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TWENTY-FOURTH YEAR OF PUBLICATION

The Canadian Mining Review

Established 1882

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BRITISH COLUMBIA:
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CONTENTS.

Are we to have a copper famine? A despatch from New York to the Canadian press states that there is no copper on hand, and that all the copper producing companies are sold out, and have contracts made that will run into next spring. Copper is now selling at 19 cents, and it is considered likely that the price will be 20 cents before the new year. It is certainly difficult to see how the price of copper can fall for some time to come.

Silver production has not increased in the same ratio as has gold production, which, together with the largely increased use of silver, has had a tendency to raise its price. It will be interesting to follow the rise of the white metal within the next few years. The United States Congress found it necessary last session to pass a law authorizing the recoinage of silver in the Philippines. This action was made necessary by a rise in the value of silver which caused the peso to be worth more as bullion than as coin. It has not been determined what ratio shall be employed in the recoinage.

Railway development is going on apace in the Dominion, yet, it seems impossible that it can be overdone for many a long year to come. Most mining propositions depend for their success upon transportation facilities, and any district that is not reached by the railway steel is out of it in more ways than one. We have regions in northern Quebec and Ontario that give every indication of becoming profitable mining fields, but which are not yet reached by any road, transcontinental or otherwise, and there are many meritorious prospects in British Columbia that will hardly be developed until some branch of our great railway systems penetrate to their seclusion. East Kootenay has been particularly unfortunate, but, now that there is said to have been a really big strike on the North Fork of Toby Creek, west of Wilmer, it is possible that relief may be forthcoming.

Last month the REVIEW printed on one of its editorial pages a note from a contributor which cast a slur upon the Ontario Government mining offi-

cials in the Cobalt district. In the hurry of the moment, we allowed this paragraph to go in without investigating the alleged shortcomings of the said Government officials; in this we were wrong, and we admit it, frankly. Since the appearance of the September issue, we have been at great pains to find at least one of the wrong doings that our correspondent hinted at, and we are pleased to be able to say that to the best of our belief, his suspicions are unfounded, as we have been unable to detect a single charge of malfeasance or improper conduct on the part of a Government official of the Cobalt region. As the strong limelight of publicity is cast upon all their actions, we think that any slip on the part of these gentlemen would have become public, and that we should have been, perhaps, the first to hear about it. It is our earnest endeavor to be fair and impartial, hence, this correction.

CHERISH THE PROSPECTOR.

In certain countries that are situated many, many miles beyond our borders, it is an accepted truism that an election cannot be carried without money; similarly, no new mining district can become famous without the assistance of the prospector. Hence, let us do what in us lies to encourage him to dwell in our midst. Anything that discourages the prospector gives a setback to the development of mining in a new country such as ours.

When mines have been opened, mills set agoing, railways built to carry ore and to bring in supplies and fuel, then a prospector becomes as useless as a soldier in time of peace. We have not reached such a state. The greater part of our north land is yet untrodden; large tracts are covered deeply by glacial drift; it is usually flat and float does not travel far. Under such conditions, prospecting is hard work, and it would be unattractive work were it not for the indomitable will, energy and love of adventure of the race. But we need the services of thousands of hardy, tireless, sharp eyed and sharp witted men, and unless we can send such out in sufficient numbers the development of the huge country between the Labrador coast and the Mackenzie is likely to be extremely slow.

With the discoveries at Silver Islet, Sudbury, Cobalt and Chibougamau before us, can we doubt that in the great lone land between the settlements and the Arctic Sea there lies to-day many a rich deposit awaiting the prospector? No sane man doubts it, and the other fellows are mostly in the asylums, though there are a few left wandering about our streets, who cannot see any future except eternal bankruptcy.

Let our law givers bear these facts in mind, and make the road of the prospector no more difficult than nature has ordained that it must be.

ALLEGED MINING ENGINEERS.

A great drawback under which the mining industry of Canada suffers is, undoubtedly, the self-styled, Mining Engineer. When he becomes a consulting engineer his power for evil is vastly increased. He is, usually, a glib-tongued, persuasive individual, with a fine nerve and sufficient education to write a smooth report.

His antecedents are always mysterious, and, generally, from the glimpses one is able to obtain of his past history, most interesting. Sometimes he starts life as a clerk in a broker's office, in others he is the ne'er-do-well of a respectable family, who, after being a pigeon during his callow youth, changes his plumage and becomes a rook in more matured life. He gets a smattering of mining terms; learns to look wise and keep his mouth shut; and with this slender equipment, aided by some good stationery, obtained on credit, he feels ready to pass judgment upon any investment in the world. More modest men may confine themselves to certain specialties; he knows no such limitations. He is equally at home on the floor of the smelter, in the stamp-room of the gold quartz mill, on the hurricane-deck of a dredge, or superintending the piping of gold-bearing gravel. If there ever was a re-incarnation of the Admirable Crichton we have him here —and all this wisdom may be obtained at cut-rate prices. Whereas, a competent and trustworthy consulting engineer may insist upon a fee of a couple of thousand dollars, the pseudo article will be only too glad to do the work for fifty; and the average Canadian mine owner, who has not learned wisdom, reasons that he is saving nineteen hundred and fifty dollars. Quite so; and if you want to see the handiwork of some of these consulting mining engineers, visit the Lake of the Woods country, and one or two other regions that will occur readily to our readers, mark the shafts full of water, the rusting mills, the abandoned buildings, and, if you would pursue the subject still further, try and find out the eventual fate of the widows, and orphans, and aged folk, whose little savings were put into these mines, and spent, under the direction of that prince of humbug—the self-constituted mining engineer.

