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The Canadian Mining Review

Established 1882

Vol. XIII.—No. 10 1894—OTTAWA, OCTOBER—1894. Vol. XIII.—No. 10.

SCHOOL OF MINING,

KINGSTON, ONTARIO.

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Lecturer on Mining Engineering, The Economic Geology of Ontario, and The Discovery and Winning of Minerals.

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THE SCHOOL PROVIDES THE FOLLOWING COURSES OF STUDY:

1. *A Course of four years leading to the Degree of MINING ENGINEER, (M.E.)*
2. *A Course of three years, for which a Certificate in ANALYTICAL CHEMISTRY and ASSAYING is given.*
3. *A COURSE OF EIGHT WEEKS, (January and February), for Prospectors, Mine Foremen and others interested in Mines and Minerals.*

Lecturers are sent to any mining centre where a sufficient number of students is guaranteed, to conduct SHORT COURSES in Blowpipe Analysis, Chemistry, Mineralogy, Geology, Prospecting and Mining.

The different courses are made thoroughly practical by work in the well-equipped Chemical, Assay, Mineralogical and Petrographical Laboratories. A Mining Laboratory, furnished with Mills, Separators, Concentrators, etc., is in course of construction. It will be open for work in Session 1894-5. Surveying is practised in the field during the warmer months of the Session.

FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO

WM. MASON, Bursar,

SCHOOL OF MINING, - KINGSTON, ONTARIO.

THE Canadian MINING REVIEW
Established 1882

Official Organ of The Mining Society of Nova Scotia; The General Mining Association of the Province of Quebec; The Asbestos Club; and the Representative Exponent of the Mineral Industries of Canada.

B. T. A. BELL, Editor. Published Monthly. OFFICES: Victoria Chambers, Ottawa.

VOL. XIII., No. 10 OCTOBER, 1894. VOL. XIII,, No. 10

Drawing the Long, Long Bow!

If you're a great financial man,
And you want to start a Co.,
You'll find the most successful plan
Is to puff and gas and blow.
You'll scoop the curate's little store,
And ruin widow's by the score,
And bag the half-way man of war
By drawing the long, long bow.
You put the money into a mine
Away in Mexico,
And then with booty large and fine,
You seek the distant Argentine,
Like other men who used to shine
In drawing the long, long bow.—[*Opera.*

A phosphate miner, who announced his intention of taking up the production of mica, was warned by a brother miner, "Don't you do it! everyone who has anything to do with mica becomes a monumental liar!" But it was replied "I suppose he has first had an education in phosphate." It was admitted that in that case he might not have much to learn in the way of prevarication. Canada has been through an experience in phosphate mining, the history of which would be instructive and entertaining in spite of its unfortunate issues. Many honest and faithful attempts were made to mine phosphate, both with private capital and by joint stock companies, where the money was carefully and judiciously expended. The uncertainties of the deposits, and finally the reduction of the market price by one half, owing to the discovery of phosphate in Florida, made the business unprofitable and caused the industry in Canada to be practically abandoned, though let us hope this is only temporary. All this time, in the midst of genuine operations, there was a constant booming of the business by schemers, who, by the aid of extravagant romances, sought to unload properties upon confiding capitalists or the unwary public, at prices often infinitely in excess of their value, for they were so worthless in many cases that their operation meant the sinking of all the money that could be put into them. These "wild cat" enterprises culminated in the grand swindle of the General Phosphate Corporation, by which more than half a million dollars were absolutely lost, and one more deterrent was given to English capitalists against investing in Canadian enterprises. It looks now as though a similar experience was to be gone through with mica mining. Owing to the recent discovery of the value of mica as an electrical insulator there has arisen a considerable demand for it. Many properties have been worked for its production, but mainly at a loss, and operations have been reduced to a few exceptionally favored properties, which, under economical and careful management, can make a fair commercial profit. The difficulties encountered consist in the uncertainty of the continuance of the deposits, the great variation in quality, and the difficulty of procuring large sizes. As the price varies from 1 cent to 50 cents per pound, it will be seen that the profit depends upon the securing of large sizes. When the producer comes to find a market for his product he realize the truth of the scriptural adage, "It is naught, it is naught, saith the buyer." If his mica will not cut large sizes he is told it is worthless and that small mica is in unlimited supply If the color is dark it is said that only a silver-grey is wanted. If it is hard only soft mica can be used, and if it is soft nothing will do but hard. If no fault can be found with his product, he is told that there is no demand and that a substitute for it has been found in brown paper. He then in despair accepts the offer of a travelling agent who claims the privilege of culling it, and after his selection the miner finds a large quantity left on his hands, and not enough paid for the balance to cover the cost of mining. These are some of the difficulties, and they may as well be faced and frankly acknowledged, for a country is not benefitted permanently by having money squandered in it for unprofitable enterprises. A reaction comes that injures legitimate work and hinders the development of promising industries. Experience, however, has shown that if good mica lands can be secured at a moderate price and be judiciously worked, they can doubtless be made to pay. The air and the press are full just now of a mica boom. Lands that were valued at a few hundred or a few thousand dollars are now quoted in the hundred thousand We are gravely informed in the *Ottawa Free Press* of a shipment of "350 tons of dressed white mica of large sizes," from the Beaver Lake Mines, Que., a quantity which would be worth nearly two millions of dollars, and exceeding in bulk the production and consumption of the whole world during a long period. An attempt was lately made to float a mica company in New York with a capital of a million dollars, based upon a few properties that would be dear at ten thousand dollars. Now we hear of an English company with a capital of £90,000 that is going to pay great prices for lands, and is setting every owner of mica or of mineral lands agog to realise an immediate fortune for his holdings. Reporters in search of a sensation crowd the papers with fictitious stories, that they take no trouble to verify by consultation with men versed in the industry. Every person who has any practical knowledge of mining and marketing mica knows the utter falsity of these statements, and what can be the object af such absurd exaggerations can only be conjectured. It seems most probable that the intention is to bond properties to be unloaded upon English investors by the wily London company promoters. The Phosphate Corporation had about half the phosphate properties in Canada tied up for two years, causing expense and worry to the owners, and they finally selected a few properties, some of which were bought, not on account of their mineral richness, but because they belonged to men prominent in political life, whose influence might aid in floating the company. These politicians, who had scarcely if ever seen a lump of phosphate, secured immense prices, and most of the mining men who had toiled in the development of lands and had bonded them with great expectations were doomed to disappointment. This should be a warning to owners of lands to be cautious about tying up their properties. Many companies are registered in London with £100,000 capital that do not possess £100 in cash, and it is not as easy as it once was to persuade the British public into bogus investments. It is astonishing though how much of this still goes on. A promoter who had floated a disastrous concern started another enterprise soon after the wrecking of the first. He was asked if he thought anything would go with his name on it after

this last fiasco. "Oh, that does'nt matter," he replied, "there's a new fool born every minute." All the interests and sentiment of the REVIEW are of course in favor of the promotion of Canadian mining enterprises, and it is for this reason that we raise a warning against the misrepresentation of the true state of affairs and utter a caution against inflation of values and exaggerated estimates. It is said that the counterfeit is the proof of the existence of real value, and so a lie is often evidence of the truth. The immorality that hovers around mining only exists because there is a genuine basis to the industry, and fortunes often come to the steady workers who persistently and pluckily delve in the ground for its mineral wealth. To promote mining in Canada, we need to instil a conviction into the minds of foreign capitalists that there is not only mineral wealth in the country but that there is a sense of moral responsibility in the use of capital for legitimate work. While we deprecate swindles and exorbitant sales of unpromising lands as in the end injurious, we are eager to promote the development of the mining industry, and we believe there is a good chance for profit for those who intelligently engage in *Moral Mica Mining*.

Mining Education in Canada.

In the course of a recent interview with a McGill graduate in Mining Engineering, we were forcibly impressed with the conventional character of the curriculum adopted by Schools of Mines generally. Necessarily such courses of study must aim at as complete a scientific education as is possible in the time allotted, yet the particular branch of the profession which the future engineer is to adopt limits the utility of many of the studies undertaken. An engineer of mines, to be proficient, must be enough of a civil engineer to make his own surveys, above and below ground, lay out his railway curves, etc., etc.; enough of a mechanical engineer to select his machinery with a view to its best utility and economy, and to oversee its erection and maintenance in a proper manner. He must be enough of a chemist to thoroughly understand the composition and nature of his ores, country rock and associated rocks and minerals, and to know the possibilities and impossibilities of inorganic reactions. He should be skilful with the blow-pipe to determine readily the value of common ores and minerals, and be able to afterwards make an accurate assay for the precious metals. A knowledge of structural geology to enable him to work out or recognize the character and probable origin of his ore body, is indispensable. Now-a-days the mining engineer must go a step farther, and be physicist enough to be thoroughly familiar with the laws of gases, especially for the utilization of compressed air, and likewise he must know enough of that mysterious force we call electricity to enable him to utilize it intelligently for power and lighting. Such a training cannot be given without abundance of time, usually four years are required by the schools. Whether the proportion of mathematics now embraced in the course as usually adopted could not be reduced with advantage, to permit of a larger amount of time being given to quantitative work in chemistry and assaying, and to more practical work in the physical and other laboratories, we submit as an inquiry to those within whose jurisdiction the course of instruction at the various schools lies. We feel safe in saying that practical engineers—men who have passed the full course as now laid out and have had ten or more years in active professional work afterwards, will endorse the idea and will probably go farther A wider range of instruction in the shape of compulsory visits (for the purpose of study) to neighboring mining and metallurgical establishments, is most desirable, demanding close and comprehensive reports from each student of what *he has seen* and understood, of what he has *seen* but *not* understood, and a final report by the instructor to each student of what he *should* have seen, and *why* he should have looked for this and that. In the new school which has just been opened at Kingston we think that an opportunity has been neglected for a reform, (or perhaps it would be more becoming to say an experiment) in this direction. The establishment in connection with this school of a good working metallurgical laboratory is greatly to be desired. There are very many promising 'prospects' in Ontario which are so remote from testing laboratories as to preclude the idea of making mill run tests, and no other test for the precious metals is of any value. The cost of a small but complete plant that would take as small a batch as 200 lbs. and give a working result from the same, would not be large and should prove self-sustaining from costs collected, besides furnishing just the element of instruction to students, which is, in these modern days, an absolute necessity.

Canadian Capital for Canadian Mining.

Elsewhere in this paper mention is made of the manner in which the authorities of the recent Triennial Provincial Exhibition at Halifax treated the exhibit of the mining industries of Nova Scotia. We do not propose to comment on the same further than to make it the text for a short paragraph on the folly of expecting this Canada of ours to grow and prosper without the support of its own citizens. "Canada for the Canadians" has been the cry of an especially self-satisfied and contented (and we might add stupid) portion of our population. But we take it that a more liberal and far-seeing portion would say "Canada—not only for Canadians, but for all aliens who will bring in their capital and sojourn among us." And to induce such capital to enter Canada and remain here, and be a profitable investment is, we submit, one of the proper and lawful objects of exhibitions, be they Provincial or Dominion. In crowding the exhibit (which we understand was an exceptionally fine one) into a little room in the gallery about six feet by ten in area, the powers that be in Nova Scotia were very short-sighted; of the 25,000 people visiting the exhibition very few were enabled to see the exhibit and thousands were ignorant that any such was on view. It has been a constant source of surprise to the REVIEW to find Canadians (without distinction of Province) so ignorant of their own resources in minerals of economic value. There is, we venture to say, an abundance of capital in Canada for full development of its mines and quarries, —but this capital is not only timid, but is ignorant of the chances for successful investment which exist on every side about it, and which are seeking to be made known and to be investigated that such capital may be induced to embark in the business of mining, milling, smelting and manufacturing the products to be obtained. We can conceive few more legitimate objects of Provincial exhibitions in the future than to take up the subject of a properly classified and well displayed exhibit of minerals and metals of economic value. The REVIEW is well aware of the enterprising spirit of some Canadian gentlemen who, for years now, in the various provinces, have pluckily demonstrated their faith in our resources by the expenditure of very considerable sums. The development of the phosphate, mica and iron industries of Quebec furnish conspicuous examples. Nevertheless the fact remains that much home capital is both unconscious and chary of the opportunities offered it, and a large measure of publicity is desirable as an agent to help in removing this ignorance or mistrust.

The paper published in this issue, read by Mr. A. Sangster, Jr., of the Canadian Rand Drill Co. at the Sherbrooke meeting of the General Mining Associatson of the Province of Quebec, on "Repairing Rock Drills," will be read with interest by every superintendent, mine manager or contractor, who has had occasion to use machine drills in his work. The suggestion made by President Blue, in the discussion following the paper, that the first cost of the drills should be reduced from 25 to 50 per cent. of the present price and the drill could then be thrown away when used up, will commend itself at first sight, but is not a satisfactory solution on further investigation. We have been promised a public discussion of this paper, supplemented by actual costs of repair, at the next meeting of the Association.

Mr. E. D. INGALL, A.R.S.M.,

Chief of the Division of Mines and Mineral Statistics, Geological Survey of Canada.

EN PASSANT.

The next ordinary meeting of the members o the Mining Society of Nova Scotia will be held in the rooms of the society, at Halifax, on Tuesday, 6th November next. The business will include the consideration of the report of the committee on federation, and discussions on the various papers submitted at the Cape Breton meeting. The members will sup together in the Halifax hotel after the evening session.

Dr. A. R. C. Selwyn, C.M.G., Director of the Geological Survey of Canada, has gone to England on a three months' vacation. Rumor is current that Dr. Selwyn will then be superannuated and Dr. G. M. Dawson, the present acting Director, will succeed to the position.

Two individuals, named Baumgarten and Starke, are cutting a considerable figure and creating no end of a stir just now in Canadian mica circles, in connection with the operations of the Canadian Mica Company (Ltd.), lately registered in London with an authorized capital of £90,000 stg. These people talk very big, and if we may judge from a reported interview in the Ottawa *Free Press*, a great deal of nonsense. They claim to have purchased the Beaver Lake mine in the Saguenay district, Que., an entirely undeveloped property by the way, for "$150,000, *spot cash*," and the Hayes mine, Murray Bay, Que., for "$35,000, *spot cash*." Readers of the REVIEW, cognizant of the Canadian mica industry, will hardly be surprised to learn that there is absolutely no truth in these assertions. Careful enquiry shows that only very small payments in cash have been made and are offered, although stock in the venture is freely offered in exchange for lands. Whether it is intended to unload these properties on the company at the inflated prices named in the *Free Press* remains to be seen. In the meantime until better evidence of the *bona fides* of these people is forthcoming we recommend owners of lands to exercise caution before tying up their properties on "options," or promises of stock in a doubtful venture. Investors in the company, if there be any beyond the promoters, will also do well to ascertain by competent expert examination and advice, the true values of the properties to be acquired. Canadian mining men have no desire to have the good name of the country tarnished by any repetition of the tactics of Knud Sando and the late General Phosphate Corporation.

A meeting of the shareholders of the New Glasgow Iron, Coal and Railway Co. (Ltd.) and the Nova Scotia Steel and Forge Co. (Ltd.) was to have been held in New Glasgow this month, to consider a scheme of consolidation. As the stock of both enterprises is very largely held by the same people and many advantages will accrue, there is little doubt but that the proposition will go through. The new enterprise will be worked under a charter obtained at the last session of Parliament in the name of the Nova Scotia Steel Company, Limited, with an authorized capital of $5,000,000.

The coal shipments to the St. Lawrence by the Dominion Coal Co. (Ltd.) from the opening of navigation to 30th ult. are as follows:

Montreal	426,510 tons.
Quebec	23,740 "
Three Rivers	5,550 "
Sorel	2,200 "

While the price of Canadian asbestos still lags below the standard of former years, the industry is steadily recovering its old position as one of the most important of our mineral producers. Shipments have been brisk and are likely to continue so until the end of the season, and altogether the outlook is brighter than it has been for the past three years. A notable feature has been the falling off in the production of Thetford No. 1. These mines used to produce as high as 75 per cent. of this grade, but with increased depth of working the output has been reduced to from 15 to 20 per cent., and it is therefore clear that prices for this standard quality must stiffen considerably. Operators are confidently looking forward to an active season and brisk prices next year. In our December issue we will, as heretofore, present our readers with a complete review of the year's operations.

The following comparison of the mechanical and electrical methods of transmitting power was given by Mr. L. B. Stillwell at a meeting of railway men. A steel cable 1½ inches in diameter, travelling at the rate of 12 miles per hour, can transmit nearly 2,000 horse power. But by taking a copper wire, 1 square inch in section, and applying it to a potential equal to that which is in use to-day in at least one place in this country, viz.: 10,000 volts, at 1,000 amperes per square inch, we find we are transmitting in an invisible form over that wire more than 13,600 horse power, which is enough to rupture iustantly 6 such cables as are ordinarily used in operating a cable railway. As much power can be transmitted through such a copper wire under the conditions named as through 6 such belts as were seen at World's Fair, 6 feet wide and running at the rate of a mile per minute.

Mr. F. A. Halsey, who has been identified for a number of years with Canadian mining affairs has, we understand, permanently severed his connection with the Canadian Rand Drill Co. and will in future reside in the States. Mr. Halsey's marked ability as a mechanical expert and his many good qualities, have gained him a wide circle of mining friends who heartily wish him well in his new sphere of professional work. The name of a popular and prominent asbestos mine manager is associated with the succession to the management of the Rand business here.

The Newfoundland asbestos property owned in Halifax has been examined by experts this season but still remains unopened. The producers of Quebec may therefore rest for another six months before fearing a deluge of the Newfoundland mineral.

Mr. John E. Hardman, S.B., President of the Mining Society of Nova Scotia, and Mr. Thos. Cantley, Secretary of the New Glasgow Iron, Coal and Railway Co., were in Ottawa during the month.

We are informed officially that Mr. R. G. Leckie has not resigned his position as general manager of the Londonderry Iron Co. (Ltd.), as currently reported. The furnace at last report was being re-lined..

Mr. Graham Fraser, managing director, and Mr. R. E. Chambers, mine superintendent, of the New Glasgow Iron, Coal and Railway Co. (Ltd.) are at present in Michigan on business connected with the company.

The continued improvement in the condition of the electrical manufacturing industries of the United States is exercising a correspondingly beneficial effect on the production and shipment of Canadian mica.

A well known property of chromium is the wonderful degree of hardness it imparts to steel. But pure chromium which has been recently prepared for the first time by M. Moissan, proves to be incapable of scratching glass, and soft enough to be filed easily. It is whiter than iron. It is untarnishable and acids have no effect upon it, but at a red heat it decomposes carbonic oxides, uniting with the carbon—a fact that explains the failure hitherto to obtain chromium free from carbon. It is purified by M. Moissan in the electric furnace in the presence of a double oxide of calcium and chromium. New alloys of chromium with aluminium and copper are tough, malleable and untarnishable.

PORTRAIT SKETCH.

Mr. E. D. Ingall, A.R.S.M., Chief of the Division of Mines and Mineral Statistics, Geological Survey of Canada.

Mr. Elfric Drew Ingall, was born at Greenhither, in the County of Kent in England, in 1858, and comes of a family most of whose members have shewn strong scientific tendencies. He was early led to take an interest in science by his father, Mr. W. T. F. P. Ingall, who, although pursuing a financial calling, occupied his leisure in scientific studies, so that the subject of our sketch was early familiarized with microscopic, spectroscopic, electrical and other apparatus.

In this way when offered his choice of a life pursuit he elected to go through the course of study at the Royal School of Mines in London. After putting in two years study in inorganic chemistry in the lecture room and laboratory, he continued through the remaining two years curriculum, which included the theoretical and practical study of mineralogy, mechanical drawing, applied mechanics, physics, geology, metallurgy and assaying. Having passed the examinations in all these subjects, necessary to obtain his degree of Associate of the Royal School of Mines, he put in another year's study attending the lectures of Prof. Huxley on biology, and of W. Warrington Smythe on mining, in which latter subject he also obtained a certificate. His father being a life member of the Royal Institution and also of the London Institution, he had the benefit of frequently attending lectures at these places, and thus hearing Tyndall, Huxley, Abel, and the leading men of science of England on a wide variety of subjects.

On leaving the Royal School of Mines he spent some time in the mining districts of Cornwall and Wales, familiarizing himself with mineral deposits and the practice of mining. In 1879 a short digression was made into the realms of electricity, when he joined the electrical staff of the Edison Telephone Company in London, during which period he was entrusted by the company, amongst other similar tasks, with the demonstration of the use of that, then quite a novel instrument, for underground communication, which was probably the first experiment of this kind.

On the amalgamation of the rival Edison and Bell Telephone companies, he determined to return to his proper field of action in mining and metallurgy, with the hope also that his wish for travel might be gratified. Shortly after he was offered the direction of an exploration of some mining property in Canada and proceeded to Lake Superior in the Spring of 1880. Arriving at Michipicotan Island on the opening of navigation, he got his first glimpse of Canadian geology in the copper-bearing Keweenawan rocks constituting that island. Having organized his party, he proceeded across the lake to his destination at Cape Mamainse, where similar rocks constitute the shores of the lake. The summer was spent examining the extensive property held by his clients, and directing the making of the preliminary tests of the mineral veins thus located.

On the completion of his engagement he returned to England, but on the formation of a company to further test and work the property, he accepted an engagement as manager, proceeding to Canada in the Spring of 1881, and fulfilled the duties of that position till the fall of 1882, when, finding the carrying out of a policy with which he was not fully in sympathy both irksome and wearing, he resigned the management. The following summer of 1883 was spent in Wyoming Territory, studying its copper deposits and reporting on the same for London capitalists.

After his return from this work, he received an offer of a position on the Canadian Geological Survey from its director, Dr. A. R. C. Selwyn. His strong scientific sympathies led him to accept this offer, and after a lengthened visit of study to the Pennsylvania coal mining regions, and some private reporting on Canadian mining properties, his connection with the Survey began in July, 1884, and has since that date been continuous, first as Mining Geologist, and latterly as Mining Engineer in charge of the Division of Mineral Statistics and Mines.

From the commencement his duties have been connected with the study of the economic minerals and mines of the Dominion, special studies having been made of the silver-bearing veins of the Thunder Bay District, and of mineral developments around the Canadian shores of Lake Superior, their history, extent and results. Several summer seasons were also spent on a special study of the mode of occurrence of the apatite deposits of the Laurentian rocks of Ottawa County, Quebec.

Since November, 1889, in performing the functions of the office he at present holds, his duties have lain chiefly in the superintendence of the Mining Division in its work of collecting technical and statistical data relating to the economic minerals of the country, and their utilization through the mining operations carried on, which is accomplished in part through direct investigations by the staff of the Division in the field and supplemented by information gathered by the other field officers of the Survey, and through other reliable channels, all which is edited and compiled to form the annually issued report of the Division.

Through the visits and study of mining districts thus necessitated, and by his past career, his attention has thus been continuously directed towards economic geology, mining, and its allied subjects.

CORRESPONDENCE.

Mining in British Columbia.

To the Editor of the Review:

SIR, - Having visited British Columbia during the mining season for the last three years, and having lately returned from four months' residence there, I respond to your polite request to give your readers a sketch of my observations and a report of the prospects for mining in the southern districts of the Province.

Throughout the Province, from the Rocky Mountains to the Pacific, south of the Canadian Pacific Railway, the traveller comes upon a succession of mining districts, each of which has its special wealth of silver, gold, lead, copper, coal, limestone and other mineral products; and every man met with has his pocket specimen of "the richest ore yet found." Others have stories of new placer ground, where the gold is to be picked up in great nuggets, and the exhibition of one mounted as a scarf pin is a convincing proof of the truth of the representations. The perplexity of the investor is, not to find something good to buy, but to know which of the innumerable offers of unlimited wealth to accept. An old man is encountered washing gravel in a creek to test it for gold. He takes the measure of his inquisitor, and spotting him in his mind as a tenderfoot capitalist, he addresses him as follows: "I have been mining for 40 years, and have been in every camp from Alaska to Mexico, but I am satisfied that West Kootenay is the richest mining district on this continent. I have explored this country pretty carefully, and I've made up my mind that Toad Mountain is the best spot in it, and if you'll come up the mountain with me, I'll show you the most valuable claim that's been discovered on it. I'm hard up or I wouldn't sell it at any price; but as things are, I'll let it go cheap."

Here one learns that he has come to the place where America's wealth has been concentrated, but he hesitates even to pay the moderate sum asked for its possession,—so much has his confidence in the veracity of prospectors been weakened.

On Toad Mountain is one great property, the Silver King, rich in copper and silver, which first gave fame to the district. It's discoverers had to give away half of it to defend themselves against claim jumpers; then after refusing several good offers, they finally floated it in England, receiving only about $30,000 in cash, but getting a large block of shares, which ought to prove valuable, as the mine is undoubtedly a good one. It has been further developed this summer with a force of about 50 men, and preparations are being made to put in machinery and a tramway, and make it a good working mine. The town of Nelson will be greatly benefitted by its operation, and its success will lead to the opening up of other properties. Not only are there ledges of similar ore near by, but within a radius of twenty miles there are many claims located for gold, both in quartz veins and placer ground.

The great smelter at Pilot Bay, about twenty miles east, is being completed at a cost of over a quarter of a million dollars, and the mines at Ainsworth are being opened up with good prospects of success. With some advance in the price of silver, it looks as though the Kootenay Lake would be the scene of lively operations in the coming year.

