mines is to be of any benefit at all we think it should be in his discretion to prohibit the use of naked lights on his own judgment, without the necessity of resorting to the intervention of a Commission or of arbitration. Events are tending this way in England, and it may be fairly anticipated that one of the recommendations of the present Commission will be to give the Inspector power to enforce the introduction of safety lamps. We are a little ahead of England in this respect in Nova Scotia.

The figures collected by a previous English Commission proved that 80 per cent. of the explosions in mines were directly due to naked lights. Is it too much to say that if safety lamps had been made compulsory in all coal mines that the

enormous death roll attending these explosions would have been prevented, in part if not wholly?

BRITISH COLUMBIA.

Rossland, B.C.

Mining throughout this whole district has received a setback from the extremely cold weather that prevailed in January; that has affected the ore shipments of the district to a very considerable extent for the first month of 1909. Owing to the slush and ice in the Kootenay River the West Kootenay Power & Light Co. was forced to stop its water wheels, with the result that the mines and smelters of Rossland and the Boundary were without the heavy voltage electric power that they depend upon the Bonnington Falls power plant to furnish for the lighting of the mines and to turn many of the wheels about the works. At the Trail smelter it was found necessary to draw the matte from the furnaces when the power was shut off, and one pot of matte exploded, setting fire to the building, which has caused a week or ten days further delay at that plant. At the works of the British Columbia Copper Co. having been forced to close down, the company took advantage of the moment to make some needed repairs, with the result that the amount of work lost at that mine has been much more than the few days of the shut-down of the power plant amounted to. The same condition, to some extent, prevailed all through the mining district for two or three weeks. There is always a lot of work that cannot be done without a shut-down, and the mine managers avoid shutting down unnecessarily, hence, when nature takes a hand and compels the mines to close many repairs are undertaken and a lot of clearing up work done that has been accumulating for some time. A coal shortage last week was the cause of about 80 men being laid off at the Le Roi mine. Many of these will be taken back as the coal supply gets better, and, it is hoped, that before very long the full force will be at work again.

The report of the Le Roi Mining Co. for the 15 months ending September 30th, 1908, is not exactly suited to bringing joy to the heart of a shareholder, although there are some redeeming features to it. The financial statement shows a debit to loss and gain account of £24,895 for the period. This figure is arrived at after writing off £27,108 2s. 4d. for exploration and development; £9,701 0s. 3d. on account of depreciation, and £3,994 17s. 5d. for sundry items, making a total deduction of £40,804 0s. 5d. The liabilities of the company are shown on the financial statement as £65,326 10s. 8d., while the assets appear as £95,792 6s. 6d., showing a surplus of £30,465 15s. 9d. This figure is very much lower than the surplus appeared for the year 1907, when it was £74,259 19s. 4d. The company, it appears, mined 100,444 "dry" tons of ore for the 15 months which it is said carried an average of .363 oz. gold, .55 oz. silver and 1.22 per cent. copper, from which it realized about $11.11 per ton. The cost of mining and treating this product of the mine was $11.71 per ton, which figure, when compared with the other, speaks for itself. This cost in 1907 was $10.02, and in 1906 $10.50; there were heavy fixed charges spread over the smaller tonnage shipped in 1908 than during the two previous years, however, and there is no way that these charges can be reduced to any extent under the present system. To the lay observer, who may not be acquainted with important facts bearing on the case, it looks as though the company ought to make a better showing; that is, it seems to one that the Le Roi mine produced enough good ore during the period named to have paid a good profit, and aside from the fact that they paid off a part of the bank overdraft, there is a showing on the wrong side of the book. If the Northport smelter, with its heavy fixed charges, is responsible for this loss, is there not some way that this asset (?) could be done away with and the concern placed on a paying basis? If this was done and a little more economy exercised in connection with the London office, then the Le Roi mine ought to pay profits as easily as the other large producers on Red Mountain are doing. Might as well have a reconciliation now as any later date and make a new start, if such a course is necessary.

The operators of the I. X. L. shipped a 6 ton lot of ore to the smelter last week. The last lot of ore that the lessees of this mine shipped returned them over $100 per ton, and it is expected that this 6 tons will average fully as much.

Phoenix.—The output of the Boundary mines has been somewhat curtailed during the past few weeks. During the week ending January 30, the Snowshoe and Oro Denoro again appeared on the shipping list, the totat output of the district for that week being 32,301 tons, which is getting up near the standard ouput once more.

There are nearly 240 men employed in the Mother Lode mine at present. It takes a much larger force to get out the required amount of ore for the big smelters here during the winter months than in summer, when glory hole operations can be advantageously carried on. The reason is obvious; but the ore shipped from the underground workings is of a much higher grade than the product of the glory hole; for one reason there is a better chance to select ore for stoping, and ore sorting can be carried out on a better scale.