Let us be thankful that we have in this country some of the most painstaking, scientific, conscientious mining engineers that the world holds, so that, we may rest assured, when we want an honest opinion as to the value of a property and the proper methods of its development, we shall have no difficulty in obtaining such advice, if we only use ordinary judgment in asking for it of the right man.

AN IMPORTANT DISCOVERY.

Mr. D. B. Dowling of the Geological Survey has found coal between the Saskatchewan and Brazeau rivers, on the flanks of the Big Horn range. There

are four principal seams, and twenty minor ones, giving in all 114 feet of coal, of which 90 feet should be worth winning. The four thickest beds are 25 inches, 26 inches, 8 feet, and 16 feet respectively. There are in all fifteen workable seams.

The analysis of these coal seams is as follows:—

No. 1 Seam (South of Big Horn Range)	p.c.
Moisture	5.80
Volatile Matter	25.50
Fixed Carbon	62.60
Ash	6.10
	100.00

No. 2 Seam (South of Big Horn Range)	p.c.
Moisture	3.74
Volatile Matter	25.50
Fixed Carbon	67.00
Ash	3.76
	100.00

No. 3 Seam (South of Big Horn Range)	p.c.
Moisture	1.85
Volatile Matter	24.95
Fixed Carbon	69.70
Ash	3.50
	100.00

No. 4 Seam (Near Brazeau River)	p.c.
Moisture	2.50
Volatile Matter	27.10
Fixed Carbon	64.00
Ash	6.40
	100.00

Seam No. 5 (Near Brazeau River)	p.c.
Moisture	2.00
Volatile Matter	28.55
Fixed Carbon	60.75
Ash	8.70
	100.00

Seam No. 6 (Kananaskis River)	p.c.
Moisture	9.10
Volatile Matter	21.00
Fixed Carbon	57.90
Ash	12.00
	100.00

In each case the analysis was made by Mr. M. F. Connor.

TELLURIDE ORES IN SOUTHERN YUKON.

Mr. D. D. Cairnes, of the Geological Survey, has been, for some time past, mapping the country around Lake Bennett, in southern Yukon. He reported, in July, that quartz containing very rich gold has been found in the neighborhood, but that the quartz was only "float." Now, however, he is able to report that diligent prospecting has located the vein and from his letter on the subject, it seems likely that the Lake Bennett district will shortly come into prominence as a deep mining field. It has long been a matter of surprise that, in spite of the phenomenal results obtained from alluvial mining, not only in the Klondike district itself, but in many other placer areas, no important gold-bearing veins have yet been discovered. The Yukon, in fact, began as an alluvial field and has continued as such. The news from Lake Bennett, however, is such as to make one believe it probable that the Yukon will at last have its profitable deep-mining. What makes Mr. Cairnes' news the more interesting is the mention he makes of sylvanite. Sylvanite is one of the telluride ores and since the wonderful output from the Kalgurli field in West Australia, every gold prospector has been on the lookout for tellurides. The peculiar feature about these ores is that, though they may be phenomenally rich, they very seldom carry visible gold. The ores in the celebrated Great Boulder mine, of Kalgurli, went eleven ounces—$220—a ton, in the first crushing, and never showed a single speck of gold. The mine has averaged 17,000 ounces of gold per month for the past three or four years. In view of these facts concerning the best known telluride district in the world, Mr. Cairnes' letter makes one feel particularly hopeful. He says "the locality where the strike was first made and where there is the most excitement and best showings, at present, is between the Watson and Wheaton rivers, about 20 miles west of Robinson station, on the W. P. & Y. Railway.

"The main veins have been traced from the one river to the other, a distance of about 8 miles at least, quartz veins strongly resembling each other are found throughout this distance. The veins are from two or three feet to twelve and fourteen feet in width.

"Very high values are obtained. I have seen large pieces of the ore full of quite coarse free gold mixed with telluride minerals, chiefly sylvanite. I have tested samples myself and know ores to be full of tellurium in reliable assays made from "Gold Reef" quartz, which looked almost barren of mineral, and it runs $900. Values up to $200 are quite common. Samples carrying the sylvanite run up to $4,000 and $5,000.

"As no work has been done, not much can be definitely known as yet, in many respects, but there is plenty of quartz here and high values are obtained from some of the claims."

COPPER DISCOVERIES IN THE YUKON.