But it is in the Slocan District that one reaches the seat of the mining fever that has agitated the country. Here are numerous veins of silver galena, some of remarkable size, and most of them giving an average of value above that of any other mining district, while a few show ore that is phenomenal in its assays, sometimes making shipments that average from 300 to 500 ounces silver to the ton, with occasional selections going up into the thousands. The great bulk of the ore that has been taken out so far can be relied on to give a value of $100 and $150 per ton. A few enterprising and persevering men have worked on for two years developing claims amid great hardships and tremendous obstacles, until now the railway has reached them and it will be possible to mine and ship ore with an assurance of profit, and with some degree of ease. A concentrator is being erected and substantial mine operators are coming into the country from the United States, and acquiring property, attracted, not only by the mineral wealth but by the more stable conditions of labor that prevail on the Canadian side of the line.

The history of the development of this region gives one of the romances of mining. First, an advance prospector comes in with ore that assays ahead of anything known. Then a thousand men start into the country. With packs weighing 50 to 75 pounds on their backs, they walk 20 miles over the narrow mountain trails, and then through almost impenetrable timber and underbrush, they force their weary way up

the seven thousand feet mountains, till at last one comes to a gulley where a snow slide has bored the rocks and shown large streaks of galena. He stakes off the ground. Others come along and see the rich show. In the hope of finding some flaw in the title they also put up stakes, or as it is called "jump the claim." They measure the first stakes to see if they are not less than four inches square. They copy all the inscriptions, look up all the records, and watch to catch the locator tripping in some lack of compliance with the many legal formalities. In one case they even bribed a sub-official to forge later dates in Government record books and destroy the original notices, so that the later location would become valid.

But the prospector wins a victory by careful observance of the mining laws, and opening up the ground improves its appearance so that he is able to sell it to a syndicate for what, to him, in his humble mode of life, is a fortune. Next, the syndicate develop the property, ship some ore that yields a high return, get a report from a noted expert and float a company with a million dollars capital. Now it becomes a mine, vast sums of money are sunk in it, and at last great dividends may float to the surface.

In this, as in all new mining districts, the hazards of claim jumping have to be reckoned with, as well as the uncertainties of mineral deposits. A brief sketch of the history of the Bon Ton mine will illustrate the difficulties that one must be prepared for. A rich deposit of galena was found on this property. The first assay gave 1,257 oz. of silver to the ton, and subsequent assays went as high as 1,800 oz. The owners opened up the ledge and left it when the snow came. Returning the next spring to work the mine, they found that the owners of an adjoining claim called the Big Bertha, that had no ore in sight, had annexed the Bon Ton, and on the strength of its "shows" had bonded the properties under the name of Big Bertha for a large sum of money. A tunnel had been run in 100 feet and ore was being shipped away. Then followed injunctions, seizures and surveys, and finally the Bon Ton owners recovered the property, though the season for work was over. In the meantime, three more jumps had been placed upon the property, and one of the jumpers discovered that the Mining Recorder had written S. E. instead of N. E. in copying a notice. Reference to the original showed this to be a clerical error, but still it was made the pretext for an adverse claim. A third interest was offered to a lawyer to take uy the case. He declined it, but there are always shysters around a mining camp ready for such work, and a suit was entered and the property hung up for nearly a year. The plaintiffs were nonsuited with costs, but being penniless and non-residents the owners could recover nothing of their expenses. Nothing daunted, the jumpers proceeded to the property and went to work again, running a new tunnel 75 feet and commencing to ship away ore when the leader was arrested and sent up for trial. The Attorney-General, however, dismissed the case, and said it ought never to have been brought, and one of the instigators of the jumpers was appointed Mining Recorder of the district. But at last the Gold Commissioner signed the Certificate of Improvements, upon which the Crown Patent is granted, and the owners are wondering whether the Queen's title will be proof against the wiles of Montana claim jumpers.

A good way to prove the value of a property is to locate it and then talk loudly, and widely and wildly about its riches. The professional claim jumpers at once start for it, search all the records and examine every point in the location, and if any fancied flaw is found they put up their stakes, or even if no flaw is found, they locate a claim over it for the purpose of blackmail, thinking the owner will buy them off rather than fight. But if no jump is put on the property the owner may as well abandon his claim as worthless, for these fellows are good prospectors, and if they do not think a property is worth staking it is pretty good proof that the surface showing gives no indication of value.

In the Slocan district ore is now being produced in such quantities that it is estimated that 10,000 tons will be shipped out this winter, and that even at the present low prices of silver and lead there will be a profit of $70 per ton, making a net income to the district of $700,000.

This summer the forest fires swept through the country destroying everything in their path. One man lost $20,000 in buildings and plant, but the clearing of the ground led to the discovery on his property of a galena ledge twelve feet in width, and he says he could stand such a fire as that every week. In spite of the revival of interest in silver mining that is surely coming, capitalists will be timid for a while in tackling the low grade properties, but the average value of the Slocan ores is so much higher than those of any other available locality, that it seems certain that this region is to be the scene of a tremendous development that will make it the largest silver producer on this continent. Those who have good properties there need have no dread of the alms-house.

But western profits are made not only in mines. Town sites are often a greater source of wealth, and the shrewd man who forecasts the location of a future city ensures the speedy acquisition of a fortune. In March, 1892, Kaslo, on Kootenay Lake, had two houses, and town lots were selling for $100. In a year from that time 3,000 people were on the spot and lots were changing hands at $2,000. Then came the silver slump; fire, flood and tempest devastated the town; superior enterprise built a railroad from the mines in a direction opposite from Kaslo, and last summer a few hundred people lingered bewilderingly, and a lot that was once in negotiation for $4,000 was sold at $50 for taxes. Widespread ruin was everywhere, and one man, who was asked for a document, replied that not only was his business extinct, but his books, house and lot had been washed away. Kaslo has a wonderfully delightful location, facing a beautiful lake and surrounded by vast mountain peaks, and it also has a promising business situation. The railway to the mines will yet be built, and a good share of the Slocan traffic is bound to flow that way.

Attracted by the possibility of a quick fortune in these suddenly growing mining regions, a syndicate of Montreal and Boston capitalists acquired a property in the Boundary Creek and Kettle River mining district, situated at the junction of two rivers, the meeting place of two projected railways, on the direct route of the only pass through the mountains for a hundred miles, and at the foot of the hills containing vast bodies of ore carrying copper, gold and silver, and with coal mines on either side. The town of Midway was started a year ago with its fence on the International boundary line, and only one log house in sight, and this month the County Court is holding its sessions there in a thriving village, located in one of the most beautiful valleys of British Columbia. Soon the boom in town lots will come and rapid fortunes will be realized. Twelve miles west of here gold is being taken from the banks of Rock Creek; further on the stamp mill at Camp McKinney is night and day crushing rock that is yielding constant rich returns, and still further west at Fairview the stamp mill of the Strathyre Mining Co., largely composed of Montreal capitalists, is making a thorough test of large reefs of quartz carrying a considerable quantity of gold. Ten miles south of this, on the Osoyoos mountains, Montreal enterprise has opened large ledges of gold bearing rock, and the Divide mine bids fair to make a name for itself. Again to the west, on the Tulameen and Similkameen rivers, Montreal capital is represented in gold and platinum placer mines, and the latest report comes of copper deposits, said by an enthusiast to be 800 feet wide and 4,000 feet long. To the north the rivers are being ploughed, dredged and pumped for gold, and even the sea coast is being attacked. In the Cariboo district, where so much gold was taken out by simple processes years ago, modern methods are coming in to wash down the rich banks of former rivers by means of hydraulic monitors, Last winter ten miles of 24 inch steel pipe were hauled in 150 miles, and ditches have been dug at the cost of hundreds of thousands of dollars, but now the clean up of gold is said to mean an average of over $1,000 a day. Many reproaches have been made against Canadians for lack of enterprise in developing the mineral resources of their own country, but one is surprised to find out how many of our cautious citizens who would not for the world be suspected of such rash conduct as investing in mines (or gambling with God, as it is often termed), yet have quietly risked a little stake in ventures which, though sometimes "wild cats," often prove to be bonanzas.

It surprises one who hears so much of the mineral wealth of British Columbia, to learn that at present, apart from the coal industry, there is not in the whole province, what in the United States would be called, a "working mine." The prospecting and developing stage has not yet been passed, owing largely to the lack of facilities for transportation; but it is evident that the time is close at hand when what can fairly be called *mines* will be operated.

It astounds one also to learn that the population of this vast territory, surpassing in area all the habitable portion of eastern Canada, possesses only a population of 100,000, of which only 65,000 are whites. Yet million dollar parliament buildings are being erected and there are no more important officials anywhere. They are largely "old timers," worthy, hearty, British gentlemen, who are loyal to the Queen, and to the Canadian Pacific Railway, and who keep to the left when they drive.

The past summer has been a trying one for the traveller. The floods were rushing over the railway tracks, and a construction train had to go ahead and prop up the road bed for the passenger train to get over. Transfers over washouts had to be made on hand cars or in boats. As the train slowly crawled on the narrow shelves along the sides of sandy mountains, the rocks could be seen rolling down from above between the wheels of the train while the gravel slid out from beneath the sleepers below. At last railway tracks and bridges all disappeared in the swollen rivers, and no resource was left but to mount the bucking cayeuse and ride over the mountain trails. A day in the saddle, fording rapid rivers, climbing along the ledges of precipices, jumping huge fallen timber and scratching through underbrush, so overcomes the tenderfoot, that although at dusk a big black bear crosses his path, and he hears the warning of a rattlesnake, he dismounts, and rolled in the saddle blankets, sleeps upon the ground in the deep forests, and only dreams of the wealth that is surely coming as the reward of his toil.

Some of our hardy phosphate miners, whose business was depressed, started out for British Columbia, and by their energy and close observation, discovered valuable properties in regions where many skilled prospectors were disappointed. Sturdy men who can find no work in the east might get some rich relations or friends to grub stake them, that is, put up the bare money for their expenses and go halves in the discoveries. Many a disheartened toiler might thus secure a fortune, or at any rate be braced up by the invigorating labor of exploring amid the grand scenery of the Selkirk mountains, and in camping in the deep forests by the snow-cooled streams that flow down the mountain gorges.

British Columbia possesses vast treasures of mineral wealth, which when capital becomes more confident, transportation more available, and trade restrictions less severe, will make it a region of great prosperity.

ROBERT C. ADAMS.

MONTREAL, 21st October, 1894.

MICA MINING NOTES.

The main shaft of the mica mine of Messrs. Wallingford & Co., in the eighth range, Township of Templeton, has attained a depth of 90 ft. The vein, which has been followed to that depth, measures ten ft. in width and contains for the greater part large sized crystals, and is continuing regularly in a north-west direction. A drift has laid bare the vein for a length of 60 feet. It is the intention of the operators to sink the shaft farther into the vein and to open up the same in lower levels by drifts. The amount of mica taken out daily is between 4 and 6 tons, cutting for the greater part 2 x 5 in. and upwards. Eighteen men are steadily at work. Some new buildings and hoisting machinery have been added to the plant with a view to increased capacity. Taking into consideration the vast amount of mica crystals as laid bare by the drifts and shafts it is safe to say that this mine can be considered at present the most valuable mica deposit in the Township of Templeton.

The Lake Girard Mica System is working the Stevenson property, lot 15, in the eighth range, of Templeton. The main shaft, which was worked some years ago for phosphate, is at present about 35 ft. deep, yielding a considerable quantity of apatite intermixed with well defined mica crystals. Some 150 tons of apatite have been taken out this season. On the western slope of the property a vein of well defined mica crystals was discovered this month. The crystals on the surface are of a perfect nature and of regular shape, some cutting 4 x 6 in. clear. This vein has been laid bare for 25 ft. in length, and shows regularity in occurrence. It is intended to work same at once with a large force of men.

The so-called Goldering mine, one of the oldest phosphate mines in the Township of Templeton, situated on lot 17, in the ninth range, has been leased to Mr. A. McLaurin, from the Bank of Hochelaga, for six months. Operations were commenced on the 10th of this month, and a great deal of mica crystals are reported to be in the main shaft. Eight men are employed.

About thirty men are working over the dumps of the Blackburn mine for Mr. P. McLaurin. The mica is being cut for a New York concern.

Work on the Cascades Mine in the 15th Range, Township of Hull, was resumed this month by W. A. Jamieson, et al.

Mr. W. F. Powell, of Messrs. Powell & Clemow, Ottawa, is now in New York disposing of the product of their properties, of which about 250 tons rough culled mica are on hand.

Parties wanting cheap jewellery in exchange for mica lands can be accommodated by applying to the representatives in Canada of a so-called English syndicate.

The White Mica Mine on Lac Pieds-des-Monts, Murray Bay, belonging to Mr. F. B. Hayes, Ottawa, has been sold to the Canadian Mica Co., represented by Baumgarten & Starke, the consideration being $8,500, almost wholly in shares of the company. A good force of men is already employed and it is reported to bethe intention to put up a steam plant very soon.

The Beaver Lake Mine in Bergeron county and the Perkins property in Hull, have been acquired by the same people. The consideration for the latter was, we understand, simply stock.

PHOSPHATES.

Mr. David T. Boyd, Glasgow, writing in the last number of the *American Fertilizer* on European and American phosphates, says: "The expansion of the phosphate business in Europe goes on uninterruptedly, and one would be rash to predict that the end of the century will not find us nearly abreast of supply, if it do not overlap it. Besides the gregarious follow-my-leader element in the increase of the use of new fertilizers, it has been wonderfully stimulated by the abnormally low prices of rock which have now ruled for some time. The experience of the past 25 years is likely to hold good again—every cycle of low prices is succeeded by a stronger reflex current, which affects a much larger area, and does its best to make the ends of supply and demand meet but not overlap. Such confidence in the future may appear a little extravagant, in view of the enormous amount of rock now being mined on both sides of the Atlantic, but 'enormous' is really a relative quantity, and the chances are that, while that word may be correct for to-day, it will have a totally different meaning when viewed from the standpoint of 1900. So long as money is abundant and cheap, so long will the enterprises representing lasting industries find favor, even if these for a time tax the patience of investors for adequate returns."

Recent newspaper and magazine articles have supplied much information about the phosphates of Algiers and Tunis and much stress has been laid on their quantity and quality and the cheapness with which it can be transported to foreign ports. The fact is, however, that notwithstanding the vast extent of the phosphate territory of Algiers it has failed to furnish any considerable quantity of the rock consumed by manufacturers. In 1892 the shipments amounted to 450 tons, in 1893 to 1,200 tons and up to date of the present year from 6,000 to 7,000 tons. There is talk that the output in 1895 will be very large. This has been the phantom which has annoyed South Carolina and Florida during the past year, but it is not much more than a phantom, if the reports in French papers be only partly true. There is much dissention among those who applied to the Government for concessions and claim that they got them as low as from 30 to 50 centimes per ton, equivalent to from 6 to 10 cents American money; but, all the same, the Government is now exacting from 2 francs to 2 francs 50 centimes per ton, which is fully as much as the royalty required by the State of South Carolina or Florida. We are not willing to under estimate the product of any country, but it will be difficult to obtain Algerian rock until the existing differences are adjusted, and this is a matter for the future. The Scotch, English and French firms who got concessions in Gafsa, Tebessa, Djebel, Dyr, Djebel and Konif, Constantine, Deckma, Sarja, Onedrio. Kora and Rio Salada have made demands upon the Government which have so far been disallowed In one case 2,000,000 francs have been asked and 6,000,000 in another. Even if these demands be granted, however, more serious questions confront the miners. Does the rock exist in the territory they have secured, which is doubted in many well informed quarters, and if it does exist in quantity, is it of merchantable quality, varying from 45 to 80 per cent. and much of it so soft as to prevent its being mined? Can it stand the sharp competition it will meet in France and Germany? It is admitted that it carries an excess of carbonate of lime, many say it lacks uniformity, others that it contains objectionable quantities of iron and alumina, and some shipments have given trouble on account of excessive carbonate of lime.

The only mine at present worked in the Ottawa district, is the High Rock, where the Phosphate of Lime Co. has about twenty-five men employed.

Some 500 tons were shipped this season from the North Star mine to the fertilizing works of the Nichols Chemical Co., at Capelton, Que. The various grades of fertilizers made by the Nichols people are finding a steadily increasing sale among Canadian farmers, and the business is likely to grow in importance.

The grinding mill at Bassin-du-Lievres has been fairly busy all season, grinding low grade phosphates in which a good deal of shipping has been done by Mr. T. S. Higginson, to the United States.

GOLD MINING IN NOVA SCOTIA

The Minneapolis property recently sold at Sheriff's sale to F. B. Wade, Q. C., has been transferred to Miner T. Foster of Halifax.

Whiteburn—It is understood that Mr. G. J. Partington, who has been working a small force of men here during the summer, has accepted the management of the Oxford Gold Mining Co., at Chezzetcook.

Chezzetcook—Mr. J. M. Reid, owing to failing health, has resigned his position as manager of the Oxford Company and will spend the winter in a warmer climate.

The property owned by Mr. John H. Anderson is showing well, the lode increasing in size and in richness. 170 ozs. were recently returned from a short mill run. The exhibit from this property at the Halifax Exhibition was exceptionally fine.

Molega—Little is doing in this camp beyond the operations conducted by Mr. Turnbull upon the property formerly owned by the Boston Gold Mining Co.

The Fiske block, held under an option for $10.000,00, is opening up in a small way, and some desultory prospecting is doing elsewhere.

South Uniacke—Reports from the Golden Lode Co. announce that the shaft has passed the 400 ft. mark. A fine stamp mill has been ordered from the Windsor Foundry Co., and is now in course of erection. It is contemplated to equip the property with an air drill plant at a near date.

The shaft in the Thompson-Quirk property is now 350 feet in depth and is still sinking to reach a lower pay chute.

Caribou—The consolidation of the various properties in this district mentioned in our August issue is hanging fire—a delay in making payments is reported, and rumor has it that other difficulties have been encountered.

The equipment of the Lake Lode under the management of Mr. W. A. Sanders is progressing rapidly. A new ten stamp mill is building, the mortar of which will be cast by I. Matheson & Co., of New Glasgow, and the tappets, cams, shoes, etc (which will be of cast steel) will be furnished by the Pittsburgh Steel Castings Co. of Pittsburgh, Pennsylvania.

Lower Country Harbour—An agreement to sell ⅞ of the Mason-Hudson property for $20,000, has been made, payments to run over two years. This is the "new-find" about six miles from Johnson's Brook. Messrs. Mason & Hudson retain a one-tenth interest.

Cochrane Hill—The twenty stamp mill is rapidly approaching completion. A considerable quantity of mill rock has been accumulated, and the results of the first clean-up will be anxiously looked for by some doubting shareholders.

Wine Harbour—The return of the Eureka Company is reported as 51 ozs. for the month. Work on the Eames patent process for extracting gold has been carried forward slowly.

Montagu—The Salisbury Co. has passed into new hands, under the management of Mr. Price. The "*Nessen*" mill, of newspaper fame, has been unceremoniously removed to the scrap heap and a new mill with new foundations has been commenced. It is reported that a good site has been made in the mine.

Goldenville—A difficulty in meeting payments is reported as the cause of suspension of work on the Springfield property, under management of Mr. MacNaughton.

GOLD MINING IN BRITISH COLUMBIA.

The Nelson Hydraulic Co., organized this year, has stopped work for the season on Forty-Nine creek, and cleaned up $500 in gold. The barren earth has been removed and next summer they will work on the rich gravel.

Since the inception of the placer fever on Cariboo Creek, prospectors have been scouring the neighboring hills, seeking to discover the quartz lead from whence come the coarse tailings found in the bed of the stream. That their efforts have been successful is amply attested by the official records here, and, for the time being, the placer fever has given place to the quartz craze. So far the discoveries are centered round Cariboo Creek and its tributories, and the ledges range in width from a few inches to several feet. In many, small streaks of galena appear, with an abundance of copper stains and white iron. The first claim staked out was the Golden Eagle, by George Hardie. This is located on the Government trail, on the west side of Cariboo Creek, one and a half miles above Mineral Creek. The ledge in this is well defined, several feet in width, and of white quartz. An assay on this went as high as $481 in gold, and 6 oz. in silver per ton. Since then nineteen other claims have been recorded, quite a number coming in this week.

B. J. Cornish, says the *Miner*, one of the directors of the Cariboo and Kootenay Mining Co., has been here for the past ten days examining the St. George placer camp and having a test made. The ground washed averaged $2 a yard. The men who have this claim in hand are of the right sort and are getting things in shape for work all through.

The Enterprise Mining Company, which has diverted the course of the south fork of the Lardeau river for 1,000 feet, netted $45 per hour during their first run.

Some new placer ground about twenty-five miles above the mouth of the Pend d'Oreille is causing some excitement. Messrs. Lobot & King, of Spokane, are putting in an hydraulic plant. Mr. Litchfield is prospecting his property with the same intention if results are satisfactory. The claims are on the American side and are one-half mile each in length.

We hear that the $5 shares in the Caribou Hydraulic Mining Co. are quoted as high as $25.

A large dredging plant is being built at the British Columbia Iron Works, Vancouver, for the Fraser River Mining and Dredging Co. The plant consists of a screw 130 x 33 with a "clam shell" dredger, having a lifting power of eight tons at a distance of 40 feet from its center, which will deliver sand and boulders alike (and gold too it is hoped) into the sluice-boxes, to which water is supplied by two eight inch centrifugal pumps. A new arrangement is the "water guard" or screen, shaped like an enormous snow plough, which, being placed ahead of the dredger divides the current and permits work to be carried on in comparatively calm water. Power is supplied by no less than five separate engines of which the largest is 125 h.p. There are also two horizontal engines aggregating 40 h.p., while two others, with 15 inch cylinders and 6 feet stroke, drive the stern wheel. Steam is supplied from a 24 h.p. boiler. The working of the new dredge will be anxiously watched.

The Le Roi Co. is shipping 8 tons daily, and ore is being continually blocked out for future shipment. The shaft is over 300 feet deep, and four levels run about 150 feet each way on the vein. The hoisting capacity of the plant is about 30 tons a day, and it will be run to its full capacity this winter. The stopes could furnish 100 tons a day if it could be taken away, and the best of it is, the greatest depth shows the richest ore. The large boiler is in place and the air compressor of eight drill capacity will be in working order within six weeks. The company has shipped ore from four other places on the mine, the ore being as rich from all four as that from the shaft, and at three places the ore bodies are fully as large.

The Canadian Pacific Mining and Milling Co., of Minneapolis, of which Mr. Westby is vice-president and manager, is preparing for active work on its gold property on Woodberry Creek, three miles north of Ainsworth. A contract will be let for about 300 feet of tunnel, seven feet by nine feet. In the meantime the necessary machinery will be erected and steam drills will be introduced for the continuance of the work.

Placer work on the Columbia River has received an impetus owing to the vast alterations in the bed of the river, made by last summer's flood. In many places bars that have been worked for many years are stripped ready for new works, and at Troy, 20 miles north of Wenatchee, some rich ground has been struck. Two men took out, according to a telegram, $15 in half a day. The gold is very fine and is difficult to save.

SILVER LEAD MINING IN BRITISH COLUMBIA.

About thirty-three claims will work and ship ore in the Slocan this winter. Times promise to be more prosperous there than in any other mining section of the North-West. The output will probably reach 17,000 tons by next spring.

The first stage in the litigation between the owners of the Lanark mine and the owner of the Maple Leaf mine, in Illecillewaet district, has resulted in favor of the former. The owner of the Maple Leaf claimed that the greater part of the ore extracted from the Lanark was from the Maple Leaf ground.

The parties who have the bond on the Fisher Maiden mine, on Four-mile Creek, Slocan district, have contracted with Lane Gilliam to pack 100 tons of ore to Silverton, a distance of eight miles. The Fisher Maiden is reported as one of the best showings for a mine in Slocan district. The ore is 'dry.'

A survey was made a few days ago of the ore in sight on the Slocan Star. The mineral was computed at the astounding figure of 232,000 tons, and that, too, without further drifting. Reckon that at the low value of $100 a ton and some idea of the richness of the property may be obtained.

The Silver King is sending down eight tons a day, of shipping ore, to Nelson, and it is understood this output will be kept up indefinitely. A. R. McPhee secured the contract for building the mile and three-quarter flume that will bring a water supply to the power house at the mine.

Although the Slocan Star is said to have 232,000 tons of ore in sight, the Idaho is now considered the "biggest thing" in the Slocan country. The great strike in the mine was made about two months ago, and already $30,000 worth of ore is sacked ready for shipment.

The President group of claims, in Goat River district, which were owned by Messrs. Fitch, Fritch and O'Neil, has been sold to a Wisconsin company, and part of the purchase money paid. Work, it is said, will be commenced at once.