The mines of the Dominion Copper Co. are free from water, and everything is being kept in condition for a resumption of work when the order comes along, which manager P. F. Roosa says will very likely be some time during the coming six weeks. The machinery at the smelter is being fixed up so that there will be no delay at that end when shipments are begun.

The Granby Company is making an average of close to 2,000,000 lbs. copper per month, from which they should realize a net profit of $65,000 to $75,000, as it is understood they are making copper for a little over 10c per lb., when working at the normal capacity of the smelter.

Development on the Johannesburg claim, Greenwood, is giving most satisfactory results. It is anticipated that this big, low-grade deposit will contribute a considerable tonnage to the output of this district some day in the future.

The work of installing the new tram on the Golden Eagle mine has begun, and it is expected that the work will be finished and ore travelling over the tram in a couple of months.

For some weeks it has been rumored that Frank A. Ross has resigned from the Daly Reduction Company, Hedley, and that M. K. Rodgers, who formerly had charge, would again become associated with the Nickel Plate Mine. Mr. Ross now denies this, and states that the mine will be started up again as soon as water is available for the mill, and that the same management will be in charge of the work, as was the case last year.

The 450 ft. tunnel on the Woodburn has been completed, but it will be necessary to make another contract and drive this adit a still farther distance before the ore body will be encountered. The present showing in the face of the tunnel is satisfactory to a degree, the rock being well mineralized.

There is no doubt but the time is coming when dredging will be carried out on a goodly scale in the Similkameen. There is a large area of promising ground in the districts where placer mining was carried on in the early days, and where a dredging enterprise would pay handsome profits at the present time. Hydraulic mining has been tried along some of the streams in this section of the country, but various unfavorable conditions were against the profitable working of the ground gone over. A large force of Orientals still find it profitable to work much of this ground. The conditions in many places are suitable for dredging, as the gravel would not average over 30 ft. deep and the bedrock is not too hard, so that a good clean-up can be made. This Similkameen gravel will carry from 25c to 30c per yard on an average, and occasional rich pockets will be encountered. As is fairly well known, the dredging companies of other

districts are working gravel that only carries 15c per yard, it costing them in the vicinity of 8c per yard to do the work. As coal and other necessary supplies can be obtained at a reasonable price in the Similkameen, it will be seen that a good margin of profit should be realized on dredging in this locality.

The Greenwood prospecting tunnel scheme crops up from time to time, and it is now stated that a German syndicate has raised sufficient funds to begin work, and that operations will be started during the next few months.

Nelson.—The unwatering of the Silver King Mine is being rapidly carried on. A bailer is being used at present, but an electric pump will be placed at work in the mine to keep the water from accumulating when once it is all out. The force will be materially increased as soon as this is accomplished.

The bond on the Queen Victoria, the big low grade copper deposit, has been thrown up by F. A. Erlund and associates. A payment of $15,000 became due a few days ago, and the syndicate gave up the bond rather than pay this amount, even though they had already expended nearly $60,000 on the property. The claim has accordingly reverted to J. P. Swedberg, the original owner.

The Nugget Mine, Sheep Creek, has turned out four gold bricks to date. The one shipped last week weighed 305 oz., and was worth $5,000. The present production of the 4 stamp mill has been brought up to $5,000 from $1,500 by Manager J. L. Warner, since November last. It is the intention to increase the capacity of the mill to ten stamps.

On the Independence claim, of the Mother Lode group, they have cut the vein 133 ft. in from the portal; this at a depth of 86 ft. from the upper workings and 126 ft. from the surface outcropping. The ore at this point is similar to that found in the upper workings, which has returned the operators an average of $2,450 per car of 30 tons.

The True Blue group of claims on True Blue Mountain have been bonded, and work is to commence. It is said that True Blue Mountain is a huge mass of low grade ore, and that the day is not far away when a heavy tonnage will be shipped from this locality.

At the Eleventh Annual Convention of the Associated Boards of Trade of Eastern British Columbia, held at Trail, B.C., Jan. 27-28, '09, the following resolutions affecting the mining industry were adopted:—

"Resolved, That the time of expiration of leases on mineral claims ceases at noon, instead of at midnight."

"Gold and silver to be purchased in Canada for coinage purposes at the Canadian Mint."

"In contemplation of the production of spelter in quantity by the zinc smelter now working at Nelson, that we represent to the Dominion Minister of Finance the necessity of a rearrangement of the duty upon zinc products coming into Canada, and to the Minister of Trade and Commerce the necessity of seeking, through the medium of Canadian trade channels, for possible markets abroad."