The association of Yukon and gold seems to be almost as natural as that of Manitoba and wheat, yet it is quite possible that, before many years are passed, Yukon and copper will seem a more intimate association than Yukon and gold. For, if the discoveries lately made in the Whitehorse district,

develop in depth in anything like the same degree as they promise at the surface, southern Yukon will become one of the most valuable copper fields of the world. The Geological Survey, represented by one of its field officers, Mr. D. D. Cairnes, has during the past summer been making surveys in this district, and his reports, full details of which will shortly appear in the Department's Summary Report, leave no doubt that west of Whitehorse there are all the makings of a wonderful copper country. Mr. Cairnes, after remarking that, with the short time at his disposal, his knowledge of the geology and origin of the ores is naturally superficial, furnishes some very interesting particulars concerning development, from which we cull the following:—

"The latest and one of the most valuable discoveries in the camp has been made by Byron N. White, of Spokane, on the Pueblo. He owns it and several adjoining properties and came in here about three months ago, only intending to remain a few days, but has found things so interesting that in spite of his interests in many of the leading camps in the Western States he is still here personally supervising developments. With a small crew of men doing surface work, chiefly, Mr. White has uncovered on the Pueblo a body of ores 250 feet by about 270 and has sunk about 100 feet and has not, as yet, found either wall. The ore is almost solid hematite heavily impregnated with copper minerals. This whole body is practically shipping ore and will average in the neighborhood of 4 per cent. cu. with some gold values. There are masses and streaks, however, of high grade ore forming a large proportion of the ore body. Cuprite and copper glance occur in considerable quantities, with some native Cu., and bornite, chalcopyrite, and the carbonates are thickly disseminated throughout the ore: so that, with only rough hand sorting, high grade shipments can be made. It is certainly an enormous surface showing.

This combined with the large copper deposits of the Copper King, Copper Queen, Arctic Chief, Carlisle, and many others of this camp give good grounds for the general enthusiasm in the vicinity. Even the question of a local smelter in the near future seems a probability. Mr. White is shipping 100 tons of ore at present and ore buyers are negotiating for large shipments. I saw smelter returns from the Tyee Smelter of ten ton lots from the Copper King which went 46, 31 and 29 per cent. copper respectively and there appears to be no scarcity, even of these high grade ores.

A geological map of this area is being asked for on all sides by mining men coming into this district.

ABITIBI.

The remarkable richness of the samples of free gold recently discovered on the shores of Opasatika Lake, just south of Lake Abitibi in the Province of Quebec, would seem to give substantial indications of the existence of a valuable gold field in the vicinity. It is not on Opasatika Lake alone, however, that samples have been found—excellent specimens have been taken near the Hudson Bay post and also on the Whitefish River, quite near the projected crossing of the Grand Trunk Pacific Railway. It is the opinion of prospectors that the gold region will be found to be still further north and east and the construction of the Abitibi section of the Grand Trunk Pacific will be hailed with intense satisfaction.

Many years ago, Sir Wm. Logan, Canada's great geologist, predicted that the permanent wealth of this country would be found in the Great Huronian Belt, and it certainly seems as if the prediction may be fulfilled in the near future. This great belt finds its widest development East of Lake Abitibi, and, where not overburdened with heavy clays, the discovery of economic minerals seems reasonably certain. The belt is cut by the Bell River, which seems to be the Eastern limit of the clay, and from the height of land north for 150 miles the exposures are the Huronian rocks—diorites and greenstones.

The great mineral area, therefore, appears to be situated between Lake Abitibi and the Bell River, and, as we have already pointed out, where the rock is not too heavily overburdened with the rich clays, it would seem to us to be a promising field for the prospector. Still further East the same rocks crop out occasionally among the granites and gneises and at Lake Chibougamau nearly three hundred miles east of Abitibi, there is an outcrop of Huronian, that contains both gold and asbestos.

Fortunately for the Province of Quebec, Abitibi and east and north of Abitibi, mining will not be the only resource. There are millions of acres of excellent clay lands extending all the way to Lake Mattagami and even down to the shore at tidewater. Once a local market is created for the products of this rich virgin soil farmers will flock into the country and we may, in the near future, have a repetition of the North Western development in the North East. What is needed, however, to develop this new section is transportation. Transportation opens the way for the prospector: the prospector discovers the gold: the promoter secures the capital to develop the minerals, this attracts labor—laborers must eat and the farmer soon discovers that there is a ready and profitable market for farm products and the plough soon penetrates the wilderness—the frontier has been extended a few hundred miles—and a region of profound silence and desolation has suddenly been converted into a thriving community and development goes on apace.

This has been the history of the Great North West for years. By present appearances it looks as if it might be the history of the Great North East—the undeveloped empire in the Northern part of the Old Province of Quebec.

A NEW COPPER FIND IN QUEBEC.

It has ever been an open question in all the geological surveys of the world, as to exactly how far the geologists of the survey should refer, in their field reports, to private undertakings. That the question is a most intricate one, nobody will deny. By different governments it has been treated in different manners, and this, very naturally, for the kind of report furnished by a geological field officer must, to a large extent, depend on the mining laws of the country for which that officer is working. In those countries such as New Zealand and Australia, where a large reward is given for the discovery of a new "field," the Government geologist frequently advises as to whether the reward has or has not been earned. In some countries, the governments are prepared to help the miner—or the mining company—to the extent of sinking a shaft so many hundred feet, and in such cases it is usual to consult the Geological Survey as to the prospect of success.