On October 8th, 1891, John Sandon and Bruce White located in Slocan district a mineral claim that has been made a mine. The location was named Slocan Star, and the winter it was bonded to Byron N. White, who early in the spring began developing it. A little work went to prove the property a good one. The bond was taken up and a company was incorporated to take over the mine. The company was organized in Milwaukee, and incorporated under the laws of the State of Wisconsin, Angus Smith, a well-known Milwaukee capitalist, accepting the presidency, Byron N. White being chosen vice-president and general manager. All through the summer and fall of 1893, when other mining operators were jumping sideways in their efforts to raise money to take up bonds and keep development work going, the "Byron N. White Company of Milwaukee, Wisconsin," had a regular pay day, and paid as regularly as the day arrived. During the winter of 1893-94, although other mines shipped ore, none was shipped from the Slocan Star. Over 800 tons were, however, hauled from the mine and stored at Three Forks, there to remain until it could be hauled by rail to the smelter. Last week, says the *Tribune*, that ore was sold in Spokane, and the sum realized will more than repay the company for every dollar it has expended on the mine for development work. The ore was purchased by the Omaha-Grant smelter of Omaha, and the contract for hauling it to the smelter was secured by the Canadian Pacific Railway. A further contract was entered into between the mining company nd the railway for the shipment of 1000 tons in addition to the 800 tons now at Three Forks, the 1800 tons to be delivered to the railway company at Three Forks, by the 1st of January, 1895. The money realized from the sale of the 1800 tons will more than place the mine "on velvet," and from this time on the Slocan Star will be a dividend payer.

The contract for freighting and smelting the 800 tons of Slocan Star ore now lying in the ore shed at Three Forks, has been secured by the Omaha and Grant smelter. Tenders for this contract were opened in Spokane this month. There were five bids, from the following firms: Omaha and Grant, represented by E. F. Matthews; Selby Co., of San Francisco, by Herbert Lang; United Smelting Company of Montana, by Charles G. Griffiths; the Everett Smelter, by Louis Verdin; and the Colorado Smelter at Butte, by O. Bergstrom. The ore will go out via Nakusp as soon as the railway reaches Three Forks and will be handled as far as St. Paul by the C.P.R.

The report again reaches us from Victoria that the Hall mines are about to build a smelter near Nelson large enough to take custom work besides treating their own ores. There is no doubt that such a proceeding has been talked of by the company and probably it will be carried out by and by. But we regret to have to deny the rumour as far as it relates to any immediate action. It has been found impossible to keep the pipes that supply water to the diamond drill on the Kootenai Bonanza free from ice. It will be remembered that this supply is forced through 1,700 feet of piping from the engine house on the Silver King. Lately, in spite of a continual stream being kept up day and night, the frost could not be avoided and several lengths of pipe have burst. The drill is now shifted to the end of the 900 feet tunnel where it will drive straight ahead, exploring the rock through which the tunnel would pass is prolonged. Including the men working at the flume there are now about 70 men employed by the Hall mines.

About 15,000 tons of ore, from the present indications, will be shipped from the Slocan, between now and next spring.

The Sunrise is showing up well. Between 50 and 100 tons will be shipped.

On the Carbonates, located at the head of Spring Creek, and bonded to J. A. Finch, the miners have uncovered three feet of ore that assays 300 ounces of silver to the ton. Selected specimens assayed 2,000 ounces to the ton.

A full force of men is now at work on the Reco; ore averages 180 ounces of silver per ton, and as a large amount will be shipped this fall and winter, it means a large amount of money for the camp.

At least four important strikes have been made on the Kaslo side of the divide this season, viz: The big strike of the McDonald Bros. on the Eureka, Finch's find of three feet of rich ore on Spring Creek, Otto's Bunker Hill on the west branch of Kaslo Creek and Price's Silver Eagle at the head of the same stream. There are better days ahead for Kaslo, and they are not a long way off.

GOLD MINING IN ONTARIO.

A ten stamp mill is being put in on the property of Ward Bros. *et al* in the Rainy River district. the vein is reported unusually rich and the development work has given satisfaction to the owners. The mine is located on an island just east of the Little American Mine.

A Duluth despatch says: The Beaver Mining company, which owns the Little American gold mine on Rainy Lake, signed a lease of the property to George A. St. Clair for twenty years. St. Clair is at the head of a syndicate which will immediately take steps towards developing the property in good shape. The lease requires that two shafts shall be sunk to a depth of 200 feet at a distance of 500 feet apart, and a tunnel cut between the two. Hoisting machinery of approved pattern must be stationed at each shaft. The new deal contemplates an outlay of $25,000, including a much larger stamp mill, which will not, however, be needed until the shafts have been sunk. Payments are to be made monthly in the shape of a royalty, a certain minimum being guaranteed. The original investors will receive at least between 15 and 20 per cent. interest on their money and later 25 per cent. or more.

new company has been incorporated lately under title of the Syndicate Mining Co., to open mining properties on Rainy Lake. This company has already sunk a 25-foot shaft on their island a mile and a half east of the town, and have let a contract for an additional 25 feet. Their purpose is to put in a stamp mill during the winter. Mr. Dent will personally direct the operations of the company for the present.

The International Mining and Milling Co. will shortly commence active mining upon the Grey Eagle and Wild Rose locations near Rossland, Lake of the Woods district. It is also reported upon good authority that two other promising gold prospects in the Rossland neighborhood will soon be open by live United States men. These lots have recently been examined by and for the owners.

NEW COMPANIES.

The Dominion Gold Dredging and Placer Mining Co. Ltd.—Application for charter of Incorporation under Dominion Statutes is made by this company with *the object of carrying on mining in the Province of British Columbia, and in the* North West Territory. Head Office: Toronto. Authorised capital $40,000 in $100 shares. Directors: James Amess, John Perkins and Alex. Leslie, all of Toronto.

Stellarton Gold Mining Co. Ltd.—This company with headquarters at New Glasgow, N. S. has applied for incorporation under Nova Scotia Statutes for the purpose of mining in the Sherbrooke district and elsewhere in that province. Authorised capital $20,000, in shares of $10. The Directors are: John McQuarrie, Guysboro; W. L. Ormond, Thorbourn; John McQuarry, Stellarton; Duncan McGregor, Westville; and James Keith, New Glasgow.

The Syndicate Mining Co. Ltd.—This company with an authorised capital of $300,000 has been incorporated with headquarters at Rainy Lake, Ontario, to operate gold mining properties, in that district. The officers are B. C. Dent, Duluth, *President*; *H. M. Miles, Duluth, Vice-President*; *H. H. Phelps, Duluth, Secretary*-Treasurer. Work has been commenced.

Nickel Steel in Shipbuilding.—The American liner Paris has had constructed for her a spare length of shafting of nickel steel. We believe this is about the first application of this alloy in a merchant steamer, notwithstanding that it is five years since Mr. Riley of the Steel Company of Scotland, first demonstrated in that country its greater elasticity and tensile strength. The Paris's new shaft has tensile strength of about 90,000 lbs., probably 25,000 lbs. more than any British or German steel shaft. It has been established by tests that nickel steel has a higher elasticity than ordinary steel to the extent of 31 per cent., and that the tensile strength is 20 per cent. greater. Moreover, ductility is not adversely affected. Although, therefore, the size and weight of the Paris's shaft might have been reduced with maintenance of strength, it has been kept the same as those first fitted at Clydebank. The original objections against the alloy, notably the influence of cold weather, have been removed by similar demonstrations to those made by Mr. Riley, and by proof of fact that it is incorrodible and can be advantageously made on the basic open hearth furnace. The idea of using it in the construction of steamships and their boilers and engines is being discussed, since there would be a reduction of nearly one fourth in weight for the same power, which weight, added to the size of the machinery to augment power, would greatly increase speed without adding to the dimensions of the vessels. For instance with 4·7 per cent. of nickel in the composition of the steel, the elastic limit has been increased from 16 to 28 tons per square inch, and the breakage strain from 30 to 40 tons. Its adoption for armour is proof of its efficiency, but it is just possible that the conservatism dominant at the Board of Trade may allow Messrs. Cramp to step in with a nickel-steel ship and machinery, and thus carry off the laurels from the Clyde. The North American continent production of nickel ore increases, and prices are decreasing.

Trees in a Coal Vein—A short time ago, it is stated, pieces of resin and wood were found in the coal vein at Newcastle, Washington, 2,000 feet under ground, and now the miners are at work getting out a tree, for there is a perfectly formed fir log lying embedded in rock and coal over one-third of a mile under the surface of the earth. The bark is probably 6 or 7 inches thick, and the peculiar characteristic marks of fir bark show very plainly. The specimens of the wood are even more clearly marked by the annual layers and wood fibres, and, though of solid rock, look so natural that they appear as if they would readily yield to a pin stuck against them. In the coal crevasses near by are found great quantities of resin, as beautifully clear and amber colored as if it had been picked from a standing tree. There is no telling how long that log of rock is, but its diameter shows that it must have been 24 inches through the wood, and must therefore have been originally 150 feet in height. It is probable that a piece not larger than a ton or two will be raised to the surface, but the miners are at work getting out as large a piece as possible. The log in places is coated with a white incrustation of limestone.—*Exchange.*

Jordan's Tipping Coal Screen.

By Mr. Robert Jordan,
(South Wales Institute of Engineers.)

The objects aimed at by this screen are the following:—

1. Efficient screening, or separation of the large coal from the small.

2. Facilities for cleaning the coal and for picking out the dirt before the coal is tipped into the truck.

3. Minimizing the amount of small coal produced by screening and transferring the coal from the pit-tram, or tub, to the railway truck.

The arrangement consists of the following:—

1. A specially designed tram tippler.

2. A tipping, curved and self-balanced screen, with the usual "Billy Fair-play," for ascertaining the weight of the small coal, attached thereto.

3. A coal cleaning platform.

4. A truck trimming platform.

1—Tram Tippler.

The tram tippler is a tipping platform and short screen combined. This screen projects about three feet beyond the front of the tram placed for tipping upon the tippler. It is also raised above the rail level of the tippler, as close as possible to the underside of the tram, so that when the coal leaves the tram it shall only have a few inches to fall upon the screen. At the end next to the tram this screen is about 3 ft. 9 in. wide, expanding to about five feet wide at the other end. The object of this expansion is to allow the coal to spread out as it leaves the tram, so as to cover as much as possible of the surface of the main screen, in order that it may be well screened, and also that by being well spread out it may be the more easy to pick the dirt from the coal.

Two curved uprights, fixed to the sides of the tippler, carry a horizontal bar, from which a swinging plate hangs in front of the tram of coal. The object of this is to prevent the coal from being pitched violently forward from the top of the tram when the tram is tipped. A short chain attached to one of the lower corners of the plate and hooked to one of the uprights prevents the plate from swinging out too far when the tram is tipped, and by this means the coal is made to drop upon the projecting short screen, close to the end of the tram; should the coal become jammed between the plate and the tram, the chain is unhooked and the coal immediately released.

The object of this projecting screen is to receive any coal that may fall from the tram while it is being tipped and before the tippler has touched the main screen, so as to convey the coal as easily as possible to the main screen from the tram. It also commences the screening the instant the coal leaves the tram.

After being tipped the tippler is brought back by a counterbalance weight suspended beneath it. A self-acting catch holds it in position to receive another tram, and prevent its tipping when the full tram is on it until required. The same catch holds the tippler down, when tipped, until all the coal is out of the tram. The catch is withdrawn by a treadle.

2—Tipping Curved and Self-balanced Screen.

This is what may be called a self-contained tipping shoot, with screen bars at the upper end, a plated platform at the lower end, and with plated sides, the whole being supported by T iron ribs or binders.

It is fixed upon a shaft resting in plummer blocks upon the coal cleaning platform. This forms the fulcrum upon which it is balanced, and the fulcrum is so placed that the weight of the upper end of the shoot, or screen, preponderates over the lower end sufficiently, when the screen is empty, to bring it back promptly, but not too rapidly, from the tipped position into position for receiving another tram load of coal. Particular care is necessary in fixing the fulcrum shaft on to the shoot to ensure the latter being properly balanced; and due attention to this and other details is fully rewarded by the satisfactory working of the arrangement afterwards.

When the shoot or screen, is in position to receive coal from the tram, the upper end rests upon suitable supports, and the lower end is supported by self-acting catches, fixed to the beams of the coal cleaning platform. In this position the fall of the screen is 4½ inches in a foot at the upper end, and 1½ inch in a foot at the lower end; the change from one gradient to the other being effected by an easy curve, so as not to block or interrupt the descent of the coal. The object of the flattened gradient is to bring the large coal to a state of rest upon the screen without abrupt shock, for the purpose of cleaning it before it is tipped into the truck. Upon the fulcrum-shaft a brake rim is fixed, which for additional strength is also bolted to the side of the screen; upon this rim a brake acts and controls the movement of the screen.

The bars of the screen are arranged in about 4 feet lengths, and the ends of the bars of one length are inserted between the bars of the adjoining lengths; so that instead of the bars being in one continuous length from end to end of the screen, as is usually the case, each length of about 4 feet, is succeeded by an intervening space of about 4 feet, into which any small coal that may have ridden down the bar will drop, instead of being carried forward with the large coal, thus securing efficient screening.

To prevent the screen, when it is tipped, from descending upon and damaging the basket or "hopper" of the "Billy Fair-play," a plank-on-edge is fixed in brackets on the middle row of columns supporting the coal-cleaning platform, on which the screen descends. In this position the screen clears the "Billy" basket, and also just clears the side of the truck, into which the snout of the screen descends. As the coal piles up in the truck it becomes necessary to arrest the descent of the screen at a higher point than the plank-on-edge to allow the free discharge of the coal from the snout of the screen. This is done by stops or stop-blocks fixed above the plank-on-edge, which are brought into use when required. By the brake, also, the descent of the screen may be arrested at any other point.

By the facilities thus afforded for depressing the snout of the screen well into the truck at the commencement of the loading, and afterwards of regulating the depression to any other point, the minimum amount of fall from the snout of the screen into the truck is attained.

Besides this, as the coal upon the screen is in a state of rest near the lower end of the screen prior to its being tipped, it acquires but very little velocity in descending into the truck when the screen is tipped. And it is found in practice that none of the coal leaves the screen until the screen has reached the desired point of depression, even when that is the lowest point upon the plank-on-edge, so that the coal is deposited in the truck with comparatively little violence. Thus, and by aforementioned means, the amount of small coal produced in transferring the coal from the tram to the truck is minimised.

Where more than one is required the screens are arranged in pairs, the breadth over each pair being 13 feet, which is less than the length of an ordinary 8-ton coal truck, so that two screens may be discharging coal simultaneously into the same truck; consequently, once a truck is placed in postion under the screens it has not to again be moved until it is full; whereas, with ordinary single screens, one end of the truck is first put under the screen and filled, then the truck moved and the other end is filled, thus involving extra labour in handling the trucks.

3.—Coal-cleaning Platform.

Upon this platform the screen (or screens) is fixed. It extends in front and on each side of the screens, and is about level with the lower end of the screens when the latter are in position to receive coal from the pit-tram, thus providing the necessary convenience for handling the screens and cleaning the coal. A man and a boy are employed at each screen for this purpose. Both take part in the cleaning, after which the man attends to the tipping of the screen, and the boy weighs the dirt. A record of the weight is kept against each tram separately, thus affording means of checking the sending out of dirty coal. Until all the dirt amongst the large coal has been picked out the screen is not to be tipped. By these means, with ordinary care and attention, the coal can be efficiently cleaned.

4.—Coal-trimming Platform.

This is a narrow platform fixed to the front row of columns which support the coal-cleaning platform. It is on a level with the top of an ordinary coal truck.

Standing upon this platform the man employed for the purpose pulls the lumps of coal into position in the truck as they leave the screen by a light rabble or rake. By this means the most of the trimming can be done without clambering over the coal, the object being to avoid as far as possible everything that tends to bruise the coal, and by this means to lessen the amount of small coal sent away with the large.

Comparison with other Screens and Modes of Cleaning and Loading Coal.

1.—*The Old-fashoned ordinary Screen.*

This, as everybody knows, is a straight shoot, placed at various and sometimes haphazard angles of inclination, without regard to the minimum angle at which the coal would slide down the same so as to avoid unnecessary and injurious velocity. The screen bars are continuous in length throughout a portion (sometimes the entire length) of the shoot. A balanced flap or door at the lower end of the screen is sometimes used to check the velocity of the descent of the coal into the trucks; and sometimes a plank-on-edge, placed higher up the screen and hinged to the side thereof, and moved by a rope or chain fixed to the other end of the plank, is used to check the descent, and to afford opportunity to pick out dirt. But the best of these are defective, as on account of the slanting position of the screen it is not possible to stand upon it to pick the dirt out thoroughly, and very much of it is carried with the coal into the truck, whence it cannot be picked out (except but a little) through its falling in between the lumps and being out of reach and out of sight. In addition, as the lower end of the screen must be placed high enough to admit of the coal being loaded above the side of the truck, and as this is a fixed point, the coal has a considerable height to fall into the truck, especially at the commencement of the loading, in consequence of which many of the lumps are broken and small coal is produced. This is especially the case where the coal goes down the screen with unchecked velocity into the truck.

2.—*The Newberry Balance Screen.*

This is a well-known screen, being in use at several collieries in Glamorganshire and Monmouthshire. It was designed to obviate the defect of excessive velocity common to fixed screens, which to some extent it is, no doubt, capable of doing. But as the whole of the tram-load of coal is deposited in a heap at the upper end of the screen, whence it travels from a state of rest with increasing velocity down the screen into the truck when the balanced end of the screen is lowered for the purpose, there is still room for improvement in this respect. Then, with regard to the cleaning of the coal—as it is deposited all of a heap upon the screen, much of the dirt may be covered up and out of sight until the coal begins to slide down the screen, when it cannot be arrested, but falls with the coal into the truck, whence some of it may be picked out, but not as much as is desirable.

3.—*Belt Arrangement.*

This is, no doubt, excellent, and with sufficient hands to pick out the dirt as the belt travels forward the coal can be efficiently cleaned. But it does not afford the facility provided by the curved-balanced screen for ascertaining the exact amount of dirt sent out in each tram separately, by means of which the offender may be properly dealt with.

Conclusion.

There are 33 of these screens now in Monmouthshire—28 at Ebbw Vale and branches, 2 at Llanhilleth, 2 at Glyn Pits, Pontypool, and 1 at Abersychan.

The first was erected at Waen Lwyd Colliery, Ebbw Vale, about sixteen years ago, where they are still at work.

They were designed by the writer, in which he was ably assisted by his late highly-respected friend, Mr. George Golightly, Mechanical Engineer, and by his very clever son, Mr. George Golightly, now of Newport, Mon.

The Canadian Iron Industry—The Canadian correspondent to the *Iron Age*, New York, writes: The pig iron consumed in Canada now comes from two sources almost exclusively—that is, from our own furnaces and from those of the United States. Great Britain furnishes very little of it. It hardly pays to carry British iron into the interior, and it no longer finds a large market in the maritime parts of the country. There, in fact, as soon as it is landed, it meets the great smelting works of the country, for our largest furnaces are in Nova Scotia. The Nova Scotia iron sells as far inland as Toronto and Hamilton, having pushed its way against both British and United States irons. The latter makes have the advantage west of Montreal, however. Even in Montreal, American iron has found a good reception this year, several carloads of No. 2 Niagara pig having been sold there last month at 12.50 dols., in bond on track there. This is equal to 17 dols. duty paid net cash 30 days. Some southern iron costing 12.25 dols. in bond on track, equal to Middlesbrough brands, was also disposed of in Montreal, but is not as suitable for the wants of foundries. New Brunswick is to become an iron producing province. A project is on foot to build two furnaces at St. John, with a capacity of 250 tons a day. Ore, limestone, and coal are easily assembled at that point, and freight facilities for shipping into the interior provinces are favorable.

AUTUMN MEETING

OF THE

General Mining Association of the Province of Quebec.

The Autumn Meeting of this Association was held in the Magog House, Sherbrooke, on Wednesday and Thursday evenings, 26th and 27th ulto. There was a large attendance. Mr. John Blue, C. and M.E., President, in the chair. Among those present we noticed: Mr. James Mitchell, (Beaver Asbestos Co.), Sherbrooke; Mr. J. Obalski, M.E., Inspector of Mines, Quebec; Mr. George E. Drummond, (Canada Iron Furnace Co.), Montreal; Mr. H. J. Williams, (Beaver Asbestos Co.), Thetford Mines; Capt. John J. Williams, Sherbrooke; Mr. F. S. Spafford, (Nichols Chemical Co.), Capelton; Mr. S. W. Jenckes, (Jenckes Machine Co.), Sherbrooke; Mr. E. B. Haycock, (Star Gold Mines), Jersey Mills; Mr. L. A. Klein, (American Asbestos Co.), Black Lake; Mr. John J. Penhale, (United Asbestos Co.), Black Lake; Mr. George R. Smith, (Bell's Asbestos Co.) Thetford Mines; Dr. James Reed, Reedsdale, Que.; Mr. A. Sangster, (Canadian Rand Drill Co.), Sherbrooke; Mr. F. P. Buck, (Dominion Lime and Marble Co.), Sherbrooke; Mr. Daniel Smith, (Hamilton Powder Co.), Brownsburg; Mr. John Jenckes, (Jenckes Machine Co.), Sherbrooke; Mr. Frank Grundy, General Manager, Quebec Central Railway, Sherbrooke; Mr. T. J. Tuck, (Dominion Lime Co.) Sherbrooke; Mr. A. W. Elkins, (Nichols Chemical Co.), Capelton; Mr. B. Rising, (Moulton Hill and Howard mines), Sherbrooke; Mr. Andrew Sangster, Sr., Sherbrooke; Mr. B. Marcusé, (Jeffrey Asbestos Mine), Danville; Captain F. Bennetts, Sherbrooke; Mr. Walter Adams, B.A. Sc., Montreal; Col. King, Sherbrooke; Mr. H. D. Lawrence, Sherbrooke; Mr. Steel, (Quebec Central Ry.), Sherbrooke; Mr. J. F. Patten, Black Lake; Mr. T. S. Somers, Sherbrooke; Mr. E. O. Grundy, Sherbrooke; Mr. John Falls, Sherbrooke; Mr. P. Jobodin, Black Lake; Mr. J. W. Woodside, Sherbrooke; Mr. C. Gordon Rogers, Ottawa; Mr. B. T. A. Bell, Ottawa, Secretary, and others.

The Secretary read the minutes of the meeting of the Association held on 6th and 9th July, which were confirmed; also a letter from the Treasurer, Mr. A. W. Stevenson, C. A., Montreal, expressing regret at being unable to be present and forwarding financial statement for the three months as follows:

Treasurer's Statement to 26th Sept., 1894.

1893			
Jan.—By Balance from 1893.....			$ 136 87
" Receipts for copies Volume of Reports:			
Government Pro. of Quebec....	$125 00		
Dominion Government.....	96 00		
Members....	136 00		
			357 00
By Subscriptions to date.....			520 00
			$1,013 87
To Paid—B. T. A. Bell Sec'y as per vote at Annual Meeting...	$150 00		
" " Windsor Hotel balance dinner.....	32 40		
" " Stenographer January Meeting.....	20 00		
" " Mortimer Co., Acct. preparing Vol. Reports.....	548 00		
" " Sec'y Acct. to 26th September, 1894	165 15		
" " Stenographer Sydney Meeting.....	15 00		
" " Sundry Postages...	11 80		
" " Circulars and Receipt Book.....	2 75		
" " Sundry Expenses, Com., Collections, Bank Com., Telegrams, &c., &c.	24 82		
			$969 92
Balance.....			$ 43 95

Memo. LIABILITIES.

Balance due on Mortimer Note....	$52 00	
Mortimer & Co., Account	58 50	
McLaughlin & Co., Account.....	41 00	
		$151 50

ASSETS.

Balance on hand as above.....	$ 43 95	
" due by Quebec Gov'mt for Vol. Reports	125 00	
		$168 95
Also unpaid subscriptions to the value of.....		$220 00

(Signed) A. W. STEVENSON,
Treasurer.

Montreal, 26 Sept., 1894.

Election of New Members.

The following new members were elected:—

R. H. Martin, New York,
B. Marcusé, Danville,
H. D. Lawrence, Sherbrooke,
T. J. Tuck, Sherbrooke,
Wm. Mitchell, Drummondville,
Col. Chas. King, Sherbrooke,
Dr. James Reed, Reedsdale,
Andrew Sangster, Sr., Sherbrooke,
J. Boas, St. Hyacinthe.

Election of a Vice-President.

The next item was the election of a vice-president in place of the late Col. Lucke, Sherbrooke. Mr. George R. Smith moved that the nomination of Mr. W. A. Allan, (Little Rapids Mining Co.), Ottawa, made at the last meeting of the Association be ratified. The motion was carried unanimously.

Federation Committee Appointed.

The subject of a federation of existing Canadian mining organizations was next discussed.

The Secretary read the minutes of the joint meeting with the Mining Society of Nova Scotia, held at Sydney, in July, and presented the report of the Committee of the Nova Scotia Society upon a scheme. It had been resolved to appoint a committee of four from each organization to draw up a basis of federation. The Ontario Mining Institute had endorsed the proposition and appointed its committee. After discussion, the report of the Mining Society being taken up clause by clause, the following committee to confer with the other organizations was appointed: Mr. John Blue, President, Mr. F. A Halsey, Mr. L. A. Klein and Mr. B. T. A. Bell, Secretary.

The President of the Privy Council elected an Honorary Member.

Mr. James Mitchell, Sherbrooke, seconded by Mr. John J. Penhale, proposed the election of the Hon. W. B. Ives, Q.C., M.P., as an Honorary member.

The motion was carried unanimously.

The Cape Breton Meeting.

On motion of the President, the Secretary was instructed to convey a very cordial vote of thanks to Mr. David McKeen, M.P., Mr. W. Blakemore, M.E., Messrs. Kingman, Brown & Co., Mr. R. H. Brown, M.E., the President and members of the Mining Society, Capt. Isaac P. Gragg, Col. Granger and the President and members of the Sydney Club, for courtesies extended during the visit of members to Cape Breton in July.