Vancouver.—There is a movement afoot here to have a smelter built along the lines of the Nelson electrical zinc smelter, which could treat the zinc ores of the northern country, but more particularly of the district in the vicinity of Southeastern Alaska.

W. E. Young, of New York, has renewed options on a number of Kamloops mining properties. It is said that Mr. Young has the Newhouse and Guggenheim interests back of him, and that the plan they will try to put through is to acquire a large number of claims and then their holdings would warrant the building of a smelter at or near Kamloops. A reduction plant close at hand will be a necessity for the future success of Kamloops as a mining centre.

A lively interest is being taken in the smaller copper mines on the Coast, and several new ones have begun shipments to the Tyee smelter. The gradual rise in the price of copper seems to be the principal cause of this movement.

The output of the Cornell Mine, Texada Island, is to be shipped to the Tyee smelter. A test shipment recently sent to this plant returned the operators over $20 per ton after paying all charges.

The company operating the Early Bird Mine, Moresby Island, recently sent 500 sacks of rich ore to the Tacoma smelter, from which they received over $60 per ton. This old mine was worked by the Hudson's Bay Company in the early days, that company taking nearly $80,000 worth of gold out of the workings, but owing to trouble they had with the hostile Indians of the locality, the mine had to be abandoned.

GENERAL MINING NEWS.

NOVA SCOTIA.

Sydney.—The Scotia Fire Brick Co., Ltd., has been formed to manufacture fire brick and fire-resisting goods from the deposits at Coxheath.

Glace Bay.—It is reported that the coal industry of Pictou County is in a very satisfactory condition, all the collieries of the Acadia Coal Co. are working full time. The Drummond Colliery at Westville is also working quite steadily.

There is a probability of work being resumed at the Broughton coal areas of the C. B. Coal, Iron & Railway Co. The areas will be worked either by the company that now owns them, which will be refinanced for the purpose, or they will be bought and worked by the C. P. R., which holds an option on the properties.

The sea entered the Mabou coal mines last week, completely flooding the mines. It is believed the sea broke in at a depth of 1,400 feet in a level unused for some considerable time. The property worked steadily till last October, since which time, on account of trouble with the syndicate, the Provincial Government has been in charge with about forty men at work, under a Government inspector. It is thought that the mine can be pumped out.

ONTARIO.

Cobalt.—An important strike has been made at the La Rose at the 200 ft. level. When starting a winze to raise up to the 110 ft. level, the main La Rose vein was encountered, showing eleven inches wide, and running over 4,000 ounces of silver to the ton. Up to this time no ore bodies had been thoroughly tested and blocked out below the 110 ft. level. This new strike proves values down 90 feet farther.

The Cobalt Central concentrator is now handling 100 tons per day. New machinery has recently been installed, and the plant now contains twelve tables, three jigs, two crushers and a conical pebble mill, besides smaller machinery. One hundred and twenty men are now employed on the property.

A vein two inches wide and carrying very rich ore has been discovered on the Townsite mine at the 90 ft. level.

The Silver Belt Telephone Company will have wires in operation from Smyth to Gowganda early in February. A modern

wire will be installed from Smyth to the main line of the T. & N. O. to make long-distance connection with Toronto.

The Temiskaming have their new twenty-drill compressor installed and ready to run. At the 200 and 250 ft. levels the ore bodies run from ten to forty-three inches in width, and they give an assay of five thousand ounces. Last year the Temiskaming produced over one million five hundred thousand ounces of silver at a total cost of six and a half cents per ounce. During the last three months of the past year over half a million ounces were mined and shipped at a cost of five and a half cents per ounce. This was done with a small plant working at the 250 ft. level.

The Coniagas Company has been successful in its action before the Chancellor against the town of Cobalt and one Jacobson. The defendants are owners of lots and streets, but the Coniagas Company hold the patent for mining rights there.

The Kerr Lake Majestic is being put in shape for active development, and a 12-drill compressor plant with engines, hoists, and other machinery is being installed. It is expected to be in full swing early in March.

The Beaver Mining Company have been fined $200 and costs in the Cobalt Police Court for not having their shaft properly protected. The charge was laid by Mr. T. E. Corkill, Inspector of Mines, after the recent fatality at the mine.

The Hargrave Company have made an offer to the Kerr Lake Company to pay the latter a tonnage royalty on Hargrave ore mined and taken out through Kerr Lake workings. The Hargrave Company want to carry the Kerr Lake sixth level across the Hargrave line to break into Hargrave ore.

Negotiations of a similar nature are on between the Cobalt Lake and Cobalt Station Companies.