In Canada, however, where the prospector gets very little encouragement from anyone or anything except his own stout heart and the knowledge that the country has hardly yet been scratched, our Geological Survey has been very chary as regards including in its reports any matter affecting private interests, and especially careful not to tread on anybody's toes. We are all the more pleased, therefore, to notice in this year's Survey Report the following rather startling paragraph, which occurs in a report by Dr. J. A. Dresser, on St. Bruno Mountain, Que. Dr. Dresser, it may be said, has made a special study of the copper-bearing rocks of the Eastern Townships, and is, therefore, likely to know what he is talking about. He writes, "On the sixth lots of ranges 2 and 3 of the same township a small amount of chalcopyrite two inches wide by two feet long, was visible for a time. A cutting of less than two feet into the rock removed all the ores as far as could be seen at the time of my visit. I am credibly informed that this property has been sold for $12,000, $3,000 of which has been paid in cash to parties in the state of Connecticut, and that a joint stock company capitalized at $500,000, has there been formed to acquire and operate the property. This occurrence, like many other copper stringers throughout this belt, is of no economic importance."

It is very doubtful if the report has been published in time to do much good, but it seems to us that here is precisely the kind of information that the public requires. We know, of course, that there are several powerful arguments against the advisability of publishing such statements in a general report, but none of these arguments gainsay the main fact that the public—through the Geological Survey—pay geologists to report on the geology—and principally the economic geology of the country—and that they expect a field officer if he comes across an evident swindle to report it.

The mention of such swindles does not necessarily mean any interference with legitimate private interests: the failure to point them out does necessarily mean an immense amount of harm to the district in which they occur. How many mineral deposits are lying idle to-day in Canada for reasons quite unconnected with the payable nature of the mine. Several fields that we could mention are lying idle—not because they cannot be profitably worked, but because the public will not supply the money to work them. And why? For the simple reason that the public have been gulled so often they are not prepared to take another risk. The Canadian is a good sport and is generally willing to accept a fair risk, but he has been bitten again and again, with the natural result that when a sound proposition comes his way, he is inclined to regard it with doubt.

We believe that the Geological Survey, in showing up such cases as we have quoted above, could very materially help the mining industry in Canada, and we trust that Mr. Low will put no such restrictions on field-officers as have too often been enforced in former years.

CANADIAN MINERALS.

The summary statement of the mineral production of Canada for the year 1905, issued by the Geological Survey, shows the total value to have been $68,574,707. This is considerably the largest in the record. In 1901 the total of $66,339,158 was reached. From that there was a gradual decline, till 1904, when the output was only $60,073,879. Before 1901 there had been a continuous increase from the figure of 1866, which is given as $10,221,255. This had grown to $20,648,694 in 1895, and to $64,618,268 in 1900, and reached the figure noted in 1905. There is no branch of industry that can show a more marked development. Moreover, the increase is likely to go on augmenting. There is no section of the country where there are not evidences of improvement in the general situation, which give promise of an increasing demand for all of the varied materials that come within the accepted classification of minerals, and there are few sections of the country in which mineral products useful in the arts and industry are not found.

The report divides the products into two classes, metallic and non-metallic. The former has risen to first place in the value of output. The total credited to it last year was $37,150,830. The details are:—

Gold	$14,486,833
Nickel	7,550,526
Copper	7,420,451
Silver	3,605,957
Lead	2,634,084
Pig Iron	1,047,860
Iron Ore Exports	125,119
Cobalt	100,000
Other Metals, including Zinc	180,000

Gold is in the lead, owing chiefly to the contributions of the Yukon, which are placed at $8,327,000, a considerable sum, but less than has been credited to the northern country in former years, and indicating, therefore, that the placer, or poor miner's fields, are becoming exhausted, and that, unless the costly works now in contemplation are carried out, and prove successful, the decline of Dawson City is likely to be rapid. The amount credited to copper is the value at 15.59 cents a pound of the estimated quantity in the ore and matte. Nickel, in like manner, is valued at 40 cents a pound, lead at 4.70 cents a pound, and silver at 60.352 cents an ounce. The refining process is not carried on in Canada in a general way yet, nor is it likely to be until there is a considerable increase in the production of the ores to which it has to be applied.

The non-metallic category is credited with an output value of $22,266,393. The leader, as usual, is coal, the 8,775,993 tons produced during the year being valued at $17,658,615. The increase in the coal trade has been notable, the output having doubled in seven years, partly through the development in iron, which began to be important about 1900, when the production from Canadian ore was 35,387 tons. The growing demands of the railways have also been a contributory impulse, as well as the growth in manufacturing industry, which, in spite of what has been said about "white coal," still seems to find it profitable to rely largely on the black article. Next to coal in importance in the non-metallic category comes asbestos, largely a product of the Province of Quebec. The output in 1905 was valued at $1,486,359. Petroleum, in spite of the bounty paid on its production, is the basis of a declining industry. It is credited last year with 634,095 barrels, valued at $849,687. In 1901, 622,392 barrels were valued at $1,008,275, and ten years ago 726,138 barrels were valued at $1,086,738. In the declining industries are included natural gas, salt and phosphate production.