The President then called for the first paper for consideration.

Slate: Its Formation, Extraction and Uses.

MR. H. J. WILLIAMS—The growing importance of the slate industry in Canada demands a consideration of the utility and value of the mineral, its occurrence and distributions, especially in the province of Quebec, and the method of extraction and usage.

The subject is so comprehensive that adequate justice cannot be given to it in a short paper of this kind.

I find nothing written upon the subject except the meagre references made in the Geological Reports of Sir Wm. Logan and others. Therefore, as no thorough examination has been made of the slate formations of this province, our knowledge of the same must be limited.

No clay slate of any value is found in the Laurentian range nor anywhere in the Province of Ontario. In coming east through the Province of Quebec, we find the first slate formation near Stanbridge, and this appears to be a continuation of a similar slate found in an island in Lake Champlain, and also in Hatch Hill, south of Whitehall, in New York State. No work has been done on this vein except on the island above mentioned. Then farther east we strike purple and green slate in Missisquoi County and at Granby, where some small openings have been made. This formation continues to the N.E. to Actonvale, where a quarry was opened and operated by Mr. Rankin of Montreal. Then we come to the Kingsy formation, which is a very wide purple and green belt. A quarry was opened on this vein at Trenholmville, but the slate that was produced was of poor quality. This formation is different from all the others, it being a laminated formation, the bedding about ¼ inch and more apart, and not capable of being split between the beddings. A slate of similar character and texture is found in Birds-Eye Mountain near Castleton, Vt., which possibly is a continuation of the same formation. East of this are the Melbourne veins upon which several openings have been made, to wit, Melbourne quarry, the New Rockland quarry, which is now being worked, the Steele quarry in Cleveland, and the Danville quarry in Shipton. Slate of excellent quality is being produced from this vein.

The next formation east of this is found near Windsor Mills. It is an extensive deposit, but owing to its ribbony character, the ribbons in it being hard and occurring at intervals of only a few inches, renders it unworkable and of no value.

Next we come to the Brompton formation upon which two openings were made near Key Brook, about 34 or 35 years ago, but this also is full of ribbons, which unfit it for the production of roofing slate. Slabs for sidewalks and cellar bottoms have been taken out of it at several places which at a greater depth would be good for that purpose. This formation is very extensive, being about a mile in width at Brompton. It is identical with the beds at Montpelier, North Johnsbury, and also Guilford, south of Brattleboro, Vt. Quarries have been opened in each of these places and were wrought for many years, the Brattleboro or Guilford quarries being undoubtedly the oldest on this continent. They were worked as far back as 1812. This vein runs south of Guilford for about ten miles when it is pinched out by the granite.

Then we come to the formations at East Angus and Garthby and several veins of different colors in Beauce County.

From the number and variety of the slate deposits of Quebec, it would appear that many remunerative quarries might be opened.

The main ingredients in the composition of slate are silica and alumina, which show it to have been at one time ordinary clay. Blue (of different shades), purple, red and green, are the ordinary colors met with. The blue color is derived from the presence of protoxide of iron, or iron and oxygen mixed in the proportion of one part of the former to two of the latter. The red and purple varieties take their color from iron in the form of peroxide, two parts of iron combined with two of oxygen. Into slate of a green color, which is the best common variety, iron less largely enters, and in combination with magnesia, gives them a greenish hue.

The clay beds were deposited in ages long past, in the bottom of the sea, and in process of time they have been hardened into stone, and lifted up so as to form dry land. That these beds were originally deposited in the sea, geological authorities mention among other reasons the fact that they contain abundantly the remains of former sea life, which lie along the planes of the bedding, such as zoophytes, mallusca and crustacea. The fossils of these strata may be studied from Sedgwick and McCoy's "Palæozoic Rock and Fossils" and other works. The presence of soda and potash in the slate deposits, being the record of the saltness of those ancient seas, is an additional proof of the beds of clay in the sea. It can be well imagined how when this deposition was made that it went through a process of sorting. The heavy, coarser material would be deposited first near to the shore; the finer matter would be carried farther to the sea, and the lighest portions of all would be held longest in solution and would reach the farthest from the shore line. We can well understand then that the variations we find in the quality, color, consistency and

thickness of the strata, etc., are all due to the disturbance of the water, caused by oceanic and tidal currents, as well as by storms, which then as now occurred periodically. As a result of these storms we might naturally expect to find, even in the finest deposits, layers of coarser material.

From these simple statements relative to its formation it will readily be seen that in a slate bed which extends over miles of country, a great variation in consistency and color will be found. The deposition of the coarser or finer portions will determine the former, while the latter is dependent on the presence in the water, of the different oxides of iron in combination with carbon, when vegetable growth has occurred, magnesia and other elements. It will be seen also that it is fallacious to suppose, that because a vein has been proved good or bad in a certain portion, that it must necessarily continue the same throughout its entire course. Each particular portion must speak for itself only.

In all slate veins, lines, or bands, sometimes wavy, but oftener straight, will be seen crossing it. These are the lines of bedding and it does not follow that the lines of cleavage will coincide with them, as it can only be supposed that the phenomenon of cleavage resulted from an action which occurred long subsequent to the deposition of the muddy layers in beds. There is some difference of opinion among those who have given attention to the subject as to the manner in which this slaty cleavage was produced. It is explained by some to be the result of a crystallizing action; by others to be due to magnetic currents, while others, again, claim it to be the effect of mechanical forces that compressed the sediment at right angles to the direction of cleavage. Be it one or the other or a combination of forces, we find the line of cleavage always at right angles to the dip of the vein.

The occurrence of joints such as floor or foot joints, face or side joints is accounted for by the mass slowly hardening and consolidating by pressure as well as heat. *Lifted out of the water it cracked and split in various directions in drying, and, in*fluenced by the laws of crystallization, it assumed definite shapes, being split into rough and homboidal masses. Had our original deposition been homogeneous and subsequent action constant and uniform our present slate veins would all have been practically perfect. As such, however, was not the case we find we have to contend against many conditions which determine its possibility of being worked to advantage. The presence of dykes, posts, wavy cleavage, impure beds, etc., we find in all slate formations, and it is only after a careful and intelligent study of the conditions that we are enabled to know of its value.

We will now proceed to the methods of working a slate quarry which are the same the world over, differing only in the manner of laying them out, which is dependent entirely on the locality of the opening, the condition of the formation, and its position relative to the surrounding rocks. It may be: 1st. An open quarry. 2nd. *A chamfered quarry worked underground by means of levels or adits. 3rd. An under*ground quarry worked by shafts. I will confine myself to a brief description of the first only, as with one exception all the quarries on this continent are open quarries.

Slate rock being of a soft clayey nature is affected by the elements more, perhaps, than any other rock. In the slate quarries now opened in Canada, the top or rock thus affected is from 30 to 40 feet in depth, all of which has to be removed before sound slate can be made. An opening is made along the face and another across the vein. This portion is quarried back, another bench or gallery started in the same way, and so on until the opening is laid out in a succession of galleries. The first operation is the quarrying of blocks, and it is here that the most intelligence is necessary. It is imperative that the block shall be quarried without shattering, and the skill of the quarryman is tested by his ability to take advantage of the sups, joints, floors, to make each hole do the work properly. In some cases wedges are used, *splitting and slowly forcing a certain portion from its position, but it is usually done* by means of blasting. A hole is put into the face and at right angles to it until a split or bed plane is notched. The hole properly charged is filled with powder to the mouth and as little tamping as will hold the powder in is used. In this way the pressure caused by the explosive being uniformly distributed along the entire width of the portion to be moved, the block is cut its entire length between floor joints and is thus moved without shattering. Had our hole been filled only half full and the balance tamped, all that portion of the block from the powder to the mouth of the hole would be shattered and rendered useless for slate. Ordinary blasting powder is used exclusively in this work as the force wanted is a dull heaving one, which will heave and displace the rock without breaking it. The sudden force of explosion in the higher explosives such as dualin or nitroglycerine acts too quickly and before our rock has time to be cut it is entirely shattered and distroyed by the rapid action.

Our large block has now to be cut up, and, here, again, much skill and judgment is requisite. And I might say here, that there is no mining in which such intelligence, skill and judgment are required on the part of the labor employed as in the quarrying and working of slate. With a small steel gauge and light single hand hammer, a small ditch or trench is cut across the end of our block. Then with a steel chisel whose point is from 1½ to 2 in. long, the workman follows along this ditch making its bottom even and straight—a similar chisel though a dull one is then used. And by heavy blows on this chisel following along the ditch, the fine grains of slate are driven into the end of our blocks, and a cut is started along the grain which if nursed properly will continue straight throughout its entire length. These separate portions are then split into convenient sizes for hoisting and tramming, and are laid down along the sides of the shanties to be further worked into slate. Here, again, skilled labor is required and our "slatemakers," so-called, who usually work in pairs, study their block that they may make the most slate therefrom. As most blocks will contain impurities and disfigurement he must consider how in cutting it up he can bring these to the end of his slate that they may be cut off in dressing with as little waste as possible. His block is cut length-wise into two or more widths in the same manner as that employed by the quarryman described before. He then splits them into blocks or slabs of about 2 in. thickness and breaks them cross-wise by striking on the edge with a large heavy wooden bath, having previously weakened the opposite edge by making a gap or cut into it. The small blocks are then carried into shanties to be split and trimmed or dressed into the different sizes of slate used in roofing. The splitting is done by means of a flat, broad, thin-edged chisel and a wooden mallet, for the blows of wood are better adapted for the splitting of slate than those from steel. Splitting is one of the most skilful and particular processes of slate making. A fresh end or side to split from is necessary and the splitter carefully guards this end or side from bruises, and keeps them damp in dry weather as the split easily runs out the side when the blocks get dry. Again, a block being in a frozen condition will work up readily while frozen, but it is almost impossible to split them when they are thawed out, in which case they are usually left until frozen again. The dresser takes the pieces from the splitter and after trimming as little as possible from one end and one side at right angles to each other, the remaining end and side are trimmed to make the largest size possible from the piece. There are usually about 18 sizes varying from 12 x 6 in. to 24 x 14. The sizes being regulated by means of a gauge attached to side of machine thus ensuring a uniform length and width to all sizes. The slates are carried to the stock piles, inspected by a competent man, and counted into 100 piece lots, allowing from 2 to 5 per cent. breakage. From here they are shipped without further treatment, except in case of transhipment from rail to water, when they are usually boxed.

In the process of school slate manufacturing, the method is entirely similar to that described for roofing slate up to the dressing or trimming stage. In this case the slates are trimmed to size by means of a small saw with few teeth revolving very rapidly. In this way a very little splintering on the under side results. The surfacing is done principally by means of emery wheels or rollers revolving in water and the slate forced under the wheels or through the rollers. The hand process of surfacing, however, is much used, and consists of drawing an ordinary drawshave across the surface exactly as one would shave a piece of board. The edges are bevelled to admit of entering tightly in the grooves of the frame. The latter are made entirely by machinery. Boys insert the slate, close and glue the frame, which is then planed and finished by means of machinery. They are packed and shipped in boxes and are sold to the market by the dozen or gross.

Another very large and growing branch of the industry is the milling of slate. *There is no rock which so much resembles wood in its method of being worked as does* slate. Blocks being brought from the quarry to the mill are sawed by circular saws, and planed by passing under a planer knife, a chisel some 6 or 8 inches long. From the planer the slabs go to the rubbing bed which is a large, heavy, revolving cast-iron plate, where by means of sand and water the surface is ground down smooth and even, to any required thickness. From here it will go to the jig or band-saw, the boring machine or the groove as the case may require. From here it may go through the marbleizing process, by which it is made to resemble any kind of stone or wood and thus used for ornamental purposes. It may be used for tanks or washtubs, or other vessels for holding liquids, in which case it is taken from the machines, put together by means of grooved joints with cement, and bolted or screwed.

The most general use for slate is for roofing. For this purpose it is unexcelled, except, perhaps, by copper, but the relative expense taking into consideration the utility *of the two, is entirely in favor of slate. We have records of roofs laid in Wales in the time* of King Henry VIII., which are in a good state of preservation to-day. The average cost per square which means enough slate to cover 100 square feet of roofing and which corresponds to 1000 feet of shingles is about $4, F.O.B. cars at shipping point of quarry. The laying including nails, etc., will cost from $2 to $2.50 per square.

We have already mentioned its use as manufactured into school slate, which branch of the industry has been checked somewhat by the introduction of cheap paper tablets.

The uses to which milled slate is put are very numerous and varied. Among others the following are the most important: Billiard beds, blackboards, mantles for fireplaces, beautifully polished, marbleized and richly ornamented by hand painting, monuments, washtubs, tanks for water, oils or acids, urinals, closets and all sanitary purposes generally in public institutions and buildings, tiles, steps, and all kinds of *flooring.* It is also becoming more and more extensively used for electrical purposes such as switch boards, instrument stands, etc.

I will mention one other use, which promises to become a very important branch of the industry. I refer to the grinding of the slate rock into dust from which is made a brick whose compactness and strength and wearing qualities are not excelled by any other brick made. Tiles of any color, both plain and glazed, are another product of this dust.

The industry in the Province of Quebec is at present confined to the workings of but two quarries. One operated by the New Rockland Slate Co., at New Rockland; and the other by the Danville Slate Co., near Danville. Both these quarries are located on what is known as the Melbourne vein previously mentioned. The former is the most extensively worked of any that has been opened in Canada. Here the rock stands nearly straight having a dip of 80° to the south-east. The slate is of excellent quality, being hard, tough and strong, and blue black in color, which is unfading. It is of compact and close grain, admitting of no soakage of water, making it very durable.

The first workings were opened about 1865, on what is known as the west bed, lying in the serpentine rock. Operations were entirely confined to this bed until the year 1881, when a cutting was made through a hard bed, and a body of slate found which was equal in quality to that of the other vein. Operations have continued in this new vein up to the present time. This vein is very regular in formation, not being intersected by any foreign rocks, but parts of it are very subject to chicks, or an unsoundness, known as slants by quarrymen, which chicks, running at an angle with the cleavage renders it unworkable for roofing slate or slab work.

A very extensive quarrying and milling plant is in use. The Salmon River here affords a very excellent water power, which is conveyed to the hoisting engines and mills, by means of wire rope transmission. Cable derricks of the Blondin system are extensively used. A large mill 100 x 60 feet, thoroughly equipped with all modern milling machinery, produces slab work of all descriptions. A narrow gauge railroad, about five miles in length, connects this quarry with the Grand Trunk Railway, at a point about five miles east of Richmond.

At the Danville quarry the vein is intersected by a series of hard ribbons, which, however, are at a sufficient distance apart to enable slate to be made from between them. The equipment here, though on a much smaller scale, is similar to that at New Rockland, except, that the power used is steam. In addition to their roofing slate and slab work, school slates are manufactured.

Owing to the private character of the companies operating, I am not able to give satisfactory statistics of the industry. The trade, however, has grown to be a very important one. This has been due principally to the efforts made by these companies to introduce slate, by the opening up of the country with railroads and by the protection which the Government has seen fit to bestow upon it. So rapidly has the trade grown of late that the demand is far in excess of the production, and with the extensive deposits of slate that we have in this country, there is every inducement for a thorough examination of the various veins, which I do not doubt would lead to the opening up and working of several remunerative quarries. And I look forward to the time, in the near future, when slate quarrying shall have become one of the principal industries of the province.

Vote of Thanks to Mr. Grundy.

Mr. F. P. BUCK—Mr. Grundy, the General Manager of the Quebec Centra Railway, has very kindly placed a special train at the disposal of the Association for the excursion on Monday (applause), and I would move that we tender him a hearty *vote of thanks for his kindness. The motion carried unanimously.*

Invitation from the Hon. W. B. Ives, Q.C.

The Chairman announced that the Hon. W. B. Ives, Q.C., M.P., had invited the members to dine at his house on Friday evening the 28th. (Applause.)

The meeting adjourned at 11 p.m.

The members re-assembled on Thursday evening, at eight o'clock, the President in the chair.

The Magnetic Needle.

MR. A. W. ELKINS—A slender bar of steel, charged with some of that mysterious, imponderable fluid or influence, called magnetism, generally about five inches long and about one-sixteenth of an inch thick, pointed or wedge-shaped at the ends, and provided at its centre with a cup-shaped piece of very hard metal, or precious stone, so arranged that the bar may freely turn upon a pivot, is essentially the simple little instrument known to-day the world over as the Magnetic Needle, which possesses the wonderful property of remaining in a direction, (or of turning upon its centre, until it assumes a direction), nearly north and south, and this provides data from which the direction of the geographic poles of the earth can be inferred with a fair degree of accuracy.

Such is the essential part of the instrument, which, for at least seven centuries, has been the greatest boon to navigators, and of inestimable service to explorers of unknown territory.

The early history of this simple but invaluable contrivance is lost in antiquity. It is thought that the Chinese were its inventors; and one authority states that the Emperor, Ho-Ang-Ti, marching with his army against the enemy, finding himself embarrassed by fog, constructed a chariot which indicated the south. This was in the year 2634 B.C., and it is supposed that the magnetic needle was referred to; but the first time that it was explicitly mentioned was in a Chinese dictionary, finished A.D. 121. However, its use to navigators was probably not generally known till the middle of the twelfth century.

In order to bring forcibly before you some of the wonderful properties of the instrument, I will arrange a needle so that its extremities will turn towards the poles.

I have here a common knitting needle about seven inches long, to which I have imparted some of that subtile, imponderable fluid or influence, generally described as magnetism. Attached to the centre of this bar of steel is a fine silk thread by which I suspend the bar. It will be noted that one end immediately turns towards the north and the other towards the south. That end towards the north is called the north pole of the needle, or more properly speaking, the north seeking pole, for I will show you that the kind of magnetism that is at the north seeking end of the needle, is different from the magnetism which attracts it towards the magnetic north pole of the earth.

I have here another needle, similar to the one suspended before you; this one has also the properties exhibited by the suspended one, that is, it is magnetised.

Now, upon bringing the north seeking pole of this needle towards the north seeking pole of that one which can turn freely, it is seen that the one I hold in my hand *repels* the other, and the south end of one also repels the south end of the other; but the north end of *either* attracts the south end of the other. Therefore, the magnetism of the so-called north end of the needle is not the same as the magnetism of the north pole of the earth.

An ordinary magnetic needle costs about two dollars, but there are circumstances under which it may, and often has suddenly risen from this trifling value, to the enormous sum of three or four millions of dollars. For instance, in the case of one of our costly modern ships of war. Imagine one of these giants of the ocean cruising in a storm on a dangerous coast, the sun, moon and stars obscured by clouds and rain; her commander unable to find anchorage, must depend entirely upon that tiny bar of steel for guidance, to save his ship and the lives of all on board.

Insignificant though the needle seems to be, there is no known substitute for it, under conditions such as I have named.

Though the value of the magnetic needle cannot be overestimated, it is subject to changes, or influences, which are not perfectly understood, and which, at times, cannot be successfully guarded against. It is, therefore, necessary to use it, or to follow it, very cautiously, otherwise serious consequences might result.

The magnetic poles of the earth are not identical with its geographic poles, and this difference, which is indicated by the angle, contained by the astronomic and magnetic meridians, is called the declination of the needle; which difference is not everywhere the same.

In this eastern part of America the direction of magnetic north is about sixteen degrees *west* of true north, whereas in British Columbia, it is about twenty degrees *east* of north; and this declination is continually changing, to the extent of about five minutes in a year, the north end of the needle now gradually moving towards the west in this eastern part of America. It is, therefore, of primary importance that, before using it in any section of the country, its direction be ascertained by astronomic observation.

It is likewise subject to another change, known as the diurnal variation, which deflects it from its usual course about twelve minutes in twenty-four hours, and must be taken into consideration in using it, the maximum variation occurring about two p.m., after which it slowly returns to its former position.

In these northern latitudes the north end of the needle is drawn downwards, the extent of the inclination varying in different locations even in the same latitude.

It has been ascertained that the north magnetic pole is situated in about latitude seventy degrees north and longitude ninety-six degrees forty-six minutes west, which is a little north-west of Hudson's Bay, and not far from Chesterfield Inlet.

The magnetic equator does not correspond at all points with the earth's equator, but it is a curved line, in places a number of degrees from the equator proper. On the magnetic equator the needle remains in a horizontal position; but in southern magnetic latitudes the south end is drawn downwards in the same way that the north end inclines in northern magnetic latitude. In order to counteract this dipping, and to keep the needle in a horizontal position, a sliding counterpoise is placed upon most needles. Sliding, because, as the instrument, from long use or any other circumstance, loses its magnetism, the north end dips less.

I have spoken of the changes that take place with a greater or lesser degree of regularity; there are others, sometimes very material, that cannot be accounted for and which require the constant watchfulness of the observer to detect. The greatest change of this unaccountable character that has come under my personal observation, was a deflection of about forty-four minutes in eight or ten minutes of time. This was probably due to an electrical storm, which could not otherwise have been noticed.

The glass cover of the compass sometimes becomes charged with electricity, which causes the needle to apparently stick to the glass. This is of rather frequent occurrence. Wetting the glass immediately dispels the electricity.

Any state of the atmosphere in which electricity is an element, greatly affects the needle, electricity and magnetism being, it would seem, almost the same; the power of an electrical motor, for mechanical purposes, being dependent on the magnetic force induced in iron by an electric coil surrounding it.

In many places a purely local attraction causes the needle to swerve from its general course from five minutes to fourteen degrees, as noticed by myself during the twelve years I was actively engaged in surveying, and instances have been recorded where this local swerving exceeded twenty-five degrees.

These considerable deflections of the magnetic needle in certain localities are doubtless due to large deposits of magnetic substances. In the vicinity of Thetford and Coleraine the iron ore, that is disseminated through the serpentine and so-called asbestos, attracts the needle very sensibly.

Navigators have to contend with another perplexing source of error in compass reading, which is not easily overcome, particularly in these days when iron enters so largely into the construction of ships, and that iron so used sometimes affects the needle to a serious extent, and from causes that are not always apparent.

It is a well known fact that iron, remaining long in one position, sometimes becomes magnetic, and it has been found that portions of iron ships become magnetic. Now, the action of unmagnetized iron upon the needle is inversely as the square of the distance between the iron and the needle; but if a piece of unmagnetized iron, which at the beginning of a voyage would attract the north end of the needle, should become magnetic, it would repel the north end under certain obvious conditions.

I believe it was recently discovered that the needle was influenced to a dangerous extent on a man-of-war by the side arms of a sentry who passed near the compass and whose bayonet had become magnetized by having been stored near the ship's dynamo.

All of these irregularities of the needle may be successfully guarded against in fair weather, by frequent astronomic observations, but such observations require special instruments, which are not always obtainable.

In the absence of astronomic observations, the correctness of the work in hand depends upon the skill of the observer and his knowledge of the capricious pranks, so to speak, of this little instrument, which, with all its faults, is so marvelously useful.

With a view to increase the accuracy of compass surveys, I, several years ago, invented and obtained a patent in the United States upon a little instrument which I called an "Improvement on Transit Compasses," and it obtained considerable favor among surveyors; in fact, some of my confreres were kind enough to say that they thought that my instrument would supersede the plain sight compass.

The instrument consists mainly of a compass, rigidly attached to the upper side of a telescope turning upon trunnions in a bifurcated holder. It possesses many of the advantages of the heavy and expensive transit instrument, with the lightness and inexpensiveness of the compass, and it is therefore particularly desirable for surveys in places not easily accessible.

In ordinary so-called "line running" the surveyor would only use the needle at starting, after which required points in the great circle would be accurately determined by the use of the telescope, indicated in the cut of the instrument.

DISCUSSION.

MR. GEO. R. SMITH—Is the compass of any value in underground workings, such as Mr. Blue's, to determine the true north—in long drifts, for instance?

MR. ELKINS—You could not depend upon it. Its principal use in underground surveying is checking deflecting angles. Sometimes in deflecting from that line a mistake might be made. By leaving the bearing of that needle it would act as a check upon the work of the surveyor.

MR. BLUE—I beg to differ with Mr. Elkins. I was engaged in mine surveying many years, and we used altogether the compass for all our mine surveys. There (in Scotland) mine owners are compelled by law to have accurate surveys of all their main workings taken every six months and accurate plans kept. To take a survey with transit in one of those large mines would require a week. I have kept plans of very many collieries in the Old Country, had charge of work where we were approaching boundaries, and have done work with the compass that was perfectly correct, and proved to be so by subsequent workings from the other side. I ran a line by compass from the bottom of two shafts about a mile and a half apart, and brought them close together in coal workings.

MR. ELKINS—Were those workings checked by Rittenhaus' method? This method calculates altitudes and departures, and proves where workings come together. That is the only way of determining exactitude.

MR. BLUE—For quick work there is nothing like the compass.

CAPT. BENNETTS—I have done correct work with a compass for several years.

MR. ELKINS—For a short distance and for rapid work there is nothing to excel the compass or take its place; but for absolutely accurate work you should never depend on it.

MR. LAWRENCE—It seems to me, as one without any experience, after hearing what has been said, that both gentlemen might be entirely correct. In the workings Mr. Blue spoke of, in coal bearing strata, there might not be any local cases of variation to interfere with the compass; but in many localities it is utterly impossible to make any correct survey without the transit instrument. I do not see why in many cases the rapid work of the compass should not be as correct, and would be cheaper; but it must be a fact that in many localities the compass would be entirely valueless.

MR. BLUE—I agree that in such cases the compass is of no value whatever. But I must say that in a great many places the compass is of more value than the transit.