La Rose No. 3 vein (where the surface exposure of native silver was for a long time the show vein of the camp) is now being worked at the 120 ft. level. The vein in both drifts shows three inches wide, and carries 5,000 ounces of silver to the ton. The south cross-cut from the main shaft is in nearly 600 feet. When in 225 feet a native silver vein was cut and drifted on for 60 ft., showing a rich, narrow vein of native silver and argentite. The veins located last summer on the surface south of the office and carrying 2,000 ounces of silver to the ton will be reached any day now in this cross-cut and values demonstrated at depth.

One hundred and eight veins have been found on Nipissing. Three hundred and ten men are employed, and there are 20,000 ft. of underground development work.

Gowganda.—One thousand acres at north end of Gowganda Lake has been selected as a townsite by the Government. Surveying will start as soon as weather permits. The lots are to be sold by auction.

The plant has been purchased for a newspaper to be devoted to the interests of Gowganda.

Fort William.—The Northern Pyrites Company has sent out a trial shipment of six cars. Four cars have been sent to the Austin Mfg. Co., Harvey, Ill., and two cars to the Detroit Chemical Works, Detroit, Mich.

ALBERTA.

Medicine Hat.—The new natural gas well in the Medicine Hat field has now developed a flow of five million cubic feet per 24 hours. This is the greatest gusher in Canada.

Lethbridge.—The Canada West Coal Company, at Taber, has partially suspended operations. About 150 men have been laid off. The reason assigned for this action is shortage of orders for coal.

BRITISH COLUMBIA.

Greenwood, Jan. 25th.

The fourth general meeting of the Western Branch of the Canadian Mining Institute was held at Greenwood, January 25th and 26th. In the unavoidable absence of A. B. W. Hodges, chairman of the branch, the meeting was presided over by S. S. Fowler, Riondel.

Resolutions were passed, first, congratulating R. W. Brock on his appointment as director of the Geological Survey; second, endorsing the proposal to apply to the Dominion Government for monetary aid to the Nelson zinc smelter; third, expressing appreciation of the action of the Provincial Government in having assisted the same industry.

A suggestion was made that the Provincial Government be requested to subsidize the Branch, as it already does farmers' institutes.

Several interesting papers were read and discussed at the meeting. Afterwards the visitors were taken through the British Columbia Copper Company's smelter and the Mother Lode mine.

Cranbrook.—A company has been incorporated in Washington to work coal lands at McGillivray Creek. Arrangements are under way for the installation of the plant.

Ymir.—It is reported that the Canadian Girl and American Girl mines near here have been sold to a New York syndicate.

Phoenix.—The B. C. Copper Company took advantage of the forced shutdown recently, through lack of power, to make some necessary repairs to the smelter plant, thus obviating a shutdown later on.

Development work at the B. C. Copper Company's Lone Star mine has been suspended until spring.

The first carload of ore under the new management of the Republic mine has reached the Granby Smelter.

Ingenika.—The Ingenika-Findlay River Development Company have, according to the Vancouver World, between fifty and sixty claims on the Ingenika River and McConnell Creek. The company has an outfit, including boiler, sinking pump and geeral plant, now going in over the snow by dog teams.

Vancouver.—The discovery is reported of lode veins of platinum ore and gold-bearing fissure veins of quartz rock thirty miles south of Hope.

Whitewater.—The contract for driving 1,500 ft. of cross-cut for the Whitewater Deep Mine has been awarded to Frank Wilson and the Lade Bros. of Rossland.

Vancouver.—As the first step towards securing the largest fleet of gold dredges in operation in the North, a big dredge, costing $70,000, was purchased in Vancouver for the Yukon Basin Gold Dredging Company. This company now controls 20,000 acres of rich dredging ground on the Stewart River.

Victoria.—The Pacific Tin Mining and Smelting Company, incorporated last month, intend erecting a smelter here to treat tin ores from Seward Peninsula, Alaska.

The new company has a working agreement with the owners of the Goodwin tin group, in the Seward Peninsula, Alaska, to take the whole of the output of the mine, which is proven to be one of the richest in Alaska. The Goodwin tin group is situated on Tin Mountain. This mountain contains almost the only workable tin in place so far discovered.

Yukon.—The first concentrator erected in the Yukon is at Conrad, Windy Arm. It is owned and operated by the Yukon District Gold Mining Co., Ltd., a Canadian corporation, with head offices at Toronto. It has been in operation since November 1st, 1908, has a capacity of 100 tons per day, and is supplied with ore from the Venus mine.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

An official table issued by the Home Office gives the number of fatal accidents in and about coal mines during 1908 as 1,136, as compared with 1,162 in the preceding year. The total number of deaths resulting was 1,306, as compared with 1,245 in 1907. The total number of deaths caused by accident in metalliferous mines was 37, an increase of 3, and fatalities in quarries numbered 92, as against 89 in 1907.