The third division of the list is devoted to structural materials and clay products. The production of the year was $8,857,484, of which building material, including brick, stone, lime, etc., accounts for $6,095,000, and cement for $1,924,000. The development of the cement industry has been notable. In 1891 the production was 93,473 barrels, valued at $108,561. By 1901 it had reached 417,552 barrels, and last year it was 1,360,731 barrels. The more this material is understood the greater does the demand for it appear to be. At first it was generally used as a cement in place of lime mortar on the better class of buildings and masonry works. Then railway and canal engineers began to utilize it for piers, abutments, walls, etc. Now it is used largely in street construction, for the protection of the steel work of large buildings, for foundations, and in an increasing way for the walls of houses and industrial establishments. It is likely, therefore, that this branch of mineral industry will continue to expand and to add to the importance of the whole.

MR. A. P. LOW IN BRITISH COLUMBIA.

Mr. A. P. Low, Director of the Geological Survey, has lately returned from a flying visit to British Columbia, a visit, which owing to the late adjournment of Parliament and to business connected with the transfer of the Geological Survey from the charge of the Minister of the Interior to that of the Minister of Inland Revenue, was much shorter than originally intended. However, even in the brief time that the director was able to devote to personal inspection of the mining areas, and in making and renewing acquaintances with the prominent mine managers, he was able to do a considerable amount of work, and he has returned more than ever impressed with the capabilities of British Columbia as a mineral province. When it is remembered that only a few years ago one of the Survey officers commenced a portion of his report with "There being no copper works in Canada," and that last year the copper production of British Columbia alone was 48,000,000 lbs., the progress has indeed been astonishing.

Mr. Low first visited the coal mines of East Kootenay. He found that at Fernie and at Michel a large output of coal and coke is being made from the mines and ovens, which are not only operated to their full present capacity, but new workings are being opened to increase the output, for which a ready market is found, both in our Dominion and the adjoining portions of the United States.

Since that momentous summer of 1890 when two prospectors located in a few hours what are now the world renowned mines, LeRoi, Centre Star, War Eagle and Idaho, few mining districts have experienced a more romantic career than Rossland. The booming of the LeRoi shares in London, Eng., the sudden collapse of the Standard Mining Company and the trial and sensational suicide of the unfortunate Whittaker Wright, combined to form a chapter in mining romance seldom equalled. After the suicide and the seeming hopelessness of securing sufficient capital to continue mining operations the Rossland mines were on the point of shutting down, and it was largely owing to favorable opinions expressed by the Geological Survey that work was continued. Naturally, therefore, the Survey takes a sort of parental interest in the operations of the Rossland camp, and naturally Mr. Low included it in his visit.

Both in Rossland itself and in the vicinity a distinct revival of mining has taken place, owing to the discoveries of richer ore in the deeper parts of the principal mines, discoveries which Mr. R. W. Brock, acting for the Survey, had predicted with

considerable confidence. The work of Mr. Brock and of his confreres is much appreciated in the district, more especially owing to the renewed confidence it has imparted both to mine managers and prospectors. At Trail, etxensive alterations and additions were being made to the smelter, and similar improvements are taking place in Nelson, Grand Forks, Greenwood and Boundary, showing that the output of the mines supplying these furnaces is of such a nature as demands more extensive and better plants for its treatment. All the mines of the Boundary copper camps were active and their general tone appeared to suggest healthy improvement without any sign of an undesirable boom.

A hurried visit was made to the silver lead districts of Slocan showing an awakening there also: several mines are working profitably.

The finding of the vein of the Rambler-Cariboo mine at a depth of more than 1,200 feet chanced to be coincident with Mr. Low's visit, and is of the greatest importance to the district pointing as it does to the probability of the silver and lead ores being found at a depth previously unknown.

At Hedley, in the Similkameen Valley, the large Nickel Plate mine was visited and a trip was made over the adjoining properties. These give surface indications of large ore bodies and when the railway freights are reduced to a reasonable figure it is expected that these ores will prove payable.

Mr. C. Camsell, who was working along the Similkameen Valley, above Princeton, was seen at Hedley and was quite enthusiastic about the large masses of ore in that region, which, although low grade, can, he confidently believes, be profitably worked, upon the completion of the railway.

The coast was reached on the 22nd of August, when Mr. LeRoy who was working on the coast section about and to the northward of Vancouver made very favorable reports concerning the mineral deposits both of the mainland and Texada Island.

Summed up, the result of Mr. Low's visit to southern British Columbia showed a renewed and increased activity in mining at all mining centres, and he came away with the feeling that the operations are now being conducted throughout those districts in a solid and legitimate manner with the object in view of making money, not from speculative dealings in shares, but from the actual output of the mines. That this visit of the director, which we trust will be of annual occurrence, will result in much mutual benefit to the mining interest and to the Geological Survey we make no doubt. Mr. Low's endeavor to meet personally the principal owners and operators of the several camps, and where possible, to freely exchange ideas as to the present and future work of the department is, we feel sure, a step in the right direction. By this means and by this means only can a clear understanding be obtained as to the desire of the Department to help in every possible way the mining interest of Canada; at the same time the Director receives valuable suggestions as to the manner in which such help may be given and these suggestions, we are sure, will be acted upon as far as circumstances permit, thus increasing the usefulness of the Geological Survey.