MR. E. B. HAYCOCK—I think that if I had to do work and was allowed to use the instrument I considered would do the best work, I should take the transit. Some years ago I made a survey on Lake Erie, and my chief instructed me to take the compass and make the survey, as being quicker and cheaper. I had a run of fourteen miles and ran it with the compass, and I can assure you that that compass line was as crooked as a lame dog could have made it. I then took the transit and ran the same trip, and came within an inch and a-half of a perfectly straight line. I also that summer did some short line work with the compass, and found that the best way I could use that compass was to start the line and use the pickets.

MR. BLUE—In surveying a coal mine where the workings were stoped would entail as many as five hundred bearings, and you could only get the bearings of the length of your rooms, twenty to forty feet. Anyone who has used the compass or transit can just imagine the difference of time in taking those five hundred measurements. Can you see any reason why one should be more accurate than the other? You are plotting little bits of short distance to a small scale. The width of your pencil line would amount to several degrees.

MR. ELKINS—I would compute the total altitudes by Rittenhaus' method and then lay off those total departures, which would insure practically absolute accuracy.

MR. KLEIN—I had a little experience with compass surveying, and the question was settled only lately in court, and our company was about one hundred acres out—against the compass. I may say that lately a survey was made of a town line and through the compass quite a deposit of chromic iron was discovered. This line had been previously run by compass, and on the three different occasions produced three different lines, which varied about half a mile. If I had a survey to make I would in every case use the transit for the first time.

MR. ELKINS—Does chromic iron attract the needle?

MR. OBALSKI—I do not think so. I have never found magnetic chromic iron in this country.

Chromic Iron: Its Properties, Mode of Occurrence and Uses.

MR. J. T. DONALD, (Montreal)—It has long been known that chromic iron occurs in this province in the Cambrian serpentines that stretch from the Vermont boundary to Gaspé, and in the past, at various times, small quantities of the ore have been mined and shipped, but the total output from the time of the discovery of these deposits to the present year is perfectly insignificant.

There are at present, however, indications that the raising of chromic iron may become an important industry in this district. The writer has examined the deposits that are now being worked at Black Lake, and has studied the occurrence of this ore in California during a professional visit to that State in June and July of the present year. The object of this paper is to clearly set forth the characters of the ore, its mode of occurrence and uses, with a view to enabling the prospector and the miner to avoid those snares that have befallen other Canadian mining industries in their infancy. Take our phosphate for example. It is well known that in one or more cases tons of pyroxene were, by mistake, mined for phosphate. And again shipments of valuable ore were sold at a loss simply because they did not come up to the required grade, and this simply because of a lack of care in dressing or in sampling the lot. It is to be feared that unless care is exercised similar costly mistakes will be made in connection with chromic iron. I repeat that the object of this paper is to furnish information that will enable those interested in this ore to avoid such costly mistakes.

Chromic iron or chromite is a compound of chromic oxide and ferrous oxide together with variable propertions of magnesia, alumina and silica. It is the only important ore of the metal chromium, and its value depends of course upon the quantity of chromic oxide it contains. Chromite as usually found is a massive compact mineral, possessing a granular or sometimes a slaty structure. Its color is iron-black or brown black, and its streak or powder is decidedly brown. Chromite is *sometimes* magnetic, but my experience with Canadian ores is that the high grade ores are not magnetic. Chromite has a hardness of 5.5, and a specific gravity of 4.4, that is, it is about twice as heavy as ordinary serpentine.

Our ore may be distinguished from magnetic iron, which is the only common mineral it resembles by the fact that its powder is brown whilst that of magnetite is black, and also by the fact that the chrome ore gives, with borax, a beautiful emerald green gloss.

Chromite occurs usually in serpentine, not in beds or veins, but in detached pockets, but sometimes these pockets seem to have been deposited along certain definite lines. This is the case in the Lambley and Robichon properties at Black Lake. The ore pockets vary greatly in size, some being exhausted by a single shot, whilst others yield hundreds of tons. Mr. Lambley has taken nearly 500 tons from one pocket which is not yet exhausted. As a rule, however, the pockets do not persist to any great depth, and in California it has been found that the ore does not improve with depth, but rather contrariwise.

The principal uses of chromite ore is the manufacture of the chromates and bichromates of potash and soda, and the preparation of chrome steel, an alloy of iron and chrome very valuable for special purposes on account of its great hardness.

But not all chromic iron is acceptable to these users of the ore. Ore containing less than 50 per cent. of chromic oxide is not desired, although, I believe, in certain cases, 48 per cent. is accepted. There are only two important manufacturers of chromates in America, viz: the Tyson Co., in Baltimore, and the Kalion Co., of Philadelphia, and these companies pay at present about $26 per long ton for 50 per cent ore delivered at their works, which is equivalent to about $20 per long ton at Black Lake.

Now whilst deposits of chromite are by no means rare, it happens, unfortunately, that but few, very few, of them are capable of producing ore of 50 per cent. chromic oxide. I have analysed a number of samples from various parts of this province, and only those from the Black Lake district have been up to the mark, the others ranging from 35 per cent. to 46 per cent. Selected specimens from Black Lake have analysed as high as 56 per cent., and Mr. Lambley informs me that the only shipment for which he had received returns averaged 51 per cent.

The question arises: Are chrome ores of less than 50 per cent. valueless? The answer must be: in their natural condition they are practically valueless at present. Recently, in California, attempts have been made to concentrate or work up the low grade ores to the market standard. Certain low grade ores are intimate mixtures of chromite and serpentine, the latter being much lighter than the chromite. It is on this fact that the system of concentration is based. It consists in crushing the ores to a fine powder and passing them over vanners or concentrators. Certain ores lend *themselves readily to this system of concentration; for instance, a crude ore of only* 24 per cent. has been dressed up to 50 per cent., whilst on the other hand some ore of 40 per cent. could not be dressed to grade over 42 per cent. The success of the operation depends upon the nature of the foreign matter associated with the chromite.

In conclusion, permit me to note two points on which special emphasis should be laid by those who are interested in this mineral, or may contemplate engaging in mining it: First make sure that your ore is up to the standard, that is, that it contains 50 per cent. chrome oxide. Secondly, remember that although a hand specimen may test over 50 per cent., it does not follow that the ore in shipping quantity will test as high. It is almost certain to test notably lower; indeed it will be found that very careful dressing or cobbing is necessary in order that large quantities, say car loads of the ore, do not test lower than 50 per cent. If selected hand specimens test not over 51 per cent. any miner knows that his ore as a whole will test considerably lower. And finally, if I may venture on a third point, permit me to say that no single fragment can possibly represent a pile of ore, and in taking a sample take a large number of small pieces chipped from all parts of the pile, from rich and poor masses alike, indeed, I would say, let your sample whether it be sent for analysis or to a buyer, be rather under than over the average of the pile. In the end the results will be none the less satisfactory.

MR. J. OBALSKI (Quebec) –The occurrence of chromic iron, or chromite, in the serpentine rocks of the Eastern Townships, has been known for many years, and it is mentioned by the late Sir William Logan, in the Geology of Canada, for 1863, eleven tons of over 50 per cent. having been then shipped to Glasgow at a price of $52 per ton. Ten years ago a few tons were extracted from Lot II, Range 24, of Wolfestown, and in 1887, Dr. James Reed made a shipment of from 4 to 5 tons, low grade, ore from Lot IV., in the 16th Range of Thetford, and 40 tons of 52 per cent. from Lot X, in the 1st Range of Leeds. At the same time specimens sent to the Antwerp Exhibition attracted much attention and a demand for the mineral was created; but owing to the small size of the deposits then known nothing eventuated. In April last (1894) a good surface show was discovered at Black Lake Station, on the Quebec Central Railway, and specimens having been forwarded to Baltimore, it was established that owing to the fair price offered and the facilities for working and shipping it would become a profitable businessr With such encouragement prospectors took the field. Other discoveries were made and a little excitement followed.

Chromic ore is found in irregular pockets and only in the serpentine rock. I will recall then that the main belt of serpentine which runs through our province and contains the well known asbestos mines starts from the south of the V. and VI. Range of Bolton, forms partly the mountains of Orford, passes east of Brompton Lake, and in the Ranges V. and VI. of Melbourne, XIV. and XV. of Cleveland, appears in Shipton (Jeffrey's Mine), Tingwick Lot XI. 21, Ham, north and south near the Nicolet Lakes Garthby, and takes a large development in the south-east part of Wolfestown, forms the mountains of Ireland and Coleraine by Black Lake and Caribou Lake with a branch to the little lake St. Francis and Adstock mountains. It comprises the important asbestos mines of Black Lake and Thetford, passes in Thetford and Brompton and is met on the rivers des Plantes and Echemin. No more serpentine is then noticed except in Gaspesia forming a large mass at the head of St. Anne River and at least on the Dartmouth River. On the course of that formation chromic ore has been noticed especially near the lake Memphremagog, in Bolton VI. 27, VII. 13, 23½ W.; Melbourne, VI. 22½ N.E.; South Ham I. 27, II. 4, 20; Garthby I. A. B. I.: Island of Breches Lake V. 35, 36; Wolfestown II. 24½ N.W., VII. 23, 24, 25.; Coleraine Block near Black Lake Station X. 19, XII. 8, XIII. S. 7, 8, IV. 25, III. 25, II. 26, B. 3, 6, and on the Mount Albert in Gaspesia. All those deposits are of variable importance and in some places like Memphremagog Lake and Mount Albert only loose rocks detect them. As a rule the chromic ore appears at the surface of the serpentine as a form of black sponge which some times is only superficial or penetrates in on a width of few inches which can increase as far as several feet. Some time too the ore appears at the surface in its largest dimensions. Loose rocks in the earth are also considered as an indication of a deposit in the vicinity. This ore is in pockets of variable sizes and forms very irregular and disappears suddenly without any trace for further investigation. I have not remarked any kind of walls except the ordinary slides in the serpentine rock.

I will give some details on a few of those deposits. 1st. Several shows exist in the part of Block A of Coleraine, situated between the Q. C. R. and Lot 10, 19, and near this one. The most noticable and first discovered has been developed by M. Nadeau & Co., and latter by Mr. M. Lambly & Co. The ore appears there but little mixed with serpentine on an area 10 x 30 feet, with same indication at a distance of 200 feet N.E. At a depth of a few feet the pocket was exhausted having produced about 500 tons of which a shipment of 250 tons sent to Baltimore yielded 50.3 of sesquioxide of chrome.

Another pocket on an adjoining property at about 400 feet N.E. shows also some good indications, but has been but very little worked. On the same block near the Black Lake some valuable deposits have also been found.

Lot 19½ N.W., in the X. Range, belongs to Dr. J. Reed, and at a little distance from the above deposits, several shows are opened by small parties of miners, the most important being the one of Mr. J. Lemelin & Co., who works in from different places, one of them showing a width of 4 feet. 150 tons have been taken out of which 1 car (18 tons) has been shipped to Philadelphia and 4 to Pittsburgh. At some distance N.E. another good show is developed by M. Frechette & Co. from which 30 tons have been extracted.

Lot II. 26 has been bought recently from the government by M. M. Leonard, Morin and Labreque, who will develop it on a large scale. This deposit is very remarkable showing solid chromic ore 60 by 150 feet with important indications connected with the main body at 50' N.E. and 100' S.W. From a small opening 5 feet deep, more than 100 tons of good ore have been extracted by only a few shots. So far it is impossible to appreciate its depth, but the ore has been found at a difference of level of 20 feet. In admitting the depth corresponding to the other dimensions we find that we have there a considerable quantity ore, which will be of great value if it only reaches the standard. This mine is 6 miles distant from the Q. C. R. between the stations of Black Lake and Coleraine, and the Company is just building a road for getting it. The above described deposits are all in the Township of Coleraine. The quantity of ore extracted represents about 850 tons of which 270 have already been shipped to Baltimore, 55 to Philadelphia, and 70 to Pittsburgh.

Distinctives Characters.—The chromite has a specific gravity of 4.5 representing about 7 cubic feet per ton in situ. Its hardness is 5.5. It gives a brown strike and dust of the same color. Some mineralogists pretend that it is magnetic, but I have not remarked this fact in our province, although I have found specimens of magnetite yielding some chrome.

Its composition is of sesquioxide of chrome and protoxide of iron, nevertheless, the elements chrome and iron are often partly replaced by alumina and magnesia, which lessen the percentage beside the mixed serpentine easily discerned. Theoretically it would contain 68 per cent. of sesquioxide but it scarcely yields over 56 or 57 in *picked specimens and 53 to 54 in cargoes. The commercial grade is* 50 per cent., but 49 and some times 48 is accepted. Below this it is considered as low grade ore and not used for chemical purposes. The Black Lake ore gives 49.8 and 50.3 on cargoes (analysis of Baltimore chrome works), and 54 and 56.02 on picked specimens (analysis of Donald)

Uses.—Chromite is mainly used for manufacturing bitchromate of potash which is employed for calico printing, for making pigments called chrome yellow, orange and green, in the construction of electric batteries and in chemistry. Chrome in alloy with other metals communicate to them its hardness, elasticity and unalterability, and now it is quite extensively used as ferro chrome for manufacturing steel armor plates, special hard tools, stamp shoes and dies, safes, etc. It is proposed too for hardening alumina.

Sources.—Chromite is always found in connection with serpentine, and the main producing countries are, or have been, Syria, (Asia Minor), New Zealand, New Caledonia, which produced high grade ore. Some chromite is also obtained from Austria, Greece, Norway, Russia and Australia *is reported as containing important* deposits, but of difficult access. There is some too in Newfoundland. In the United States, Pennsylvania and Maryland, have been as far as 1880 and for many years, large producers of this ore, while California contains important deposits, but of low grade ore (38 to 47%), and of difficult access. Nevertheless, they can be concentrated there and sent after in a granulated form with a percentage of 50 per cent. and over.

Market.—In the United States there are two Companies manufacturing bi-chromite: the Baltimore Chrome Works (Jesse Tyson & Son), Baltimore, the Kalion Chemical Co., (Harrison Bros., Philadelphia. The following Companies are using chrome for metallurgical purposes: Brooklyn Steel Chrome Company, Brooklyn; Bethlehem Steel Company, Bethlehem; Carnegie Steel Works, Pittsburgh.

In Europe there are several manufacturers in England, France, Norway, Russia, but we have no information regarding them. Glasgow (Scotland) seems to be the most important place for chrome manufacturing, and I will mention as purchasers: John Nelson Cuthbertson, Stevenson and Carlyle, J. & L. White. It is worthy of mention that for metallurgical purposes the low grade ore can be used, it is said as low as 40 per cent.

For the United States the manufacturers of Baltimore and Philadelphia give $26 per gross ton (2240 lbs) delivered for 50 per cent. and over. For a few years there was a duty of 15 per cent. *ad valorem* representing $2.90 per ton, but with the Wilson Bill this duty has been removed and chrome ore is now on the free list. The freight is $5.50 from Black Lake to Baltimore and $5 to Philadelphia. The cost of carting from the mine to the railroad ranges from 25 cents to $2 per ton, and mining and hoisting vary from $1 to $8 leaving then a good margin for profit.

I am not well informed about the European market, but I understand that in Glasgow they pay $22.50 per ton delivered, the freight amounting to $4.50.

According to the "Mineral Industry" the price in Europe would be £5.10 per ton of 50 per cent., with a rise of 5s. per unit. In the United States the price paid for Turkish ore would be: for 48 per cent. $26, 50 per cent. $27.50, 52 per cent. $31.80, 54 per cent. $34.50. The production of the United States in 1893 would

have been 1,620 tons, and the importation 6,354 tons, total, 7,974 tons. The manufacturers of bichromite requiring from 5 to 6000 tons.

I don't know what the consumption in Europe is, but from what is said above, the market and the demand for chrome ore appear to be favorable, our deposits being in the best condition for working and shipping. At date, the annual consumption of chrome ore for commercial purposes, is from 10 to 12,000 tons.

The present paper has been prepared at the request of the President of the G.M.A., after only a few days of notice, which explains and may excuse its elementary form. For better information on the subject, I refer to a very good article of the "Mineral Industry for 1893," in which I have found a good deal of facts. I must mention too the information I have obtained from Dr. J. Reed, one of the first exporters of Canadian chrome ore, and from Mr. W. Gleen, of the Baltimore Chrome Works.

As a conclusion, I will recall the irregularity of those deposits which make their exploitation a investment favorable only under certain conditions.

DISCUSSION.

MR. BLUE—What is the difference in the specific gravity between chromic iron and gangue?

MR. OBALSKI—Between 3.20 and 4.50.

DR. REED—The papers just read are very exhaustive and cover the whole ground. People have an idea that chromic iron is generally found in small pockets. I believe that to be a fallacy. I have been told by parties who have mined in California and the States that they found very deep pockets, five hundred feet, and chromic iron there. You can find pockets in a certain strike in the rock; you go along a mountain and find five or six pockets all in one stretch. You go off that stretch thirty or forty yards north or south and will not find it. Large portions of this ore will be found in veins. If that can be found correct, we will be able to mine chromic iron as we do other minerals. You will find at Coleraine the pockets nearly touch each other. The most important thing to miners is the acid. We sent to Baltimore a carload of chromic iron. They say: this is forty-eight per cent—and you must take their word for it. Now, that is a bad position to be in. You notify them to come and examine what you have and say what it is worth. They say: you must send it to us, and take whatever we will give you. See how much better it would be to send it to Glasgow. In Glasgow they have an official analyst who examines not only chrome but other minerals, and his assays are binding on both buyer and seller. Why should not our Government be able to furnish correct assays for our people, so that when we who have a large quantity of ore to send away the certificate of our Government would give the quality of our ore? I would suggest that our Secretary correspond with the Government upon that subject that we may have a proper chemist who will certify as to the quality of our ore, not only chrome, but other ores, so that we will not be at the mercy of the buyers, and that we may be in the same position in regard to ores as in regard to timber. We sent a carload down to Philadelphia. They wrote back that the ore was only forty-eight per cent. We had to take their word and reduce the price so much a ton; and the same thing occurred in regard to our Baltimore shipments. I believe ores as low as forty per cent. can be sold to mix with iron and steel.

MR. OBALSKI—I noticed at St. Francis a very large pocket. I do not suppose that chromic iron is found in regular veins. Sometimes some inside pockets can be found, which could be tested by a diamond drill. I agree with Dr. Reed as to having an analyst appointed by the Government, and I think we should have a Bureau for this purpose, and a certificate could be issued by the Government.

MR. B. T. A. BELL—I have argued for a long time that our Mining Bureaus should give more attention to the commercial aspect of our mining industries.

MR. GEORGE DRUMMOND—My friends, Dr. Reed and Mr. Bell, have made a good point with reference to the appointment by the Government of an analyst, but I cannot see how that is going to bind the American buyer. The latter will be bound, not by the Canadian chemist, but by his own chemist. I think it would be well for those gentlemen if each had his own chemist, and then a sample could be sent to some independent or neutral chemist in the United States, as a safeguard against the courts later on, so that his certificate would be just as good as the certificate of the buyer. Buyers in the United States are more competent than gentlemen mining in Canada to tell the correct percentage of ores. We have got to meet our customers and admit that they are honest until we find them otherwise. There are only a few buyers in the United States, and they are not likely to defraud wilfully. I think Mr. Donald and Mr. Obalski have pointed out a few facts we ought to look at squarely. There is a tendency which almost every miner, particularly those who own property which they desire to sell to some unfortunate speculator or financial men—there is a tendency to go down and pick out the best specimen and say: There! that is a fair sample of my mine! With regard to Black Lake, I had a gentleman call on me the other day with a very fine specimen, and he said he had "mountains of it!" Dr. Reed says you have very large pockets, but he has not said as much as the gentleman I have just referred to. I think the concensus of opinion is that in the majority of cases chromic iron occurs in pockets, and although it is a good thing to push our mines to development, I think it would be wisest for those going into these mines to go very cautiously. They should be very careful in the selection of their ores and in the amount of money put into these mines until it is proved that there is a large supply.

MR. B. T. A. BELL—It is a lamentable fact that to-day we have absolutely no data respecting the economic geology of many promising mining districts in Canada, while at the same time, officers of our Geological Survey are exploring and reporting on distant sections of our great country. How many years, I should like to know, will it be before the resources of Chesterfield Inlet and Labrador will be economically available? In the County of Hastings, and in other sections of Ontario, where gold and other minerals have been found, and where capitalists are seeking investment, no official reports that would be helpful to the development of the industry are available. Has any officer of the Geological Survey visited this field since these important discoveries of chrome iron were developed.

MR. KLEIN—Mr. Willimott is, I believe, there now.

MR. BELL—Is he investigating the nature and occurrence of the deposits, or simply collecting specimens? (Laughter.)

MR. JOHN J. PENHALE—Mr. Obalski mentioned the cost of carting chrome as 25 cents to $1 per ton, and the cost of mining from $1 to $8 per ton. I would like to know how that is arrived at.

MR. OBALSKI—I mentioned the case of Lake St. Francis, lot 26. I was there myself and saw the place. After making inquiry, I estimated that it would not cost more than one dollar for carting. Eight dollars would also be the maximum for mining.

MR. JOHN J. PENHALE—Would that be a fair statement to put before the public? Is it fair to suppose that the miner is mining at as high a cost as he ever will mine it? If he has to pay a royalty, and the cost of mining is eight dollars, and the freight five dollars and fifty cents, and there is a duty of 15%, he would be left a very narrow margin.

MR. BELL—The duty has been taken off.

CAPT. BENNETTS—I went out to examine these chrome mines, and the first question I considered was the geological question. Was it serpentine? And if so, is that serpentine congenial to the deposition of chrome iron? I found it was. These ores are in pockets. The quautity of ore raised has been considerable, considering the amount of work done--between nine hundred and one thousand tons—and by the returns of the United States they raise there twelve hundred, so that gives me the idea that these ores are worth not only recognition but searching after. So far, they appear to be of great value. The occurrence of the mineral covers a wide area, extending from Black Lake into Coleraine. I should like to ask Mr. Obalski if he noticed any other minerals that might be of value to the prospector in connection with serpentine.

MR. OBALSKI—In Bolton there is a great deal of magnetite.

MR. BLUE—I hardly agree with Dr. Reed in his suggestion of a Government analyst for determining the value of chrome iron and other ores. If a man has an article to sell, and another wants to buy it, they ought between themselves to establish a value. As to finding the proportion of valuable metal in ores—say, the amount of iron in these minerals—there is no difficulty whatever in taking a sample and having a public analyst, of whom there are plenty in Canada and the United States, make a complete analysis. I do not see what the Government has got to do between the private transactions of two persons. In our copper business we do not have the least bit of trouble, and I do not see any difference between selling copper and chrome iron. We sometimes have a littie argument; but no trouble in having it ultimately settled. If the assayer of the buyer does not agree with the assayer of the seller, a third party can be called in. In regard to low grade ores, it is claimed that ores under 50% are not of much value, and Mr. Obalski says the specific gravity of the chrome iron is 4.50 and of the rock about 3. This being the case, it would not be difficult to establish a system of concentration that would bring up low grade ores to the required standard.

MR. GEO. DRUMMOND—In selling chrome, as a safeguard, why not sell it so much per unit? You will have to determine the unit by having your own chemist and a corresponding chemist in the United States. I ship goods to a man and he says he receives only 990. Who will settle the difference? You must fight that man in the courts. These differences will arise, and no government can help you out. A great many young men come out of our college every year as trained chemists——some of them members of this Association—are you going to shut them out because you want to appoint a government official? If you find that a man in the United States has been acting badly and been trying to cheat you, why, find another buyer. You will find buyers in Scotland; and if we sell in the best markets we can always guard ourselves commercially, and that will be done by using the unit.

DR. REED—The laws of England are pretty good laws, and based upon justice, and if it is right and proper for the British Government to appoint Dr. Clark to assay ores and weigh them, why should it not be right for our Government to appoint one here?

MR. DRUMMOND—Dr. Clark will not be bound by any Government chemist appointed here.

DR. REED—I know of a case of an American who took Dr. Clark's decision as final.

The meeting adjourned at 11 o'clock p.m.

Repairing Rock Drills.

MR. A. SANGSTER (Sherbrooke)—It is to the interest of every drill user to keep the repair bill as small as possible. The Canadian Rand Drill Co. believe it to be their interest also to have their drills require few repairs, and in the following suggestions the writer would endeavour to show how a drill can be made to last longer and do more work. The repairs will refer more especially to those for which it is necessary to send a machine, or part, to the shop.

In nearly every case of a drill coming in for repairs, we find the cylinder worn in the bore from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch (mostly on the bottom side, from using the drill in a horizontal position) so that it will require to be bored $\frac{1}{8}$ to $\frac{1}{4}$ of an inch larger.

The rings are generally worn out.

The split bushing for the lower head, and the stuffer, are generally worn $\frac{1}{8}$ or more, ond the piston (barring accidents) usually in good condition; in fact it is a common occurrence to get a piston that has been in use for years, not worn more than $\frac{1}{64}$ inch in diameter, running in a cylinder $\frac{1}{8}$ inch larger.

The drill is often accompanied by an order to re-bore cylinder and put in new rings, or larger rings; but the lower head is considered good enough.

As the cylinder is one of the most expensive parts of the drill, we should consider how to prevent this excessive wear. It is the opinion of the writer that it could be prevented by putting in a new split bushing in the lower head when that part wears out. It is very evident that when the bushing is worn so loose it no longer forms a guide for the rod, and all the wear caused by the drill bits being out of truth, or by the drill moving on the mounting, comes on the piston and cylinder, and the cylinder being the softer suffers most.