The wages of Northumberland coal miners have been reduced 3¾ per cent.

Owing to the scarcity of radium, a syndicate has been formed in London for working the pitch blende deposits in the Trenwith copper mine, Cornwall, with the hope of producing radium in commercial quantities Previous to the discovery of radium the pitch blende was thrown away after the copper and uranium had been extracted.

RUSSIA.

An extensive export trade in steel rails is being developed. The Societe Dnieprovienne Metallurgique du Midi de la Russie alone shipped 37,866 tons during the eight months ending with October last. Of these 14,016 tons were exported to Italy and 6,285 tons to Japan.

An Anglo-Japanese syndicate has been formed for the purpose of exploiting on a large scale the gold, silver and copper deposits of Manchuria on the right bank of the Yalu.

Rich silver-lead ores have been discovered in Murman in the far north of Russia near the Norwegian frontier. It is intended to develop the deposits, using electricity generated from water power for smelting the metals.

GERMANY.

A new battery of 60 coke ovens is about to be established at the works of the Deutscher Kaiser Gewerkschaft at Hamborn.

SWEDEN.

The total production of iron ore in Sweden in 1907 was 4,478,917 tons from 294 mines, a decrease of 23,000 tons as compared with 1906. The output of pig iron was 615,778 tons, an increase of 10,989 tons. The number of workmen employed at the iron mines and smelting plants was 9,970, a decrease of 525 as compared with 1906.

AUSTRALASIA.

Tests of the Dawson coal of Queensland have proved very satisfactory, showing that it can be economically used in place of coke as fuel in suitable suction producer gas plants.

Upwards of 15,000 acres in the northern territory of Australia have been secured by different companies and syndicates for gold dredging. A dredging plant is to be sent to the territory in March and is to be operated on Sandy Creek. A lucrative alluvial gold industry was formerly carried on in some of these fields.

The labor dispute at Broken Hill, N.S.W., involving several thousand miners has been characterized by rioting and conflicts with the police. A number of unionists were arrested. The water main leading from the concentrating plant to the mill at one of the mines has been blown up.

Australian mining companies are contracting with the Cape Explosives Co. of South Africa, an offshoot of the De Beers Mining Company, for a supply of explosives by Australian manufacturers.

SOUTH AFRICA.

Extensive floods which prevailed in January throughout the Transvaal and Northern Natal, caused considerable loss of life in the mining districts. The flooding of the Witwatersrand gold mine owing to the bursting of a dam resulted in the drowning of 160 mine employees, ten of whom were white men and the others natives.

Experienced prospectors who have returned from the new diamond diggings at Rietfontein in the Vryburg district report that the fields are not payable owing to the shallowness of the diamondiferous soil.

The attempt made by a Durban syndicate to work the deposits of molybdenum in the mountainous districts of Natal has been abandoned.

INDIA.

It is announced that the Tata Iron & Steel Co., Bombay, will in the spring proceed with the erection of a new plant at a cost of £1,500,000, including blast furnaces, open hearth steel furnaces and rolling mills.

CHINA.

The deposits of gold near the city of Laichowfu have been opened under the direction of the Chinese Government, and the enterprise has turned out successful though only antiquated methods of mining are employed.

Deposits of coal have been located by an American engineer in Shensi Province, and a Chinese-American syndicate has applied for a concession.

UNITED STATES.

The suit brought by the farmers of Deer Lodge County, Montana, against the Anaconda Copper Mining & Smelting Co. to recover $2,000,000 damages and secure an injunction to prevent the operation of the smelter on the ground that the fumes were injurious to vegetation, has been dismissed by the court. The hearing of the case lasted for one year and two months, and the judge took nearly two years to deliberate before giving his decision.

The convention of the United Mine Workers of America held at Indianapolis adjourned on February 6th after a three weeks' session. They demanded an 8-hour day for the miners in the Pennsylvania anthracite districts, increased pay, and full recognition of the union.

Seventeen miners were killed by an explosion in the No. 2 Short Creek mines of the Birmingham Coal & Iron Co., of Alabama, on February 2nd.

The Frick Coke Company has abandoned work on 1,700 additional coke ovens at Uniontown, Pa., and will substitute for them an enormous by-product coke plant at Gary, Ind.

Congress has been asked for an appropriation of $2,500,000 for a fireproof building for the Geological Survey and other bureaus of the Department of the Interior.

MEXICO.