THE KNORR METHOD OF DETERMINING ARSENIC AND ANTIMONY IN REFINED COPPER.

By P. Butler, M.Sc. (McGill.)

This method was originated in 1901 by Mr. A. E. Knorr, chemist, with whom the writer was associated, in the laboratory of the Guggenheim Copper Refinery, at Maured, New Jersey.

The bulk of the copper is first separated from the impurities; then the arsenic and antimony are separated from each other by distillation, making use of a special distilling apparatus designed by Mr. Knorr for the purpose.

This apparatus can be purchased at a reasonable price from E. Machlett & Sons, New York City.

It consists of three parts — distilling flask, thistle-tube with dropper regulated by stopcock, and bulb-condenser—all connected by ground glass joints and conveniently attached to an ordinary iron rod imbedded in the work table.

(I) Separation of copper from As., Sb., Sn., etc.:

100 gms. refined copper turnings (or sawings) are weighed into a one-litre Jena beaker, covered with water and completely dissolved by the gradual addition of 400 cc HNO_3 (conc.)

The solution is then evaporated slowly on a hot plate until all excess of free acid is driven off—this is recognized by the crystallization on the sides of the beaker of basic copper nitrate.

The neutral solution is now diluted with hot water to a bulk of about 600 cc, brought to a boil, and a pinch of powdered $KClo_3$ added.

Then, while gently agitating with a glass rod, about 0.6 gms. ferrous sulphate (free from As., and Sb.) is added and the solution boiled for two minutes and then removed from the heat.

The iron will be precipitated as Fe_2O_3 in a granular condition which, upon standing a few minutes, will rapidly settle, carrying down with it all arsenic, antimony, tin, etc.

This precipitate can readily be filtered and is then ready for distilling.

(II) The Distillation:—

The precipitate is dissolved through the filter by HCl (sp.gr. 1.17) into the distilling flask, care being taken to use a minimum amount of acid.

10 c.c. H_2SO_4 (conc.) is then added and the apparatus connected together, a little H_2SO_4 being used on the glass joints as a seal.

Through the funnel of the thistle-tube is added 10 to 15 drops hypophosphorous acid (10 per cent.

solution) and washed through with enough HCl (1.17) to fill the flask not more than 1-3 full (estimated).

Moderate heat is applied to the flask and the solution distilled into a beaker of cold water, care being taken to maintain as nearly as possible a constant volume in the flask, regulating the dropping HCl (1.17) from the funnel by means of the stop-cock in the thistle-tube.

The beaker containing the distillate should be kept cool (by suitable cooling bath) and should be changed at intervals of 10 minutes.

Generally, two distillates of 10 minutes each will contain all the arsenic, but an extra one should always be tested for arsenic as a matter of precaution.

No antimony will be distilled over if the solution in the flask is maintained at a volume of about 30 to 40 cubic cent.

The arsenic can be precipitated as a sulphide and filtered through asbestos on a weighed platinum gooch, the free sulphur being removed by washing with alcohol (ethyl) and CS_2, and drying with etlier and weighing as As_2S_3.

To obtain the antimony slow up the dropping HCl and increase the heat until SO_3 fumes begin to appear in the condenser.

Maintain at this temperature for one hour or until all the antimony is over, changing the distillate at intervals and testing with H_2S.

The beaker for antimony distillate should contain a little tartaric acid to prevent formation of Sb, O, Cl.

Unless tin is known to be absent, the antimony should be precipitated in an Oxalic acid solution by means of H_2S (separation from Sn_2S_3) and weighed as Sb_2S_3, the sulphur being eliminated as in the case of arsenic.

The writer has used this method continuously for the last five years and has found it to give extremely accurate results.

In slightly modified form this method has been used by the writer in analyzing ores, mattes, babbitts, base bullion, copper electrolytes and blister copper.

THE NEW SMELTING.

By Alfred W. Dyer.

The introduction of the Huntington-Heberlein process, together with the employment of a novel system of ore crushing and sampling, has practically renovated the art of lead smelting at the Hall Mines Smelter in Nelson, B.C. Face to face with an irregular and uncertain supply of ore, now happily improving under better conditions, with severe competition both at home and abroad, with labor laws that have increased the number of men employed at the works through shorter hours, with an inconvenient and cramped position on a hillside, the smelter having originally been built for the treatment of the ores of the Silver King mine, the smelter management have been able, despite all these adverse conditions to expend close on to $100,000 in renovating their works. These profits were made from the apparently precarious supply of the Slocan and East Kootenay lead ores. They are now in a better position than ever to take advantage of conditions that are so greatly improving the lead miners' prospects, and to earn those profits for the English shareholders, which they deserve because of their business acumen and because of their persistent faith in the west of Canada.

That which is true as regards the newer methods of treating lead ore at Nelson is, also, true of the smelters at Trail and Marysville.