Some drill repairers recognize and try to prevent this wear, and keep a guide on the rod by putting in a new stuffer, but it is designed only to tighten up the packing, and will not take the place of the bushing, which is a steel casting and has a bearing surface nearly four inches long, while the stuffer is of malleable iron and has a bearing only 2 inches long.

The bushing is held in place as solid as the cylinder itself, by a projection into the cylinder, a large shoulder on the cylinder, and firmly clamped in the lower head, which is pulled up tight with the side rods; while the stuffer is only held in place by being pinched on the threads, a bearing of about one inch. This soon wears itself loose (and the threads in the lower head as well) when this extra duty is imposed upon it.

We supply at least ten stuffers to one lower head bushing, and as many cylinders as bushings, yet if the bushing was renewed in time a new stuffer would be u necessary, and the cylinder would last much longer; and this bushing might be renewed five times for the price of a cylinder.

We will now consider how to repair a cylinder already worn out as described.

When the piston or cylinder of your pumps, hoists, or compressors, is worn too loose, you have the cylinder re-bored and a new piston made to fit, at a comparatively small expense; but in a rock drill, where the piston with the rod and chuck are all one piece and the most expensive part of the drill, the case is quite different.

To re-bore the cylinder $\frac{1}{8}$ inch larger requires a collar on the ratchet box and on the lower head bushing, to fit necessarily enlarged counterbores. If this is done and only larger piston rings put in, it is not worth the doing, as we have then only $\frac{1}{4}$ in. bearing at each end of piston, that is the width of the rings, which will wear out and be as bad as ever with a few days' use.

If a new piston is made for the re-bored cylinder, it is the most expensive and troublesome way to repair the drill, as the part saved (the cylinder) is the cheaper of

the two. This also requires the collars in counterbores. Then, in the Little Giant Drill the piston is too close to the rocker pin hole, by one half the amount bored out. This necessitates reducing the rocker on the face, and as it is tempered it is a difficult job, and could not be done nicely outside of a machine shop without considerable time and trouble. This difficulty is not confined to the Little Giant Drill, but occurs in any drill in which the valve is moved by mechanism in contact with the piston.

It would be better and cheaper to put in a new cylinder. If necessary the piston can be trued up, and the new cylinder made a little smaller to fit.

The only way an old cylinder can be economically repaired, and a way which is made a regular practice in some of the American mines, is to bush the cylinder with a brass tube. These can be obtained drawn the standard size of the cylinder, and if the piston is not worn much, a good fit can be made, with all parts standard size, which is a matter of great convenience at the mines when it is desired to exchange parts from one drill to another.

The cost of boring and lining the cylinder the first time would be less than half that of a new cylinder, while to renew the lining would be less than one third.

Of course it cannot be expected that the brass lining will last as long as a new cylinder, but it can be renewed as often as desired.

A point in the Little Giant drills where much loss of power can be prevented, is in the rocker. With the wear on both points of contact with the piston, the ball of the rocker, the hole in the slide valve, and the dropping away of the piston itself there is sometimes in an old drill, a very small port opening. This can be remedied by swagging out the rocker, as well, and even better, than with a new rocker, as it can be drawn a little more to allow for the wear in the other parts. But it is a fine job, and could not be done by every drill sharpener; but in the hands of a good mechanic it is one of the best ways to liven up an old drill. We usually swag the rocker on every drill that comes in for repairs, and have had old rockers sent in to be swagged.

We use, in repairing an old drill or in setting up a new one, a skeleton valve, which is simply an ordinary slide valve, with the port cut right through so as to show it working on the seat.

By leaving the steam chest off, and moving the piston backward and forward by hand, we can see exactly what port opening the drill has, and in swagging the rocker can see where to draw it so as to give full and equal port opening at both ends of the stroke.

I would recommend that every repairer have a skeleton valve, and examine the drills with it when they come out of the mine, and not wait till the drill gets weakened in its action.

At some mines, after the slide valve and seat have been used as long as they will work, they are thrown aside, and new ones put in.

This is unnecessary, as a valve seat can be planed up as good as new several times. The same with the slide valve; but as it can be dressed as cheaply with a file as on a planer, it can be done at the mines. The recess or steam passage must be looked to and dressed out to its original depth, otherwise the steam or air would be throttled at this point.

A customary way in which the drills are abused is by pounding on the piston rod or chuck with a hammer or bar when for any reason the drill gets stuck in the hole. With our hexagonal chuck there seems to be no excuse for this undue punishment of the piston. And the fact that some pistons which have been out for years, even without the hexagonal chuck come in with very few marks upon them, plainly shows that it is not necessary.

About a year ago we repaired several chucks which had been pounded out of all shape, some of them right through to the bushing, and all of them allowing the bushing to project from an $\frac{1}{8}$ in. to $\frac{1}{4}$ in.

These are repaired by turning up the end as large as possible, and shrinking and pinning a steel collar on about 1 in. or 1$\frac{1}{4}$ in. wide. The collar was bored to fit the bushing at one end, thus lengthening out the hole for the bushnig. They were held in place by two large pins screwed and riveted in parallel with the rod, and several put in diametrically. Upon inquiry last week it was learned that they were giving good satisfaction.

The annoyance of nuts working loose can be prevented by using lock washers which we now put under each nut on all drills. They also make practicable the use of a paul stud, which many prefer to the stud we regularly put in: it has a long taper head fitting in a reamed hole in the ratchet box, and passes right through the cover, and has two nuts with a lock washer between them. The first nut is to make a close joint about the hole; the washer and second nut to keep it from slacking back. These, or the regular studs can be put in any old ratchet box, no matter how large the hole may have become, by plugging it and making a fresh hole for the stud.

In the progress which has been made in the construction of rock drills better material is being used, parts which were once made of cast iron have for several years been made of malleable; amongst them the steam chest and ratchet box, making the breakage of those parts a rarity. In fact the cylinder and valve seat are the only parts of the Little Giant Drill which are made of cast iron.

Great care should be taken to see that the drill is oiled regularly with a good quality of lubricating oil. From the rough nature of the work for which this class of machinery is used, this important point is often overlooked and by using an inferior oil, through misrepresentation or from a sense of economy, a plant which has been laid out with expert engineering advice and the best machinery put in, is often seriously crippled.

DISCUSSION.

MR. GEORGE R. SMITH—In expressing an opinion upon Mr. Sangster's paper I should exercise great care, for it is entirely, I presume, based upon his acquaintance with the Rand machine; and, as you all know, my ideas are founded upon experience with the Ingersoll make. The valve motion of the Rand is entirely different from the Ingersoll, there being no tappet. The bushing of the cylinder is a new idea to me. Is his idea that the company who furnish the drill furnish the bushings?

MR. SANGSTER—Yes.

MR. GEORGE R. SMITH—The trouble is, I think, that the bottom side of the cylinder is usually worn more than the top side. The latter would either have to be bored out a little to take the bushing, or the bushing would have to be tapered to be put in. How can we use this bushing without re-boring the cylinder or getting a taper brass lining? Would not the cylinder have to be re-bored to take the brass lining?

MR. SANGSTER—The cylinder would have to be re-bored the first time. Afterwards the bushings would be renewed without reboring.

MR. GEORGE R. SMITH—Of course, the only point is that you could use the old cylinder; but I think the idea a new one and a good one.

MR. BLUE—How is the bushing kept in place?

MR. SANGSTER—It has such a long fit in the cylinder that the danger of moving would be very slight. It could not move sideways, as the heads and two pins screwed in and rivetted over would prevent its turning round.

MR. BLUE—Would it not be possible when a cylinder was in the shop to bore it out a certain size and get several bushings, all fitted for that size, and when sending the drill back to the mine owners send several bushings at the same time.

MR. SANGSTER—Yes; the bushings would all be the same size, and a cylinder once re-bored a bushing could be exchanged.

MR. L. A. KLEIN—The economical part of the question has not been referred to. Have you, Mr. Sangster, made any practical test of your theory? How long will such a brass bushing stand?

MR. SANGSTER—A practical test has been made at some of the American mines. I have only had experience in bushing one cylinder. I never heard anything against its use.

MR. KLEIN—Would it not pay better to have a new cylinder instead of putting in four or five bushings? How would that compare?

MR. SANGSTER—The cost would be less than one-half to bush it the first time, and less than one-third to renew the bushing. Many mine owners are averse to putting in new cylinders. They wish to use out the old parts.

MR. KLEIN—Wrong tactics!

MR. SANGSTER—No doubt a new cylinder is the best method. But how many are there who will do that?

MR. F. P. BUCK—We would all do it if we knew it to be cheaper.

MR. L. A. KLEIN—Is it not better to have a new cylinder than new bushings, and be obliged to renew these brass bushings so often?

MR. SANGSTER—My argument is that the old cylinder can be used economically.

MR. S. L. SPAFFORD—My experience is that after a drill gets to a certain stage, when the cylinder is worn and the piston is worn, and the general repairs would be heavy, it is better to get a new machine than try and patch the old one up. Such a policy is a saving in your fuel, and I do not believe in bushing old machines. It is possible that bushing a cylinder is a good idea; but I think that if the cost of bushings were taken into consideration, and the time of repairing the machines, it would be found that it did not pay. Brass bushings wear out rapidly.

MR. BLUE—I think if the manufacturers of drills would be content with a moderate profit, on the manufacture of drills, say if they would give us a drill for something like 25 or 50 per cent. on the cost, it would be the wisest plan for all users of steam drills to throw them away after the first six months' work and get new drills. I have always found the first six or eight months' work of drills the best work, and not very satisfactory after that time.

MR. GEORGE R. SMITH—We all ought to feel very grateful to Mr. Sangster for having introduced such a subject. If there is a sore point among mining men it is that of repairing drills and drill parts.

MR. BLUE—The use of better oil is a good suggestion by Mr. Sangster. A drill is the worst used piece of machinery on the face of the earth.

CAPT. BENNETTS—I have been using these drills some two hundred miles from a machine shop; and in such a case as that, many points of Mr. Sangster's paper would come in usefully.

MR. A. SANGSTER, SR.—I think there is not enough care exercised in the choice of oil. Agents will come along sometimes and offer you an oil at a cheap rate, telling you it is of the same grade and quality as the best. But instead of this cheap oil keeping the machinery lubricated, the machinery begins to cut, more especially in the case of cast iron. We always try to get the best oil; and when we once get a good grade of oil, we keep to it, no matter what agent comes along. I think there is a great deal in the oiling of machinery to keep it running longer than it ordinarily does. I am not acquainted with any kind of drills, but simply with the running of machinery so far as oil is concerned. That one point has been very well taken by Mr. Sangster.

MR. SPAFFORD—What do you consider, Mr. Sangster, the usual cost of repairs per month?

MR. SANGSTER, JR.—I refer you to Mr. Jenckes, and to those who use drills, on that question.

MR. L. A. KLEIN—We have had a few American and Canadian machines. Our repairs in the first year, on five machines, did not amount to more than $42, using them all the time, two of them underground and three at open work. But in the interests of drill manufacturers, I do not like to mention what they cost afterwards.

MR. BLUE—That bears me out.

MR. GEORGE R. SMITH—Mr. Spafford's question is a hard one to answer. With us a drill will last longer than in the Copper mines. Our rock is solid. A seamy rock seems to break the drills up much quicker than a good straight stratified rock. Another great point is the operator. You can give a new drill each to two men. One man's drill will be in just as good condition at the end of six months as at the beginning; while the other man's drill may have cost in that time six or eight, or sixty or eighty dollars, according to the manner he used it. It depends on the rock and the man who was running the machine.

MR. KLEIN—The difference in cost of repairs between machines run by compressed air and machines run by steam is very considerable. With steam, you break a machine in about half the time that you do one with compressed air. I have been using both on the same ground, with the same men and conditions, and the steam does not stand half the time. There are certain parts which seem to break away, and at certain points.

MR. S. W. JENCKES—I never heard of any difference in working between steam and air, unless there was greater pressure used by steam than air.

MR. KLEIN—We carry eighty and ninety pounds, steam and air.

MR. S. W. JENCKES—Would your pressure be the same?

MR. KLEIN—Not exactly the same, on account of the difference in length of pipe line. 1,800 feet of pipe line, used in the case of air, naturally reduced the pressure ultimately on the machine, while the steam gets nearly the full benefit of the ninety pounds. I know Mr. Lindsey fully admitted the repairs to be considerably higher in the use of steam; and his explanation was that it was due to the heating of the drill.

MR. SANGSTER, JR.—Certainly, repairs are greater in the use of steam.

MR. KLEIN—It is not more expensive at the same time to run with steam, though the repairs on a drill are higher. For the ultimate cost of a foot drilling where there is a possibility of running with steam in open works, is considerably lower than using compressed air. We can well afford to repair drills and use steam just the same.

MR. B. T. A. BELL moved the adjournment of the discussion, which was carried.

Excursion to the Copper, Chrome and Asbestos Mines.

Favored with the best of weather, the members drove to Capelton on Thursday and spent a thoroughly enjoyable day as the guests of President and Mrs. Blue. A considerable portion of the time was spent in a profitable inspection of the surface plant of the Eustis mine, and in examining the extensive underground works for which it is famous. (For a full description of the operations carried on here see our issue of July, 1893.) A *recherché* luncheon, given by Mr. and Mrs. Blue, was served in the

Club House. The adjacent mines of the Nichols Chemical Co., with which are connected extensive works for the manufacture of sulphuric acid and super-phosphate, were not thrown open to the inspection of the Association, for business reasons, but as the character of the ore and the conditions of its occurrence are the same as at the Eustis mine, both properties being located on what is regarded as the same vein, the real object of the visit was obtained. Too much cannot be said of the geniality of the hosts of the day, who were untiring in their efforts to make everything thoroughly pleasant, and it is needless to say, judging from the delighted remarks of the party, they succeeded admirably. The drive home over the fine roads and through a delightful stretch of picturesque scenery was greatly appreciated by all, Sherbrooke being reached in time for supper.

Delightful warmth and glorious sunshine favored the members for their excursion to the mining districts, on the line of the Quebec Central Railway, on Friday. Mr. Frank Grundy, the genial manager of the line, courteously placed a special train at the disposal of the members, a token of his good will to the mining fraternity, which was heartily appreciated. A start was made at nine o'clock, the first stop being made to permit an inspection of the important pulp and paper making industries at East Angus. Then a pleasant run through the charming scenery of the St. Francis Valley brought the members to the quarry and works of the Dominion Lime Co., Ltd., at Dudswell. About 100 persons are employed here. There are 10 kilns, and the output when running full time is about 150 tons. The face of the quarry is about 150 ft. in height. The lime is celebrated for its great purity, and is surpassed by that of no other lime works in Canada or the adjoining States, the amount of foreign matter being not more than one per cent. The train was soon again in motion for a run to Black Lake, and in order to lose no more time, a lunch, embracing everything that could be desired was served on the way, the fresh air and exercise, and the universal feeling of good fellowship causing everyone to appreciate the good things provided to the fullest extent. Choice bits of scenery abounded, and the run to the chrome workings—they can hardly yet be called mines—which were reached about one o'clock, was enjoyable in the extreme. The members, under the guidance of Dr. Reed, Mr. Lambley and Mr. Robichon, were soon scattered about the various pits and trenches that have been opened recently on the hillside in close proximity to the railway, and from which several hundred tons of chromic iron of excellent quality have been mined. The nature and occurrence of these deposits are fully described in the papers by Mr. Obalski and Mr. Donald, reproduced elsewhere in this issue. A stop was made at Black Lake to visit some of the important asbestos mines, but the main body continued to run to Thetford mines, the headquarters of the industry, where the remainder of the day was spent with profit examining the important works of the Bell's, Beaver, King Bros. and Johnson mines. The return trip was a fast one, Sherbrooke being reached shortly after six o'clock, in time to dress for the second part of the day's entertainment.

Dined by the Hon. W. B. Ives, Q. C., M. P.

On Friday evening the members assembled at the residence of the Hon. W. B. Ives, Q. C., M. P., President of H. M. Privy Council, where they were entertained to dinner. Mr. Rufus H. Pope M. P. occupied the vice-chair. After a royal repast, and cigars were lit,

The Hon. Mr. IVES rising to propose the health of President Blue said:—Your President came over here when a young man; and by virtue of sterling ability, perseverance and industry has attained to a very important and responsible position. He has done very well for himself—as Scotchmen generally do—and he is doing a great deal of good to the country. He is a man of integrity, a man of substance, a man of stability; and he is a man whom we would like to see multiplied. (Applause.)

Mr. JOHN BLUE, responding to the toast and the iterated vocal assertion that he was all right and a jolly good fellow, said: I was told this afternoon by one whom I supposed to be an authority, that there were to be no speeches on this occasion; and I rejoiced thereat exceedingly. Nevertheless, I have to thank you as best I can for the toast. But you are all too kind and flattering. Quite a number here know that at last winter's meeting of the Association, in Montreal, I accepted with a great deal of reluctance and hesitation the position which is responsible for my being on my feet at the present moment—the position of President of this Association, which I have the honor of holding. I had a great many scruples as to my ability to fill the position and that fact, taken in connection with the position itself, reminds me of a little story.

A certain great iron master in the North of Scotland had risen right from the pit, and come to a high position in the manufacturing world. He was noted for his good deeds and works and beneficence to educational institutions and the church; and in recognition of these qualities, the church to which he belonged decided to confer upon him the honor of making him an elder. The object of this attention had serious scruples about accepting the eldership; but he did not see how he could decently refuse, and so was compelled to submit to his fate. Shortly afterwards, a neighbor called in and asked him to come to the bedside of a dying parishoner; and in the exercise of his duty as an elder of the church, he went, though somewhat taken aback by this unexpected call to arms.

"My friend," he said to the dying man, "a very great mistake has been made in calling me here. I am only a sort of business or managing elder of the congregation. I am not a praying elder. If you want spiritual discourse, you will have to get somebody else." (Laughter)

And so, gentlemen, you can apply this little story to my own particular case. I am not a talking machine for the Association. But none the less, I trust you will understand how I appreciate—an appreciation I cannot express—the manner in which you have responded to the too flattering manner in which my health has been proposed.

Mr. B. T. A. BELL, in proposing the health of the Hon. gentlemen whose guests they were said: It would be presumption on my part to attempt to express what we all think of our host, and the delightful hospitality which he has extended to us during this meeting. He is an old and valued friend to every mine operator in the Eastern Townships. He is known to every one of us, as a statesman of sterling worth and ability, whose first interest is the welfare of this constituency which he so ably represents. This merry evening under his hospitable roof is the crowning feature of what has been unquestionably one of the most successful gatherings since our Association was formed. (Applause.)

Hon. Mr. IVES, in responding, to the remarkably uniform manner in which the glasses were emptied to his health, and the vociferous singing of a popular refrain of which he was the objective point, said: I am exceedingly obliged to you, Mr Bell and gentlemen, for the very kind manner in which my health has been proposed and received. I can assure Mr. Bell that in the Townships we are a very happy family, and a fairly united family: and it gives me great pleasure to meet gentlemen from other parts of the Dominion, who come here to meet them as on this occasion; and nothing can give us greater pleasure than to take part in the celebration and enjoyment which follow these meetings. I feel assured that the General Mining Association of the Province of Quebec is an association that has done and is doing and is likely to do a very great good. I am certain from what I hear that Mr. Bell in the journal which he publishes and edits and in his other efforts is doing a very good work—a work that is very useful to the Dominion and very highly appreciated by the practical miners of the Eastern Townships. As for our President, we have a very kindly feeling for him indeed in the Eastern Townships. He is one of our *boys*, and has been identified for a great many years with us, and he has made a success of an enterprise whose success was doubtful when he took hold of it. He has made money for his company, and I trust he is making a fairly good competence for himself. We like to see him succeed; and he has the best wishes for himself and the mining interests of the Eastern Townships of us all! If you look at the exports of the Eastern Townships, you will find that the mineral exports are among the most important, if not the most important of all. We feel proud when we go outside to say that our resources are so varied as they are. Mineral, agricultural, lumbering and others—we have them all, not depending upon one string to our bow. For we have very many strings! After travelling over the Dominion from West to East, you will find that there is no portion of our country endowed with so many natural advantages and at the present moment so solidly prosperous as the Eastern Townships. Our agriculture is prospering, our mining industries are prospering. There may be an ebb and flow to this or that industry; but in the main all are prosperous.

When I was in London, not very long ago, I was in company with two or three others from Montreal, and we occasionally went around among the barmaids. One day a conundrum was propounded to us by one of these barmaids. She said: When is a virgin not a virgin? We all gave it up, and the answer she gave us was: In nine cases out of ten! (Laughter.)

When you find an Eastern Townships man who is not thoroughly proud of the Eastern Townships he is the one case in ten. We are all proud of the Eastern Townships. It is a country large enough to receive all, and employ all, to say nothing of giving a competency and prosperity to all.

I have to thank you all again for the manner in which you have received the toast of my health. I am the unworthy representative (No! no!) in the Cabinet of the Eastern Townships. I feel streng in the support your strength and support gives me. I feel when I go to Ottawa that I have behind me the pulsation of the Eastern Townships, and I hope I shall be true to the Eastern Townships. I try to be; and if my common sense does not fail me, I shall be so always. And you may be sure of this: that I shall thoroughly, and truly and honestly represent the interests, and wishes and aspirations of the Eastern Townships.

The genial host called upon his guests to fill their glasses to the brim and drink to the health and prosperity of one who was an important factor of the Association, and of the Association's success, the Secretary.

Mr. B. T. A. BELL, in responding to the toast and the enthusiastic manner in which it had been received, briefly returned thanks.

Between the speeches, and later when the party adjourned to the spacious hallway, where an impromptu but highly successful concert was gaily held, songs and recitations of a pathetic and sentimental, and tragic and comic order were given by Mr. Geo. R. Smith, Mr. B. Marcusé, Mr. Gordon Rogers and Mr. H. J. Williams, while Mr. F. Grundy, Jr., proved himself a skilled and incomparable accompanist. It was 1 a.m. when a very happy lot of gentlemen shook hands with their kind host and drove back merrily under the glittering stars to Sherbrooke and bed.

Sherbrooke and Thereabouts, with the Q. M. A.

By the Junior Reporter.

The Gog and Magog Hotel, Sherbrooke, does not cover as many arable townships in its area as its name would imply; but there is a great deal of room about it—for improvement. Still, the morning pilgrim who comes in on the Shivering Express at 5 a.m., and tries to register his name in Egyptian italics with his numbed fingers, will always find a nice new Early Rose potato for him to wipe his pen in, curled up with the ink and the blotting paper, calling cards and the matches, looking like a cross between a porcupine and a target in the time of Robin Hood, with its stucco of dismembered pen nibs and forgotten toothpicks.

There are two balconies running around the hotel three quarters of the way, like a short belt that wont buckle around a fat man. The upper one is for flirtation, and serves its purpose well; and the lower one is for business, and pleasure of a less romantic turn. The ground floor balcony is a nice retreat for a flat-chested man, provided he sits up close to the wall. He can sit there and see the Postmaster wake up to hand out a letter in the Post Office opposite; and he can hearken to the waterfall below the bridge, and the clinking of the "ryes" in the bar behind him, while his feet stray off into the road and paralyze traffic.

Sweet little Lennoxville—the neatest village on the continent! Shall we ever forget the drive on that matchless morning through the rich and beautiful country about delightful Sherbrooke, over that piece of perfect road that lies between the picturesque town and the village that has been made famous by its college? Sweet little Lennoxville! indeed, with its broad clean street, its fine buildings of fresh-looking brick, its wholesome, healthy atmosphere, its beautiful entrances of perfect roadway bordered by great willows, and its background of lovely hills and slopes and charming farms and valleys!

We drove through a land indescribably delightful and smiling—even in the autumn time of sadness that is in itself most sweet; through the country of the St. Francis and the Magog, the Massawippi and the Coaticooke rivers. Such a tangle of tree-girt, willow-bound, shadowy streams, that seemed to run into each other and lie in one another's bed, as it were, and then straighten out and loiter on as before.

"Mine? Yes, a mine! *Copper* mine!"

When you stand in the gravelled roadway by the office of the Manager of the Eustis Copper Mines at Capelton, and look about you, your eye rests and feasts upon a veritable land of promise—but a land of promise that has given much already and promises much more. Before you stretches a broad valley, green and glorious, that rises as if leisurely until it terminates as if exultantly in a stretch of wooded hillside. And across the valley, and up and over the hill, passes a white line of road, like a path running out from Arcadia to the world!

Then, beyond you, rises abruptly a great hill—a hill that is a mountain, rugged and most repellant in the hardness of its features. But it is a kindly old hill, after all; for deep down beneath the rough surface of its breast, that has been pierced by shafts nearly two thousand feet deep, there is a treasure house of countless tons of pyrites, from which this old hill has been giving and from which it will give for many years.

The J. R. didn't go down this trip. But he sat on the verandah of the Club House, where there were a good many sweet little things of different sorts (soda scones and nips of scotch), and watched the procession pass by with its blue underclothes and cheap-sale assortment of last year's stock of headgear. When they came back, there was a sort of fagged, ragged, jagged, bagged-at-the-knees, curled-up-at-the-ankles look.

about them; but it seemed that a little nip of something or other, taken quickly with the eyes shut, was a good cure for this.