Prospecting is being conducted with good results west of Laguna, a station on the Mexican Central Railway, in the northern part of Chihuahua. The ores are mainly gold and silver-bearing copper and lead sulphides.

A party of engineers under the direction of Pearson's Oil Field Department have left San Cristobal, Vera Cruz, on an expedition through the States of Chiapas and Tabasco for the purpose of making a geological and geographical survey of a region very little known.

The third furnace of the American Smelting & Refining Co. at Chihuahua has been blown in. The smelter is now treating 400 tons daily.

The Cananea district is resuming its former activity. Four of the Green-Cananea Copper Company's furnaces are in operation, and the other four will shortly be started.

COMPANY NOTES.

WATTS MINING CO.

The annual statement of the Watts Mining Company shows that mining expenses for the year were $70,466.62, and general expenses $18,497.14. Against this there were credited sales of ore amounting to $131,582.62, from which had to be deducted for smelting and other charges $14,204.98. The income account therefore shows that this mine only made $18,244.40 for the year.

Another feature in the statement is that the Watts Mining Company at the end of the year, November 30, owed the King Edward Mining Company $98,803.05, and other creditors $11,107.76, a total of nearly $110,000.

NIPISSING EARNINGS.

President Earle says that during October, November and December, Nipissing earned a little over $100,000 net each month. The indications are that January returns will be fully as good. This means at the rate of $1,200,000 a year, which is equal to 20 per cent. on the $6,000,000 stock.

The superintendent in charge of operations reports that a strike has been made on the Fourth of July shaft at a depth of 138 ft. There a vein running from one to two inches in width was found, the ore assaying as high as 2,000 ounces of silver to the ton.

A cheque for $49,518.29 was received by the Provincial Treasurer on February 3rd from the O'Brien Mine, being the 20 per cent. royalty for the last three months of 1908.

The net profits for La Rose for seven months amounts to nearly $650,000. This ore has come out of pure development work. Much of this work is in new territory and on new veins.

LE ROI MINING CO.

On Friday, the 8th of January, the ninth ordinary meeting of the Le Roi Mining Co., Limited, was held in London, at which the reports of the directors; of W. A. Carlyle, M.E., consulting engineer; of A. J. McMillan, managing director, and of A. J. Larson, superintendent, were read and adopted.

The directors' report is for the 15 months ending September 30, 1908. The accounts show a balance to the debit of profit and loss £24,895 on the operations of the company for the period under review. The result is arrived at after writing off the sum of £40,804 0s. 5d, made up as follows: Exploration and development, £27,108 2s. 4d; depreciation of machinery and plant, surface improvements, etc., at the mine and smelter, £9,701 0s. 3d.; other items of expenditure, £3,994 17s. 10d. This makes a total of £40,804 0s. 5d. The liabilities of the company on September 30, 1908, amounted to £65,326 10s. 9d., and the liquid assets amounted to £95,792 6s. 6d., showing a surplus of liquid assets over liabilities of £30,465 15s. 9d.

The mineral property owned by the company forms a block of 142 acres in the centre of the Rossland mining belt, the larger part of which is virgin ground.

The report of W. A. Carlyle, M.E., consulting engineer, deals with the work done and the different veins and ledges. A definite plan for future development and prospecting of the mine was drawn up by Mr. Larson, superintendent, and himself. Mr. Carlyle praises Mr. T. Kiddie's work at the smelter, but says his costs would be materially reduced if a larger tonnage of ore was available for treatment.

A. J. McMillan, managing director, in his report stated that the severe decline in the market values of copper and silver had affected the mine greatly. Copper dropped from 22½c per lb. to 13¼c during the year, and silver from 68c per ounce to 51¾c per ounce.

The cost of mining, smelting and realization per ton in 1906, when 110,042 tons were mined, was $10.50; in 1907, when 131,696 tons were mined, was $10.02, and in 1907-8 (15 months), when 100,444 tons were mined, was $11.71. During the year the ore values have increased $1.40 per ton. The ore contained nearly 5 pounds more copper to the ton than in 1907, but owing to the fall in the price of that metal, the realization was less than during the previous year.

The ore smelted at Northport during the period ending September 30th, 1908, amounted to 124,263 dry tons. The matte shipped was 2,780 tons, valued at $1,164,912.63, equal to $418.97 per ton.

The report of A. G. Larson, superintendent, is substantially as follows:—

The tonnage extracted was made up as follows:—

Main vein	30,093 tons
North vein	4,498 "
South and Intermediate veins	43,364 "
Black Bear claim	22,489 "
Total	100,444 tons

Main Vein.—The ore from this vein was of good shipping grade, and came chiefly from the 100, 350, 500, 700 and 800 ft. levels. Quite an important tonnage was found in parts practically abandoned some years ago. Development work is now under way on the 1,200 ft. level with a view to proving the downward continuation of this ore body.