The Hall mines smelter has now a capacity of some 200 tons daily and employs about 130 men. Custom ore, on which it is wholly dependent, is brought to the new crusher and sampler, alongside a C.P.R. siding. This plant, nearly all made by the Colorado Iron Works, has cost the company $30,000 and is just completed. The ore is first passed into an ordinary crusher at the platform level. Falling through, it is fed automatically and regularly, no matter the speed at which the crusher is working, into an elevator which takes it to the top of the building. Thence, if required for sampling, the ore drops into a Vezin sampler which rejects four-fifths of the flow, going into a reject bin outside, and passes one-fifth into an automatic mixer and feeder which sends the ore into a Gates roll, crushing it to 1½ inch.

From the 1½ inch Gates roll the ore drops into an automatic feeder as before and is taken up a second elevator, to the top of the building, dropping through a second Vezin sampler, where again a fifth of the flow is taken, which goes to a Colorado Iron Works roll, this time being reduced to ½ inch. It goes up a third elevator, through a third Vezin sampler, and 1-125th of the original carload is then taken through a third set of rolls, and brought down to ¼ inch, and is then taken through to the bucking room where samples are prepared for the assay office in the usual way.

But for the Heberlein process the ore has to be reduced to six mesh. Hence, the sampling not being necessary, or having been accomplished, the ore flow on reaching the chute leading to the first Vezin sampler, is turned by means of a swivel spout at the top of the elevator. Before it reaches the rolls, however, the ore flow is stopped by an impact screen which rejects all oversize, which is returned for recrushing. The ore flow is directed over the whole system of rolls as described, finally passing through a six-mesh, impact screen, into a feeder which distributes it evenly in a horizontal layer in the bedding bins immediatey behind.

All boxes on the line shafting in the mill are with Chapman double ball bearings, which renders it possible, even when some of the machinery is

geared on, to turn the whole system by hand instead of employing perhaps 10 to 15 horsepower as would be ordinarily required. This does away with the labor of an oiler and is an example, everywhere visible, of the labor-saving devices generally employed in these reduction works. All rolls are duplicated in order to prevent delay in case of replacement of the roll shells. The capacity of the mill is 20 tons per hour.

The laying of the ores in the bedding bins permits of the proper admixture of ores which will flux, together with the addition in layers of the principal fluxes as may be required. A rail track runs along the bottom of the bin and the ore, in vertical sections, is shovelled into buckets which are immediately hooked on to an endless chain conveyed up an incline, automatically cutting off the power as they reach the top and running by gravity to the other end of the smelter, past the furnaces, to the Heberlein building. Here they dump their ore into a series of bins, pass on up an incline over a spring switch which sends them back to the bedding, bin doors, by means of yet another runway and spring switch at the far end.

From the second series of bins the ore is fed on to a belt, which carries it to an automatic mixer and thence it goes to a supply bin, whence it is taken either to the Heberlein roaster or converter as desired. The ore being roasted in the Heberlein roaster, a circular furnace having a diameter of 26 feet upon the hearth and a capacity of 55 tons, is passed out, slaked, taken up an elevator to a height above the Heberlein convertors, and is there fed automatically in the pots, each of which has a capacity of 12 to 15 tons each twelve hours. Here the product, ignition having been started by means of a small woodfire, is burned till the sulphur practically is entirely consumed, being subjected to an air blast. It has been found by experience that it is possible and, indeed, advantageous, occasionally to feed raw ore from the bedding bins into these convertors.

The mass coming out of the convertors is tipped to the floor below where it is broken up to a convenient size by the dropping of a weight from above, and thence is loaded through the floor into cars which run out over a similarly arranged switchback, as that noted on its passage from the bedding bins and return, having automatically dumped its contents into a bin alongside a C.P.R. siding. From this bin the product is taken to the other end of the smelter, dumped into a bin under the track, taken thence by a conveyor, and passed through sampling mill and crusher to a gravity tramway which takes it to a storage bin alongside the furnaces. Through this bin at the upper siding is passed those fluxes and ores which have not to be put through the Heberlein process and, hence, do not go through the bedding bins, but are fed raw into the furnaces.

As to the furnaces there is nothing novel as to their construction, beyond that they are each fitted with a Harris distributor, which has the effect of parting the flow of slag and matte, the one going out on one side of the distributor and the other on the other.

It will be perceived that the system employed is not only effective but greatly reduces the cost of handling a mixture of ores, coming mostly in small quantities. The mill and bedding bins were designed by Messrs. Hedley and Harris, the smelter manager and superintendent respectively who, together with the general manager, J. J. Campbell, are to be credited with the successful operation of this concern.

In connection with the Huntington-Heberlein process, there are many savings. The sulphur is entirely or nearly so, eliminated. It is taken out in far less time, far more perfectly, with less fuel and less labor than under the old methods. Handling is, therefore, not only cheaper, but faster. Moreover, there is another great economy, connected with the blast furnace. Under old conditions there was a certain quantity of sulphur in the charge which was troublesome to eliminate. This involved much cost and labor. Under the new method raw ore can be fed in just sufficient quantity to take up whatever copper might happen to be present in the charge in the blast furnace, and a matte of the requisite grade made at once or at worst in two operations. It is in these methods that the Hall mines smelter by making a better recovery of values while, at the same time, reducing the cost of that recovery, is meeting its rivals and is enabled to reduce by 20 per cent. its cost of treatment—or from $15 to $12. Further reductions can yet be made, but must wait upon an enlarged and steadier supply of ore, which in its turn hinges, though to a lesser degree, upon lower smelting charges.