We sat down to as fine and variegated and wholesome and merry a luncheon as ever graced a table with four sound legs; and one of the many best parts of it was that there were no speeches. Every eligible jaw-wiggler had known in advance that this would be the case, and as a consequence no naturally fine appetites were impaired by worrying over the smart things to be said, and everyone eat as he had never eaten before, and thought between bites how good Mrs. Blue had been. Poor Mrs. Blue's ears must have been burning an awful lot about that time! It was one of the bluest days, in the best sense of the word, we ever put in—blue sky, blue clothes, blue everywhere; and Ge—rge R-r-r-r-rg-l-s S——th, in his cerulean jeans and roundabout, blew in frequently to have something, bless him!

Long live John Blue! So say we all of us!

There is a high school at Capelton that looks like something between a sun-burnt lighthouse and a north pole observatory. You see the kids come scampering out of the port holes that are on the ground floor like the fire escapes of an Esquimaux palace; and the solid, stolid, red-faced, telescopic old egg shell of education seems positively to smile down upon the youngsters in its grim way.

When a boy in this institution passes out of the part-first, ground-floor class, he rises higher—to the next floor—and keeps on rising and graduating until he slides up into the tenth or twelfth story and passes out on to the roof in all the glory of degrees and diplomas and scholarships and heart failure. And then he takes wings and spreads them out and flies away.

The genial little gentleman who bosses the running of the trains of the Q.C.R.R. had placed a special train at our disposal, and we ran out in it on Friday, a jolly party, on a bright morning that promised an even brighter day.

A stop at East Angus allowed us to see the works of the Royal Pulp and Paper Company—works so extensive that they require two townships to locate in, as there is an extensive paper mill operated by the same company on the other side of the stream. Paper! paper! paper! of all sorts and conditions and sizes—paper in embryo, paper in its infancy, paper in its prime! The mills of the R. P. & P. Co. don't grind slowly, but they grind exceeding fine paper. Paper, sir? Well, rather!

Then we branched off for about five miles to Dudswell, and inspected the great quarry of the Dominion Lime and Marble Company. This quarry of limestone is a sight to see. It is a great excavation, two or three hundred feet across either way, and one hundred and fifty feet deep. The perpendicular gray white wall would make the Sunlight soap advertising agent take to drink out of sheer envy; while down below, the workmen, quarrying, look like pigmies. The stone is loaded down there upon small cars, that come gliding up the incline to the tops of the kilns. At the base of the latter you can look in upon a glowing mass—and wish that you had in your yard at home just half the hardwood they fire in there in a day. Then you can see the lime drawn out from another doorway, irregularly shaped blocks—and there you are! There is one ton of lime for every ton of stone dumped upon the hot summit of the kiln.

When near Black Lake we made another stop and trudged away up a mountain—the highest in Canada, I think—and saw the chromic iron deposits; and if the proprietor's pockets are ever half so full of finances, on the head of his shipments, as those ore pockets were of dumps, he can go out of the business.

Acres upon acres of serpentine, stretching far away, greeted our eyes at Thetford. It's a case of mine, counter-mine, here, too; but you want about four hands to count them all on; and your feet have to be mates when you are walking around there. This is the great asbestos region; and Mr. H. J. Williams—the only Harry—toted us about and showed us how it is all taken up out of the great big quarries, and smashed and pulverized until it is all so soft and silky, you could turn a handspring on it without hurting anything but your feelings. Then, over the way, Mr. William King—long life to him—coralled us all in his snug house and set 'em up in a fashion that I hope will always be in style.

I don't know how it was. None of us *should* have been very hungry after the excellent luncheon we had tought to a finish on the train, on the way to Thetford. But all the same, we proved to the Honorable W. B. Ives that we *were*, when we sat down to the admirable dinner on Friday evening, he had bidden us to.

But all good things must have an ending—this article included—the dinner had, and so too had the variety show in which the inimitable G——e R-r-r-g-l-s S——h distinguished himself and brought down the house with applause and laughter. And at last we shook hands cordially with our incomparable host, and drove back under the clear stars of a fine autumn night, and an impression that we had never had a better time before—even in our boyhood.

An Improved Rock Drill.

Messrs. R. G. Ross & Son, of Glasgow, Scotland, have patented an improved rock drill. The drill is mounted on a tripod and fitted with the latest patent pneumatic automatic feed, whereby the screw feed is entirely dispensed with. The piston works in the cylinder of the drill proper to which the flexible tube is connected.

The tool is attached by a plunger to the pneumatic feed cylinder which is clamped to a bracket connected to the tripod.

The tool is ready to start work when air is admitted to the cylinder by the thumb cock, the piston at once gets into rapid motion and simultaneously the air finds its way by a small channel to the outer end of the plunger in the feed cylinder, thereby pressing the drill up to its work with a steady and unvarying pressure. All the attendant has to do is to turn the hand wheel steadily and somewhat quickly. When the drill has penetrated 18 in. or so, the plunger has travelled out that distance; the attendant then slackens the clamp a little, pushes forward the feed cylinder till its outer end is near the clamp, fixes it by a turn of the nut and the tool is ready for another 18 in. of travel. It will thus be seen that holes 3 ft. deep can be bored by this tool with one length of drill.

The tool is clamped to the upright stretcher bar by a simple bolt. One turn of the bolt enables the workman to raise or lower the tool, or to swivel it in any direction; indeed, the arrangement of clamps form a perfect universal joint. The principle of the tool, we are informed, frees it from much of the tear and wear inseparable from the rock drills hitherto in use and thus enables them to be made lighter and more portable. This secures greater economy in working, as one man can shift a complete tool and set it up at any new place without assistance. The tool is also made to work by hand and is, we understand, very effective in rock of a soft nature; but in hard rock it is desirable to use either stretcher bar or tripod, as may be found most convenient.

An Incident of Forty Years Ago.

The following is clipped from *The Sporting Times* of London, and portrays an actual incident. The incident, however, did not occur near New Denver, as some who have read it believe, or near Denver, Colorado, but, in the early 50's, near a little town in Shasta County, California, named Muletown, where for awhile gold was as easy to get out of the ground as whisky is to get from over a bar at New Denver now. The roads leading from Muletown down through the valley of Sacramento river were then, as they are yet, probably the dustiest in California, and to follow behind a freight "outfit" for any considerable distance would certainly be a great punishment. Although the incident occurred forty years ago, men of the mining camps are just as foolish to-day as they were then.

"WALK."

Up the dusty road from Denver town,
To where the mines their treasures hide,
The road is long, and many miles
The golden store and town divide.
Along this road one summer day
There toiled a tired man,
Begrimed with dust, the weary way
He cussed, as some folks can.
The stranger hailed a passing team
That slowly dragged its load along,
His hail raised up the teamster old,
And checked his merry song.
"Say, stranger. Wal, who-o-ap,
Ken I walk behind your load
A spell on this yer road?"
"Wal, no, yer can't walk, but git
Up on this seat and ride. Git up har."
"No-op, that ain't what I want;
Fur its in yer dust, that's like a smudge
I want to trudge, for I desarve it."
"Wal, pard, I ain't no hog, and I don't
Own this road afore nor 'hind,
So just git right in the dust and walk,
If that's the way yer 'clined.
Gee up! ger 'lang," the driver said,
The creaking wain moved on amain,
The teamster heard the stranger talk,
As if two trudged behind his van;
Yet looking back could only spy
A single lonely man.
Yet heard the teamster words like these
Come from the dust as from a cloud,
For the weary traveller spoke his mind,
His thoughts he uttered loud.
And this the burden of his talk:
"Walk, now yer damn fool, walk,
Not the way yer went to Denver,
Walk ——, —— yer, walk.
Went to the mines and made yer stake,
'Nuff to take yer back to the state
Whar yer was born.
Whar in hell's yer corn?
Wal, walk, —— yer walk.
Dust in yer eyes, dust in yer nose,
Dust down yer throat, and thick
On yer clothes. Can't hardly talk,
I know it, but walk, —— yer walk.
What did yer do with all yer tin?
Y-e-s, blew every cent of it in!
Got drunk—got sober—got drunk agin?
Wal, walk, —— yer, just walk.
What did yer do? What didn't yer do?
Why when you war thar yer gold dust flew.
Yer thought it war fine to keep opening wine,
Now walk, 'you son of a biscuit!' walk.
Stop ter drink! What!! Water!!!
Why, the water with you warn't anywhar',
It was wine—extra dry—oh! you flew high,
Now walk, ——, ——, yer walk!
Chokes yer this dust? Wal, that 'aint the wust,
When yer git back to whar the diggings are,
No pick, no shovel, no pan. Wal, you're a healthy man,
So walk, —— yer—just walk."
"The fools don't all go to Denver town,
Nor do they all to the mines come down;
Most of us all have in our day,
In some sort of shape, some kind of way,
Painted the town with the old stuff,
Dipped in stocks, made some bluff,
Mixed wines old and new,
Got caught in wedlock by a shrew,
Stayed out all night, tight,
Rolled home in the morning light,
With crumpled tie and torn clawhammer,
And woke up next morn with a 'katzenjammer,'
And walked, yes, —— us, how we walked?
Now don't try to yank every bun,
Don't try to have all the fun,
Don't think you know it all,
Don't think real estate won't fall,
Don't try to bluff on an ace,
Don't get stuck on a pretty face,
Don't believe every 'jay's' talk,
For if you do—
You can bet your sweet life you'll walk."

MISCELLANEOUS NOTES.

The mining lands, plant and equipment, and other property of the Drury Nickel Co. (Ltd.), in liquidation, will be sold in the White House, Sudbury, Ont., on Wednesday, 5th December next.

The shipments of coal from the Old Sydney colliery, Cape Breton, N.S., operated by the General Mining Association (Ltd.), are greatly in excess of last year. For the year ending 30th Sept., 1893, the total output was 217,000 tons; daily average 852 tons, or 1,265 tubs; while for the same period this year the total output has been 246,000 tons; daily average 946 tons, or 1,408 tubs, an increase of 29,000 tons. Mr. Robert Robertson, for many years underground manager, is we believe, likely to sever his connection with the colliery at an early date.

The H. H. Vivian Company, owners of the Murray mine, near Sudbury, is opening up a new location about a mile south of the present works. Mr. H. Merry has arrived from Swansea in connection with alterations to smelting plant.

The Crystal Gold Mining Co., lately incorporated, has started work with a strong force under Mr. McConnell, on their property at Lake Wahnapitae, Ont.

We take the following from the report of the British Columbia Board of Trade for 1894: The West Kootenay district has given further evidence of its richness, principally in silver bearing ores. During 1893, 1,337 mining claims were recorded and 1,167 transfers were made. Between December 12th, 1893, and May 31st, 1894, 5,374 tons of ore were exported (chiefly from Slocan mines), to Swansea and United States, the declared average value for customs purposes being $120 per ton. All the Slocan mines have been discovered since 1891, and, with few exceptions, every mine located there has improved as it has been developed, the veins becoming stronger as they went deeper. In 1893 the mines gave employment to 225 men.

The Jeffrey asbestos mine, at present operated by the Messrs. Boas of St. Hyacinthe, Que., has a force of 150 men working under the superintendence of Mr. B. Marcusé, and a large output is being made.

The Danville Slate Co. has about 100 men employed at its Danville quarry.

Clarence H. Dimock, of the Wentworth Gypsum Co., Windsor, N. S. and J. B. King, of the firm of J. B. King & Co., manufacturers of plaster, New York, visited the new plaster quarries, owned by Mr. Dimock, at D. iselle Creek, this month. The plaster from these quarries has been tested and proved a superior quality. A new wharf has been built at Gray's Island, Hillsboro', affording ample shipping facilities. It is rumored that Mr. Dimock will build a plaster mill at the quarries next summer. A branch line from the Salisbury & Harvey railway is now being built to the quarries.

The New Glasgow Iron, Coal and Railway Co. (Ltd.), has, we understand, acquired from the Government of Newfoundland a 99 years' lease of a fine red hematite deposit on Great Bell Island, Conception Bay. The ore body is extensive and gives on analyses 55% of iron and 0.08 silica. Work has been commenced, and tenders have been asked for the construction of an overhead tramway from the quarry to shipping pier, a distance of about three quarters of a mile. The ore will make a fine mixture with the others from the company's mines in Pictou County.

The test well for oil that is being drilled by the Dominion Government at Athabaska Landing, 90 miles from Fort Edmonton, is down 700 feet. No oil has yet been struck, though gas is very plentiful, a second flow having just been tapped.

A prospector from Fort Edmonton, N.W.T., reports that 200 men are placer mining within about 20 miles of that town, but with poor success, most of them averaging only $1 per day. On the Peace river no gold at all is being taken out. On the Mackenzie river, 1,000 miles north of Edmonton, 15 men are averaging $10 a day. Flour is 25c. a pound, sugar 50c., tobacco $1 a plug, and other articles equally as high.

The coal shipments from the province of British Columbia for the month of September were:—

	Tons.
New Vancouver Coal Mining and Land Co	20,275
Wellington Coal Co	21,062
Union Colliery Co	19,960
Total	61,297

This shows an increase over the two previous months, the total for August being 54,009 tons, and for July 52,201 tons. The shipments from the collieries of the New Vancouver Coal Co. remain practically the same as in August, the difference being only 30 tons. Wellington's shipments show an increase of over 4,000 tons, and Union's of about 2,500.

A new seam of coal exceeding 9 ft. is reported to have been found at Anthracite, N.W.T., on the mining property worked by the H. W. McNeill Co. (Ltd.) The Winnipeg *Free Press* is our authority for the statement that about 8,000 tons of this company's coal is now banked in Winnipeg, and that it will be retailed all winter for $8.50 a ton, quite a drop from $10.50, last winter's price.

"Not many months ago, says a B. C. exchange, "there arrived at Nelson a man who knew absolutely nothing of prospecting or mining, having worked for years as a railway mail clerk. For awhile he worked at mining on Toad mountain, then he tried prospecting in the Slocan. He returned to Nelson this week a prospective millionaire, having struck a claim on which is eight inches of solid gray copper and antimonial silver ore, that runs over 1,200 ounces of silver to the ton. The discovery was made on the 1st of September, and it is situate about a mile south-west of the Dardanelles. The claim is named "Nil Desperandum," and the name of the locator is D. R. McLean."

Dr. Heintzerling, of Frankfort, Germany, has been sent out in the interests of European capitalists, to examine and report on the well known Jeffrey asbestos mine, at Danville, Que.

The exports of minerals from the Ottawa Consular district for the eight months ended 31st August last, were: Phosphates, $8,830; mica, $9,414.89; nickel, $161.75. It should, however, be pointed out that mica is shipped in considerable quantities, of which the Consular agent has no record, inasmuch as where the value of the shipment is less than $100, it is not necessary to secure a certified invoice.

A new discovery of free gold in the Township of Addington, Ont., is being rapidly opened up by Ottawa capitalists, but before any machinery is put in, it has been wisely determined to have a thorough mill test, and a carload will, we believe, be shipped shortly to the Oldham Gold Co., Oldham, N.S., for this purpose. The samples shown the REVIEW were rich in free gold.

We understand that the shipments of chromic iron from Black Lake have given entire satisfaction to the American purchasers, who have increased their orders for further supplies. A report reaches us that a German concern will take 3,000 tons at a fair figure.

The Price of Silver.—The recent advance in silver, though not very great, is very welcome to all classes of the community. There seems to be no doubt that it is connected with a war loan to China which is being negotiated in London. The demand is entirely from that quarter and it is reasonable to think that there will be more needed after a little as the China-Japan war is likely to be a long one. This, with returning confidence in business circles and an improvement in the volume of general trade, will give an impetus to the mining industry which it has long needed.

The Harvey Hill Copper Mines Sold—Dr. James Reid, Reedsdale, has purchased from the Bank of Montreal, the well-known Harvey Hill copper mines, Broughton, Que, the property of the Leeds Copper Co. Ltd., in liquidation. The purchase consideration was $10,500 cash. The estate comprises 2,801 acres, freehold, 1,300 acres of mining rights, together with the plant, machinery, buildings, ore on hand, etc. For many years, under various owners, this property has been worked, extensively developed, and a large quantity of high grade copper ore taken out, but owing to excessive capitalization and other causes, the mine has never been a success. Dr. Reed hopes, by careful and economic exploitation, to make the property a remunerative investment. He certainly bought the property cheap enough.

The Spanish River Talc and Nickel Mining Co.—A new company under this designation is seeking incorporation under Ontario Statutes, for the purpose of carrying on mining operations in the Township of May and elsewhere within the district of Algoma. Head office: North Bay. Authorized capital, $96,000, in shares of $100. The directors are: G. J. Bury, F. J. Lee, Henry Dreany, D. H. Barr, H. Troop, D. Cameron, all of North Bay, and A. Sharp, Sault Ste. Marie.

American Development Co. (Ltd.) has been registered at Victoria, B.C., with an authorized capital of $100,000, in shares of $100, and headquarters in the city of Chicago, to carry on mining operations in British Columbia.

Mica Mining in the United States.*

By E. W. Parker.

North Carolina—During the latter part of November, 1893, the writer visited the mica regions of North Carolina for the purpose of studying the methods employed in mining the mica in that locality and the facilities afforded for placing it upon the market. The time selected for the trip was unfortunate, for the region had just been visited by heavy rains, and the mountain roads, bad at the best seasons, were in many places almost impassable. With a good pair of horses, capable of making 10 miles an hour on a good road, and in a light buckboard, with no other burden than the writer and driver, two full days were occupied in travelling from Asheville to Bakersville, a distance barely exceeding 50 miles. A number of places which it was desirable to visit could not be reached on account of the condition of the road, it being necessary to keep to the county roads. Notwithstanding these disappointments, considerable information was obtained, and the writer is indebted to Mr. G. D. Ray of Burnsville, and Mr. G. L. Rorison, of Bakersville, for valuable assistance and various courtesies extended. Mr. Ray owns one of the largest mines in the vicinity of Burnsville, besides doing considerable business in buying and shipping mica, when business justifies it, but owing to low prices prevailing during 1893, his mine remained idle and he did no other trading in mica. Mr. Rorison handles most of the mica shipped from Bakersville. He attributes the unsatisfactory condition of the mica mining industry in that locality principally to the crude methods employed. There has been an entire absence of enterprise in the way of adopting modern mining appliances, and this, he claims, accounts for the limited product. In addition to this, there is the lack of transportation facilities. The region is very mountainous and without railroads, while the waggon roads for many months of the year are all but impassable. The streams are without bridges and the larger ones much of the time past fording. The beds of the smaller streams frequently form a part of the county road, especially in ascending and descending the heavy mountain grades. These portions of the "road" are naturally rough and very hard, both on the horses and vehicles. The nearest railroad point from Bakersville is at Marion, distant about 40 miles. For a heavy team the time necessary for this journey is nearly four days, in fairly good seasons. With these disadvantages it is not surprising that more capital has not been invested in modern machinery, and that the crude methods of mining with which the industry started still obtain. There is, however, some prospect of the extension of the Charleston, Cincinnati and Chicago railroad from Marion to Johnson City, Tennessee, following the grade of the North Toe river. This road, if constructed as at present contemplated, will pass within about two miles of Bakersville, and within five or six miles of Burnsville. The lack of railroad transportation will then be supplied, and it would be an easy matter to induce capital to invest in the necessary machinery to properly develop the mica properties.

The Mica Industry of New Hampshire—Mr. D. L. Stran, of Grafton Center, reports the following in regard to the mica industry of New Hampshire:—

"Mica deposits exist and mica has been mined in the towns of Acworth, Alstead, and Springfield, in Sullivan county; Wilmot and Danbury, Merrimack county; and in Alexandria, Grafton, Orange, Dorchester, Groton and Wentworth, Grafton county. These towns are located on a belt that runs in a northeast and southwest direction. On this belt at various places, for a distance of 50 miles, are found veins of quartz, feldspar and mica, interspersed with beryl, tourmaline, garnets, quartz, crystals, and many other minerals. In the above-named towns no mica was produced in 1893, except in the towns of Alexandria and Groton. In Alexandria work was commenced in April, and continued until September at the deposit formerly owned by the Alexandria Mica Company.

"This work was under the management of the American Mica Company, of Boston, Massachusetts. Large quantities of mica are here found, but a large percent-

*Mineral Resources of the United States 1893.

age is of a poor quality. In the town of Groton the several companies were in operation and producing mica during the year 1893. The largest producer has been the Old Ruggles deposit, located in the town of Grafton. It was at this place that the first mica was mined for commercial purposes in the United States, as far back as the commencement of the present century.

"At first and for many years the work was carried on in a desultory way. About the period of 1840 there was an increased demand for this mineral, and more extensive operations were carried on. About the year of 1860 there was a greatly increased demand, and from that time down to 1885, this deposit was in the full tide of prosperity. This property being owned by private parties, with their headquarters in Boston, and they for many years having a monopoly of the mica business, but little could be ascertained of the output or its value. The large piles of waste mica that can be seen at this deposit show the production to have been immense. Other openings have been made at various places in this town by different parties, and some have been very productive.

"The discovery of mica in North Carolina about the year 1867, and the large production that followed caused a decline in prices, more especially for small and medium sizes, and this finally closed most of the deposits for several years. When the deposits of North Carolina began to decrease in their production, the mica business of the United States found its level, and the industry gradually revived in New Hampshire, and for several years good deposits carried on a remunerative business. About 1885 mica began to be imported from India, duty free, and later from the Dominion of Canada. This tended to reduce prices, and production was again curtailed. The large importation of 1892, before the McKinley tariff took effect (which placed an ad valorem duty of 35 per cent. on mica), probably furnished this country with that article for quite a period in advance of the consumption. During the early part of 1893, quite extensive plans were under consideration for mining mica in this State, but the widespread business demoralization that followed, paralyzed the industry, and the present outlook is not very encouraging for mining mica in this vicinity.

"The hills of this mica belt are fast being cleared of their forests, and in many instances these denuded tracts are burned over, thus bringing into view new deposits, some of which look very promising. When the business of the country assumes a brighter aspect, with the increasing demand for mica it is expected that this section will again come to the front with large productions."

Mr. S. A. Mitchell, of Alstead, New Hampshire, states that the first mica mining in that State was carried on by a Mr. Ruggles at Grafton, in Grafton county, but the date of his operations is uncertain. Later, (about 1830 to 1835), Mr. James Bowers commenced working mica deposits at Ackworth, Sullivan county, and Alstead, Cheshire county. These parties supplied the trade of the United States for a number of years. Mr. Bowers was succeeded by his son, who continued the business until his death, working deposits in Alstead, Acworth and Orange, New Hampshire, and in North Carolina. He was in his turn succeeded by his son, who worked the North Carolina mines, and by Mr. Mitchell, who worked the New Hampshire properties. Meanwhile other parties were working other mines in New Hampshire at different periods and with varying success. Mr. Mitchell states that the mica-bearing belt extends from Cheshire county in a north-easterly direction through Sullivan and Grafton counties. The deposits are overlain with micaceous slate or schist, sometimes approaching hornblende slate. This has been ruptured, and seams of granite, sometimes rich in mica, occur in the overlying rock. Tourmalines, beryl, and other crystals are associated with the mica. According to Mr. Mitchell, the sheets of mica are more numerous in the New Hampshire veins than in the North Carolina deposits, but are not as perfect. He attributes this difference in quality to more violent disturbances, which not only affected the crystals directly by pressure and distortion, but opened seams in the rock which exposed the deposits to the action of water and changes of temperature.

Alabama—Mr. J. B. Merrill, of Edwardsville, Alabama, reports a production of $1,000 worth of rough mica in that State during 1893. Mr. Merrill states that it is only very recently that the mica deposits of Alabama have been receiving proper attention, or that efforts made to develop them gave promise of successful results. He claims that the mica is of excellent quality, and that the lands are being taken up by parties interested in obtaining good merchantable mica. A writer in the Chattanooga *Tradesman* gives the following account of the mica deposits in Alabama:—

"The occurrence of mica in Alabama, in crystals large enough to make merchantable sheets, was discovered and considerable prospect work done several years since. Attention was first attracted to the occurrence of mica by some prehistoric workings, considerable in extent, and very ancient, large oak trees from 15 to 18 inches through having grown on the dumps and in the pits since they were abandoned.

"The location of these granite veins bearing mica is in the extreme southern portion of Cleburn county, east of the Tallapoosa river, and also in the extreme northern portion of Randolph county. The district from which merchantable mica can be mined, covers about fifteen or sixteen square miles, being about five miles in length from northeast to southwest and three in width. On one property there appear as many as 11 distinct veins carrying mica, which outcrop parallel with each other at irregular intervals for half a mile, and a shaft sunk 80 feet cross-cut four of these, the narrowest of which was four feet. The strike of the veins is in a course slightly east of north to south of west, and the outcrop can be easily traced across 600 acres, showing great continuity in length. The dip is irregular, at an angle of about 20° to 25° towards the southeast. Each vein is distinct and separated from the next in rotation by strata of decomposed feldspar and kaolin clay.

"A few years ago considerable activity was manifested in the mica mines, and the prospect work previously mentioned was then performed; but the imported Indian mica was placed on the Eastern market at so low a price for the better grade used in stoves and furnaces that, although slightly inferior in transparency to the North Carolina, and the best of the Alabama mica, the miners in both of those States became discouraged, and all the Alabama mines, as well as some in North Carolina, were shut down, and remained idle until quite recently. In North Carolina, as well as Alabama, the mica mines are remote from railroad transportation, and the work has been crudely done, but the transparency of the mica and the sizes in which it can be cut, promises to bring it into demand in the future, and with an increased demand and steady market, the one great drawback of distance will, it is believed, be overcome.