North Vein.—The tonnage extracted from this vein is not as large as last year. The ore, though small in quantity, is of a good shipping grade.

South and Intermediate Veins.—The development work carried on resulted in opening up an immense amount of ore, a great deal of which was, however, too low grade to ship. At the present time development work is being done on what has every indication of being a large chute of ore, considerably above the average grade of the mine.

Black Bear Claim.—Payable ore bodies have not been found yet at a greater depth than 1,125 ft. Considerable work was done on the 1,200 ft. level, but the ore was scattered and too low grade to have commercial value.

Ore Production.—The ore mined and shipped during the year amounted to 100,444 tons, its metal values averaging: Gold, .363 oz.; silver, .55 oz.; and copper, 1.22 per cent. per ton, equal to an average value of $11.11 per ton.

Development.—The details of development work during the year are as follows:—

	Footage.	Total cost	Aver. cost Per ft.
Raising and winzing	485	$17,417.74	$35.91
Cross-cutting and drifting	5,921.5	91,303.02	15.42
Station and pocket cutting, etc.		747.56	
	6,406.5	$109,468.32	
Diamond drilling	5,224	14,305.17	$2.74
		$123,773.49	

NO CROW'S NEST DIVIDEND.

Secretary Young of the Crow's Nest Coal Company has announced that no dividend will be paid to shareholders of the last half of 1908, in view of the heavy losses of the company in the Fernie fire, as well as the general depression.

LE ROI NO. 2 COMPANY.

The December report of Paul S. Counlley, mine manager, is as follows: Ore shipped, 2,410 tons. The smelter receipts were $24,759, being payment for 1,995 tons shipped, and $744 being payment for 73 tons concentrates shipped; in all, $25,503.

STATISTICS AND RETURNS.

SMALL OUTPUT OF COAL.

The output of the Dominion Coal collieries in January was 195,971 tons, for the same month last year it was 314,000 tons, illustrating the slackness of the present season. Last month was the smallest January output in several years, two years ago having been 45,000 tons more.

SCOTIA STEEL OUTPUT.

The Nova Scotia Steel and Coal Company's January output was 57,530 tons of coal, 5,730 tons pig iron, all steel products 6,498 tons.

DOMINION STEEL.

Dominion Steel's output for January was 21,100 tons pig iron and 22,073 tons of steel. The total shipments were 20,037 tons.

The rail mill, which has been idle for some time, will probably resume operations shortly.

COBALT ORE SHIPMENTS.

Following are the weekly shipments from Cobalt camp and those from Jan. 1, 1909, to date:—

	Week ending Jan. 23. Ore in lbs.	Since Jan. 1. Ore in lbs.
Chambers-Ferland	62,000	142,000
Kerr Lake	62,460	123,460
King Edward	53,920	53,920
La Rose	393,650	924,100
Nova Scotia	41,390	401,390
Nipissing	186,033	398,795
Peterson Lake	81,560	81,560
Right of Way	244,715	244,715
Temiskaming	60,000	60,000
Temiskaming & Hudson Bay	184,060	264,060

Ore shipments to date for 1909 are 3,124,745 lbs., or 1,562 tons.

The total shipments for week ending January 23 were 1,369,788 lbs., or 684 tons.

	Week ending Jan. 29 Ore in lbs.	Since Jan. 1. Ore in lbs.
Crown Reserve	160,700	280,700
Cobalt Central	41,238	81,238
City of Cobalt	155,840	218,930
La Rose	320,700	1,244,800
McKinley-Darragh	121,500	227,080
Nipissing	525,000	923,855
Temiskaming	130,000	190,000
Temiskaming & Hudson Bay	60,000	324,060

Ore shipments to January 29 for 1909 are 4,639,813 lbs., or 2,319 tons.

The total shipments for week ending January 29 were 1,515,068 lbs., or 757 tons.

	Week ending Feb. 6. Ore in lbs.	Since Jan. 1. Ore in lbs.
Buffalo	44,260	88,280
Coniagas	126,590	271,905
Crown Reserve	272,540	553,240
Cobalt Central	.....	81,238
Chambers-Ferland	.....	142,000
City of Cobalt	.....	218,930
Kerr Lake	81,637	205,097
King Edward	.....	53,920
La Rose	310,620	1,555,420
McKinley-Darragh	41,000	268,080
Nipissing	255,310	1,179,165
Nova Scotia	.....	401,390
Nancy Helen	.....	40,000
Peterson Lake	.....	81,560
O'Brien	64,040	127,880
Right of Way	.....	244,715
Temiskaming	120,000	310,000
Trethewey	125,400	185,400
Temiskaming & Hudson Bay	.....	324,060
Muggley Con.	.....	72,900

Ore shipments to February 6, 1909 are 6,081,210 lbs., or 3,040 tons.

The total shipments for week ending February 6 were 1,441,397 lbs., or 720 tons.

CROW'S NEST PASS COAL CO.

The output of the Crow's Nest Pass collieries for the week ending January 22 was 15,033 tons, being a daily average of 2,505 tons.

For the week ending January 29th totalled 18,348 tons; daily average, 3,058 tons.

The output for the week ending February 5th was 16,979 tons, a daily average of 2,830 tons.

B. C. ORE SHIPMENTS.

The following are the ore shipments for the week ending Jan. 23rd and year to date in tons:

Boundary Shipments.

Granby	14,421	45,074
Mother Lode	9,744	22,134
Snowshoe	820	6,336
Other Mines	....	651
Total	24,985	74,105

Rossland Shipments.

Le Roi	634	2,216
Le Roi No. 2	810	1,392
Le Roi No. 2, milled	206	620
I. X. L.	8	8
Other Mines	....	3,656
Total	1,712	7,892

The total shipments for the past week were 30,242 tons and for the past year to date 91,039 tons.

Granby Smelter Receipts.

Grand Forks, B.C.

Granby	14,421	45,074

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	9,744	22,134
Other Mines	....	1,850
Total	9,744	23,984

Le Roi Smelter Receipts.

Northport, Wash.

Le Roi	634	2,216
Other Mines	292	788
Total	926	3,004

The total smelter receipts of the various smelters for the past week were 27,679 tons and for the year to date 84,477 tons.

The following are the shipments for the week ending Jan. 30th and year to date in tons:

Boundary Shipments.

Granby	22,100	67,174
Mother Lode	7,686	29,820
Oro Denoro	420	1,050
Snowshoe	2,090	8,426
Other Mines	....	21
Total	34,239	108,434

Rossland Shipments.

Le Roi	746	2,962
Le Roi No. 2, milled	200	880
Centre Star	1,979	5,551
Other Mines	....	1,484
Total	2,985	10,877

The total shipments for the past week were 40,976 tons and for the year to date 271,297 tons.

Granby Smelter Receipts.

Grand Forks, B.C.

Granby	22,100	67,174

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	7,686	29,820
Oro Denoro	420	1,050
Other Mines	....	1,220
Total	8,106	32,090

Le Roi Smelter Receipts.

Northport, Wash.

Le Roi	746	2,962
Other Mines	296	1,084
Total	1,042	4,046

The total smelter receipts of the various mines for the past week were 36,064 tons and for the year to date 120,374 tons.

SILVER PRICES.

	New York. Cents.	London. Pence.
Jan. 23	51 1-2	23 3-4
Jan. 25	52	23 15-16
Jan. 26	52 3-8	24 1-8
Jan. 27	51 3-4	23 13-16
Jan. 28	51 3-4	23 13-16
Jan. 29	51 1-2	23 3-4
Jan. 30	52 1-8	24
Feb. 1	52 1-8	24
Feb. 2	51 7-8	23 7-8
Feb. 3	52 1-8	24
Feb. 4	52	24
Feb. 5	52	24

MARKET REPORTS.

February 5—

Connellsville coke, f.o.b., ovens:—

Furnace coke, prompt, $1.65 to $1.75.

Foundry coke, prompt, $1.85 to $2.00.

Metals.

February 5th—

Tin, Straits, 27.55 cents.

Copper, prime Lake, 13.75 to 14 cents.

Lake, arsenical brands, 13.50 to 14 cents.

Electrolytic copper, 13.50 cents.

Copper wire, 15.25 cents.

Lead, 4.10 cents.

Spelter, 5.07½ cents.

Sheet zinc, 7.50 cents.

Antimony, Cookson's, 8.05 cents.

Aluminium, 24 cents.

Nickel, 40 to 47 cents.

Platinum, $22.50 to $23.50 per ounce.

Bismuth, $1.75 per pound.

Quicksilver, $44.50 per 75-lb. flask.

The Robb Engineering Company, Limited, of Amherst, N.S., have recently received the following orders from Cobalt, Ont.: For the Crown Reserve Mining Co., one 30 h.p. Robb-Armstrong vertical engine; for the Colonial Mining Co., one 75 h.p. Robb-Armstrong vertical engine; for the Temiskaming Mining Co., two 100 h.p. Robb-Mumford water tube boilers.