The production of North Carolina in 1884, from only a few mines, reached $180,000 in value, and demonstrates what the possibilities are in the future for the Southern mines with an increased demand and steady market for the product. The work in Alabama has only been shallow, up to the present time, but crystals which produced 7 per cent. of first grade sheets of cut mica have been mined. As depth is attained the rust, stains, and flaws in the sheets become scarcer and the transparency consequently improves, so that in the near future it is possible that Alabama mica will be in as great demand as any on the market. The superficial area of the district being limited to the size before mentioned, is an incentive to the owners of property to develop it in a systematic and thorough manner, instead of following the crude system of a few years since. When this is done the value of the Alabama mines will be demonstrated more fully than to-day, and it will be possible to estimate with some degree of accuracy the quantity of mica in sight and the probable yield of the district. But this will always be somewhat speculative, because all the mines are pockety; in other words, although the veins are regular in their occurrence and dip, yet the mica crystals are found in irregular bunches in the veins, especially where a vein swells and in offshoots.

"On all the mica properties there is a large quantity of refuse on the dumps which would be of value for electrical purposes, but which, because of the lack of railroad transportation is not at present utilized, although pronounced by experts superior to the Canadian mica.

"There is a good prospect, though, as soon as the present panicky conditions pass away, that a railroad, and maybe two, will be built into this section of Alabama. One of these is projected and partially graded from Tallapoosa, Georgia, southward to connect Roanoke, in the southern portion of Randolph county, with the East Alabama railroad, and the other is projected from Anniston, Alabama, southeastward to Brunswick Georgia, or, rather, to be more particular, from Sheffield, at deep water on the Tennessee river, to Lagrange, Georgia, and thence to Brunswick."

Connecticut—Mr. S. L. Wilson, of New Milford, Connecticut, was the only producer of mica in that State during 1893. His production amounted to two tons of rough mica, which was sold to an electrical company, by whom it was cut and split for market. The mine is not worked for mica alone, but also for feldspar, golden beryl, aquamarine, and garnets.

Nevada—During 1893, 300 pounds of uncut mica were shipped from the Czarina mine, near Rioville, Nevada. All of this was sent to Hamburg, Germany, to be cut. In February, 1894, 200 pounds were shipped to Hamburg and 300 pounds to Syracuse, New York. In April, 1894, 1,000 pounds were shipped to Syracuse. All of this was cleaned of waste, so far as practicable, and was supposed to cut from two by three inches to eight by ten inches, a good portion of it being estimated to cut about three by five inches. No returns had been received by the shipper, Mr. Daniel Bouelli, up to the time of making his report. In addition to the Czarina mine, Mr. Bouelli has other claims, chief among which are the Pioneer and Princess mines. In his report to the Survey, Mr. Bouelli, says:

"The mica mines, of which the Pioneer and Princess are among the best, (there being someother smaller deposits) were discovered by me about twenty years ago They are situated in the Virgin range in the St. Thomas mining district, Lincoln county, Nevada. The Pioneer is about fifteen miles slightly north of east from Rioville, which is at the head of steam navigation on the Colorado river, at its confluence with the Rio Virgin. The Princess is about 1 mile northeast from the Pioneer. The Pioneer group is at an altitude of 5,000 feet, near springs and accessible to waggons. About $600 has been expended in development work, and the probability is that $1,000 worth of work is needed to strike the mica below the influence of surface dislocations. The mica occurs in hard, glassy quartz rock, of which there is an outcrop 200 feet wide and 600 feet long. The surrounding rocks are systematic gneiss and granular schists.

"The Princess is a smaller reef of white quartz, with solid mica, better laminated, surrounded by dark-colored tourmaline bearing rocks, gneissoid graduating into syenite. Hornblende and biotite abound and pyrite and other associations of tin are at hand. These claims have been worked very little of late years.

"The Czarina was discovered and located in May, 1891. On this claim there is now a shaft on an incline following the dip of the mica 27 feet. This was found unsafe and another shaft of 35 feet is now directly over the point towards which the dip of the mica seam leads, and will be sunk vertically until the surface crush of the inclosing rocks is penetrated and the crystals show no breaks. Here also the mica occurs in and along the side of a heavy outcrop of white quartz in a country rock of gneiss, carrying various characteristic minerals. The muscovite or white mica seems to follow the division plane of the stratification, along the line or axis of the uplift or rock fold. This line runs north and south, slightly east of north of the main trend of the range, thus running into Arizona a few miles north of Rioville. In fact, the mica belt forms the boundary line between Nevada and Arizona for about 50 miles. The mica, mostly small, is abundant, but marketable sizes are rare and not to be had without a good deal of hard work."

Imports—In October, 1890, mica was placed on the dutiable list by the new tariff, with a duty of 35 per cent. ad valorem. It had previously been imported free. The imports for the year, especially before the law went into effect, were exceptionally heavy—more than double the value of the imports in any previous year. This undoubtedly provided for an accumulation of stock beyond immediate needs.

Engineering Instruments and their Calibration.*

By Prof. D. S. Capper, M.A., King's College, London.

The value of laboratory training to an engineer is now everywhere recognized. It gives him facility in designing and making accurate scientific experiments, and, above all, it trains his judgment, and that faculty most essential to an engineer, his common sense, so that he may soundly interpret his results. Many valuable engineering data are lost, or vitiated by false assumptions as to the accuracy of the observations upon which they depend. One frequent source of such error is a too ready reliance upon the accuracy of the instruments employed.

There are two sorts of experiment which enter very laegely into engineering work of all kinds, and which specially exemplify the advantages of laboratory experience, viz: Testing engines and motors, and the strength of materials. In testing materials there are two instruments whose accuracy limits the accuracy of the resulting observations—the testing machine, which applies and records the load, and (where elastic extensions are required) some form of extensometer for measuring the resulting strain. Ordinary specification tests involve the accuracy of the machine alone, and may be relied on with any first rate machine to 0·5 per cent., which is sufficient for all practical purposes where the ordinary factors of safety are employed. But where determinations of the resilience or modulus of a material are wanted, some more exact knowledge of the limits within which the machine may be trusted are required. The more important possible sources of error are three in number: First, errors due to leverage; second, errors produced by friction; and third, errors in reading the position of the jockey weight. The actual value of these errors varies with different machines, as does the ease with which they can be determined.

With regard to testing machines, it will generally be sufficient for practical purposes if an accuracy of 1 per cent. is insured in the limit of elasticity and breaking load values. If the modulus is required, the second significant figure is of importance. Beyond that figure it is unnecessary to go for practical work, as two pieces of the same material may differ by a greater amount than that in the value of their "moduli," and it would, therefore, be unsafe to rely upon a greater uniformity for constructive purposes. For purposes of calibration, machines divide themselves into two classes, vertical and horizontal.

*Abstract of a paper read before the British Association, Oxford.

Horizontal machines require more knife edges than vertical, and the weight of grip and connections between the last knife edge and the specimen must be borne on rollers or other "frictionless" bearings. The calibration is rendered difficult by the fact that to apply dead loads (the only satisfactory method) a bellcrank lever must be interposed between the load and machine. Friction, on this lever, therefore vitiates calibration to some small extent. The maximum error will, however, be obtained in this manner.

Vertical machines have usually but one knife edge between steelyard and specimen, and a dead load can be applied direct with but little trouble, for at all events an appreciable portion of the total range.

The accuracy of load reading will depend largely upon the proportions of the machine and upon the size of the jockey weight. In English vertical machines the load is usually measured by a 1 or 2 ton jockey weight. In horizontal machines of the Kirkaldy type a variable jockey weight is universal. In the former case, the error due to reading is probably the largest error in the load measurements. In the latter, the accuracy with which the load can be read exceeds the accuracy of the machine. With a 100 ton vertical machine with a 100 inch steel yard, and a jockey weight of 1 ton, 0·01 inch error in the placing or adjustment of the jockey index will cause an error of 22½lb in the reading, and a possible error of 45lb over a range. With a variable jockey weight this source of error can be made as small as you please.

Vertical machines have been calibrated, but, as far as the author can discover, no published results exist of the accuracy actually obtained. Horizontal machines have also been calibrated for some portion of their range. The author has recently calibrated his own machine (50,000lb) at King's College, up to the point where the stress relieved the weight on the bearings of the grips, and so reduced the friction to that upon the knife edges alone. The apparatus used, as being ready to hand, consisted of the torsion wheels belonging to the machine, to which ball bearings and a knife edge were fitted for the purpose. This was found to answer very well for low, although, of course, unsuitable for heavy loads. Dead loads were attached to the rim of these wheels, and then balanced on the steelyard of the machine. Varying jockey weights were employed, so that measurements were taken at intervals along the whole length of the steelyard. Up to the point where the ball bearings failed there was an error, whose maximum value, including friction in the wheel bearings, was 24lb. There was no noticeable upward tendency of this error, but fluctuations were observed between 8 and 18lb.

To test the sensitiveness of the machine at higher loads, a test bar was inserted, and loads varying in value up to 20,000lb total load applied. The extra load required to move the steelyard from its central position was then measured by placing weights of 0·1lb each on its outer end. The amounts required to produce the first visible drop were as follows:—

At 5,000lb	total load,	6lb	additional load.
At 10,000lb	"	7lb	" "
At 15,000lb	"	7·5lb	" "
At 20,000lb	"	8·5lb	" "

To test sensitiveness at starting, when all the friction due to the weight of the jaws, etc., was present, a silk thread was attached to the grips, and it was found that a thread which broke under a load of 7·78lb sufficed to move the steelyard from its zero position against the stops. If we remember, therefore, that when taken over a range this error will, in many cases, disappear, and always be reduced, and that with a variable jockey weight (even if it is not less than 50lb in weight) the load can be accurately read to 1lb, we are fairly entitled to assume that in such a horizontal machine the maximum error is below 25lb.

On a 10 inch steel bar, ¾ inch in diameter, 25lb total load would produce an extension of under $\frac{1}{10000}$ inch, which would only affect the modulus in the third figure. A similar cast iron specimen would extend $\frac{1}{7500}$ inch under this load. In the vertical machine, with a maximum possible error of reading of 45lb over a range and similar steel test bar, an error in the extension of $\frac{1}{20000}$ inch, and on a cast iron $\frac{1}{15000}$ inch, would result. This would still leave the second figure accurate in the modulus if the average of a sufficient number of ranges were taken. To get an accuracy equal to that from a variable jockey weight, a test bar with larger area of section is needed. To ensure certainty in the second significant figure in the modulus, measurements of extension must be true to $\frac{1}{150000}$ inch, so that either of the above cases is well beyond this limit. Extensometres must be accurate, therefore, to this amount, and in order to insure this must be supported entirely independently of the machine—must, in fact, be self-contained on the test bar.

The instrument designed by Professor Kennedy is true to $\frac{1}{100000}$ inch, and if properly adjusted is entirely free from backlash. It can be readily calibrated by direct application to a micrometer, and is specially designed for ordinary laboratory use. The beautiful extensometers designed by Professor Bauschinger and Professor Unwin, will be read to $\frac{1}{200000}$ inch, and are, therefore, more adapted for scientific work where special precautions can be taken. Professor Ewing has also lately designed a beautifully simple apparatus which will read accurately to $\frac{1}{200000}$ inch, and supplies its own means of calibration against a micrometer screw. He has kindly consented to exhibit it, to those who are interested in its construction, at the end of this paper.

With these latter instruments, if the necessary precautions have been taken, the testing machine previously calibrated, or the jockey weight or sectional area of test bar adjusted so as to render its errors negligible, it is possible to approximate closely to the third figure of the modulus. No uniform calibration of these instruments has, however, ever been attempted, and it is at least possible that the want of consistency in published values of moduli, etc., by different observers may, in some part, be due to such absence of uniform standard calibration. In bending experiments a possible error, such as above indicated in the testing machine, has a more serious effect.

The length between supports of the beam, or its sectional area, requires to be proportioned to the known error of the machine. For example, an error in the load of 45lb would, on a beam 20 inches between supports, and 2 inches by 3 inches sectional area, cause an extension of $\frac{1}{13000}$ inch on a steel beam at the outer fibre, and on a cast iron beam of $\frac{1}{8000}$ inch. It is possible that neglect of this fact may have caused some of the discrepancies which have occurred in published beam experiments. It is advisable, where small sections or long beams are to be tested, to use a separate and more sensitive machine.

When we turn to engine trials the possible sources of error are more numerous. In making up a heat balance for an engine, we have, on the one side of the account, fuel used. The measurement of fuel, being a weight measurement, can be extremely accurately made except for the fact that a certain amount of difference may occur between the state of the fires at the beginning and end of the trial. This error can readily be reduced to less than ½ per cent. by suitably lengthening the duration of the trial. The calorific value and heat constant can be determined with equal precision. On the other side of the account are quantities of heat expended in power, and, second, quantities of heat rejected in exhaust and up the chimney. In a condensing engine, these last (heat rejected) can be measured very closely, also, as they depend upon weight and temperature measurements. If the thermometers are corrected by a single Gay-Lussac correction, the exhaust rejection can be determined to less than ½ per cent. It is now possible to measure flue temperatures by a Callendar pyrometer to the $\frac{1}{10}$th of a degree, and, by taking sufficient samples of blue gases and subjecting them to chemical analysis, the heat rejected can be measured to about ½ to 1 per cent. Radiation losses are generally determined by the method of differences, but can be found very exactly by special experiment. As their total value should not exceed a small percentage of the heat expenditure, a very approximate determination will suffice to render the final result true to ½ per cent.

The power measurement is usually made by means of indicators, the original steam pressure being made by means of gauges. A well made gauge may be and remain accurate to 1lb for a long period, but errors of 3lb to 8lb are not infrequent, and it is probable that considerable alterations take place after undue heating or subjection to shocks. Periodical calibration of gauges is therefore advisable. The types of indicator in general use are so well known that any description of them will be unnecessary. It will suffice to point out that the essential principle upon which they all depend is multiplication by some form of linkwork of the extensions and compressions of a spiral spring under variations of pressure. All engineers know that such an instrument cannot give absolutely accurate indications of pressure when used under varying conditions of temperature, etc. The more important sources of error are as follows: 1. The scale of the spring is sensibly different when hot and cold. Upon this point some interesting experiments were made recently in the laboratories of Sibley College, America, and the results embodied in a paper read before the American Society of Mechanical Engineers last December, by Messrs. Carpenter, Marks and Barraclough. They found that the average difference between hot and cold tests of the same spring was about 3·6 per cent. 2. The effects of pencil and piston friction, inertia of cord, etc., have been investigated by Professor Osborne Reynolds. 3. The errors due to inaccuracy in length of levers, etc., all of which may occur, and tend to vitiate the indicator readings.

Many of these errors do not affect the mean pressure readings to more than ½ per cent.; most of them may be corrected by suitably adjusting the spring scale. This scale error frequently reaches 4 to 5 per cent. of the total indicated power, and, as there seems little possibility of avoiding it altogether by improved manufacture, it is of great importance that, where closer accuracy is required, the indicators should be calibrated and a suitable correction introduced.

With the object of investigating how far such calibration and correction is practically possible, the author has recently devised and erected an apparatus in his laboratory at King's College for directly testing indicators and gauges under steam against a column of mercury. By this means pressures up to 180lb per square inch can be measured with an accuracy of ⅛ inch of mercury. With this apparatus he has made a large number of experiments on different indicators, and has found the following practical points clearly demonstrated:—

1. Tests to be of value must be made at the same temperature at which the diagram is taken. In other words, the error of the indicator can only be determined at any pressure by heating the indicator to the same temperature that it would be subjected to at that pressure in actual use. For this purpose the most convenient method is to test the indicator under steam, and the conditions must then be closely identical with those it would be under when used in a steam engine. For indicators for use on gas and oil engines this condition is more difficult to attain. It is certain that in very many cases the temperature to which the spring is subjected, when attached to a gas engine cylinder, is very far below the temperature of explosion. It is probable that the indicator cylinder is filled with a cushion of combustion products, and that the flame never actually enters it. Under these conditions it is not easy to determine what is the correct temperature at which it should be tested. It is at any rate more accurate to correct under steam than cold; it would be still better to test under heated compressed air, in the manner advocated by Prof. Witz, of Lille.

2. A second condition is that spring and indicator must be tested together. This will be obvious. A small difference in the adjustment of the same spring to two indicator pistons will make a considerable alteration in the piston friction and resulting error.

3. A third point is that many springs which will give closely accurate results if used over a small range of pressure will have very large errors over a wider range. As the result of these experiments, the author has found that most springs cannot safely be used over the full range usually assigned to them. It is better to limit the height of the diagram in all cases to less than 2 inches. The actual range which each indicator and spring will accurately cover can only be determined by individual experiment. Many will little exceed a diagram 1¼ inch high without serious errors.

4. Blacklash or lag exists to a greater or less extent in most indicators. It is wellnigh impossible to avoid it, even with the very perfect appliances now used in their manufacture. It is due to a variety of causes. Many indicators, which show little or none up to 1 inch height of diagram, have a very appreciable amount above that point. This is probably due to side thrusts from the springs, and consequent friction upon piston and rod. Undue pressure upon the pencil naturally magnifies this source of error. In general, the fewer and more rigid the links, the less will be the tendency to backlash, other things being equal. Where much backlash occurs, it will

(To be continued.)

CONDITIONS

OF

Obtaining Government Drill to Explore Mines or Mineral Lands.

Owners or lessees of mines or mineral lands in Ontario may procure the use of a Government Diamond Drill, subject to the provisions of the Rules and Regulations relating thereto, upon giving a bond for payment to the Treasurer of the Province, of costs and charges for (1) freight to location, (2) working expenses of drill, including labor, fuel and water, (3) loss or breakage of bits, core lifters and core shells, (4) wear or loss of diamonds, (5) other repairs of breakages and wear and tear of machinery at a rate per month to be estimated, and (6) an additional charge of $50 per month after the mine or land has been shown, through use of the drill, to be a valuable mineral property.

Of the aggregate of costs and charges above enumerated, excepting the sixth item, forty per cent. will be borne by the Bureau of Mines in 1894, thirty-five per cent. in 1895, thirty per cent. in 1896, and twenty-five per cent. in each year thereafter until the end of 1900. All accounts payable monthly.

For Rules and Regulations *in extenso* governing the use by companies and mine owners of Diamond Drills, or other information referring to their employment, application may be made to ARCHIBALD BLUE, Director of the Bureau of Mines, Toronto.

A. S. HARDY,
Commissioner of Crown Lands.

Toronto, October 17, 1894.

MINING LAWS OF ONTARIO.

ANY person may explore Crown Lands for minerals. Mining lands may be taken up as surveyed locations or staked claims.

Locations range from 40 to 320 acres.

Claims range from 10 to 20 acres on vein or lode.

Locations may be acquired in fee or under leasehold.

Price of locations north of French River, $2 to $3 per acre, and south of it, $2 to $1.50, according to distance from railway.

Rent of locations first year 60c. to $1 per acre, and subsequent years 15c. to 25c. per acre.

Rent of claims, $1 per acre each year.

Claims must be worked continuously.

Royalty on ores specified in the Act, 2 per cent. of value at pit's mouth less cost of labor and explosives.

Royalty not charged until seven years from date of patent or lease, nor (as provided in s. 4 (3) of the Mines' Act, 1892), until fifteen years in the case of an original discovery of ore or mineral.

Original discoverer of ore or mineral on claim entitled to stake out a second claim.

Crown Lands sold under provisions of mining laws in force prior to 4th May, 1891, exempt from royalty.

Copies of the Mines Act, 1892, Amendment Act, 1894, may be had on application to

ARCHIBALD BLUE,
Director Bureau of Mines.

TORONTO, May 25th, 1894.

IN PREPARATION. TO BE ISSUED IN JANUARY, 1895.

. . . 5th ANNUAL NUMBER . . .

FIFTH YEAR.

FOR 1895.

Mining, Engineering . Iron and Steel Trades Companies Manual . .

EDITED AND PUBLISHED BY

B. T. A. BELL, Editor of the Canadian Mining Review,

Secretary General Mining Association of the Province of Quebec, Honorary Secretary the Mining Society of Nova Scotia, Secretary Ontario Mining Institute.

This, the Fifth Edition of the Manual, will contain a careful digest of information, compiled up to date, respecting the history, organization and operations of all Canadian Mining and Quarrying Companies, Blast Furnaces, Rolling Mills, Iron and Steel Works, also of all the Rod Mills, Wire Mills, Cut Nail and Horse Nail Works, Car Axle Works, Car Wheel Works, Car Builders, Locomotive Works, Cast and Wrot Iron Pipe Works and Bridge Engineering Establishments.

In one Volume—600 Pages; Cloth; Royal Octavo.

PRICE: FOUR DOLLARS PER COPY.

MINING REGULATIONS

TO GOVERN THE DISPOSAL OF

Dominion Lands Containing Minerals other than Coal.

THESE REGULATIONS shall be applicable to all Dominion Lands, excepting those situated in the Province of British Columbia, containing gold, silver cinnabar, lead, tin, copper, petroleum, iron or other mineral deposits of economic value, with the exception of coal.

Any person may explore vacant Dominion Lands, not appropriated or reserved by Government for other purposes, and may search therein either by surface or subterranean prospecting for mineral deposits, with a view to obtaining under the Regulations a mining location for the same, but no mining location or mining claim shall be granted until the discovery of the vein, lode or deposit of mineral or metal within the limits of the location or claim.

QUARTZ MINING.

A location for mining, except for iron, on veins, lodes or ledges of quartz or other rock in place, shall not exceed 1,500 feet in length and 600 feet in breadth. Its surface boundary shall be four straight lines, the opposite sides of which shall be parallel, except where prior locations would prevent, in which case it may be of such a shape as may be approved of by the Superintendent of Mining.

Any person having discovered a mineral deposit may obtain a mining location therefor, in the manner set forth in the Regulations which provides for the character of the survey and the marks necessary to designate the location on the ground.

When the location has been marked conformably to the requirements of the Regulations, the claimant shall within sixty days thereafter, file with the local agent in the Dominion Land Office for the district in which the location is situated, a declaration or oath setting forth the circumstances of his discovery, and describing, as nearly as may be, the locality and dimensions of the claim marked out by him as aforesaid; and shall, along with such declaration, pay to the said agent an entry fee of FIVE DOLLARS. The agent's receipt for such fee will be the claimant's authority to enter into possession of the location applied for.

At any time before the expiration of FIVE years from the date of his obtaining the agent's receipt it shall be open to the claimant to purchase the location on filing with the local agent proof that he has expended not less than FIVE HUNDRED DOLLARS in actual mining operations on the same; but the claimant is required, before the expiration of each of the five years, to prove that he has performed not less than ONE HUNDRED DOLLARS' worth of labour during the year in the actual development of his claim, and at the same time obtain a renewal of his location receipt, for which he is required to pay a fee of FIVE DOLLARS.

The price to be paid for a mining location shall be at the rate of FIVE DOLLARS PER ACRE, cash, and the sum of FIFTY DOLLARS extra for the survey of the same.

No more than one mining location shall be granted to any individual claimant upon the same lode or vein.

IRON.

The Minister of the Interior may grant a location for the mining of iron not exceeding 160 acres in area which shall be bounded by north and south and east and west lines astronomically, and its breadth shall equal it in length. Provided that should any person making an application purporting to be for the purpose of mining iron thus obtain, whether in good faith or fradulently, possession of a valuable mineral deposit other than iron, his right in such deposit shall be restricted to the area prescribed by the Regulations for other minerals, and the rest of the location shall revert to the Crown for such disposition as the Minister may direct.

The Regulations also provide for the manner in which stone quarries may be acquired.

PLACER MINING.

The Regulations laid down in respect to quartz mining shall be applicable to placer mining as far as they relate to entries, entry fees, assignments, marking of localities, agents' receipts, and generally where they can be applied.

The nature and size of placer mining claims are provided for in the Regulations, including bar, dry, bench creek or hill diggings, and the RIGHTS AND DUTIES OF MINERS are fully set forth.

The Regulations apply also to

BED-ROCK FLUMES, DRAINAGE OF MINES AND DITCHES.

The GENERAL PROVISIONS of the Regulations include the interpretation of expressions used therein; how disputes shall be heard and adjudicated upon; under what circumstances miners shall be entitled to absent themselves from their locations or diggings, etc., etc.

THE SCHEDULE OF MINING REGULATIONS

Contains the *forms* to be observed in the drawing up of all documents such as: "Application and affidavit of discoverer of quartz mine." "Receipt for fee paid by applicant for mining location." "Receipt for fee on extension of time for purchase of a mining location." "Patent of a mining location." "Certificate of the assignment of a mining location.' "Application for grant for placer mining and affidavit of applicant." "Grant for placer mining." "Certificate of the assignment of a placer mining claim." "Grant to a bed rock flume company." "Grant for drainage." "Grant of right to divert water and construct ditches."

Since the publication, in 1884, of the Mining Regulations to govern the disposal of Dominion Mineral Lands the same have been carefully and thoroughly revised with a view to ensure ample protection to the public interests, and at the same time to encourage the prospector and miner in order that the mineral resources may be made valuable by development.

COPIES OF THE REGULATIONS MAY BE OBTAINED UPON APPLICATION TO THE DEPARTMENT OF INTERIOR.

A. M. BURGESS,

Deputy Minister of the Interior.

PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones; five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.