SUNDRY GEOLOGICAL PROBLEMS.

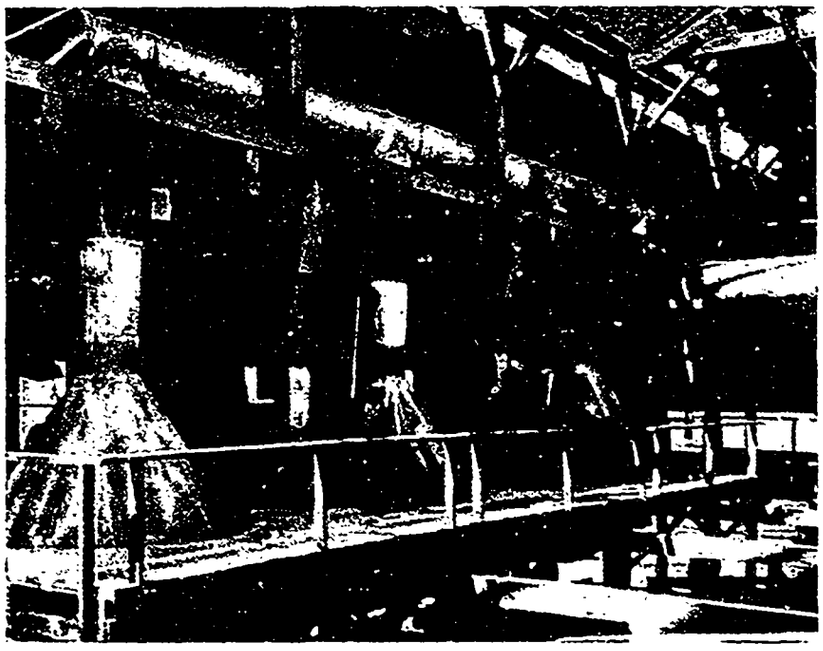
By G. Henriksen, Inspector of Mines, Christiana.

On October the 1st, 1902, the writer sent a telegraphic report to the newspapers in Christiana *Morgenbladet*, *Aftenposten*, and *Verdens Gang* on "The Iron Ore Deposits in Sydvaranger, Finmarken, Norway, and Relative Geological Problems" which has since been reproduced in the Lake Superior number for August 27th, 1904, of the *Mining World*, Chicago, in *La Revue Noire*, Lille, for January 15th, 1905, in *L'Echo des Mines et de la Metallurgie*, Paris, for December 5th, 1904, in *Zeitschrift fur der Berg-Hutten-und Salinenwesen*, 1905, page 19-21, in *Engineering and Mining Journal*, New York, for February 24th, 1906, and in *Oesterreichische Zeitschrift fur Berg- und Huttenwesen*, No. 13, 1906. Referring to this report the writer wishes to submit the following as the conclusions from the geological observations which he has since then been able to make here in Norway:

The so-called Devonian sandstone at Krokkleven and Sundvolden, Ringerike, which has been deemed of the same horizon as the "Old Red" of the British Isles, is an igneous rock: it is the sheeted pendant of the superimposed chocolate colored rhombe-porphyry. Its "ripple marks" are curved-faced jointing planes. The conglomerate found about the transition point from porphyry to red sandstone also is an igneous rock. The "pebbles" partly can be recognized as crystals, imperfect and rough as they are and with rounded surfaces. They are also largely flattened, especially is this the case where the conglomerate shows rudimentary lamination. "Pebbles" flattened parallel to the lamination will then be found lying in rows along the bedding-planes. It may be that the red sandstone does not show exactly the same chemical composition as the porphyry; but this would not signify, because sheeted portions of eruptives usually differ in composition from adjacent and contemporary crystalline parts of the same. Thus for instance, quartz, calcspar, ores and carbon show a tendency to diffuse toward sheeted portions of igneous rocks and give them a composition different from the rest. Also sheeted zones of pressure are frequently "sericitized," "kaolinized" or "porphyritized." Conglomerates are often found on the boundary between the sheeted and crystalline facies of an eruptive, also marking the boundary between two systems of differentiated lamination at angles to each other. Hence the frequent occurrence of "bottom conglomerates." Each "pebble" of a conglomerate often is found to be the centre of concentrically sheeted matrix. Near Krokkleven I have found concentric pressure-zones in the porphyry enclosing blocks of porphyry looking like huge waterworn cobble stones. The lumps of crystalline gabbro at the Roros mines of cupiferous pyrites, between which gabbro and concentrically laminated eruptive the ore is usually found, have a smooth surface and the form of hogs-backs and potatoes.

At Sundvolden, Ringerlike, the same force which brought about the border-sheeting of the eruptive field of which the rhombe-porphyry is a part, has also been the occasion of the more or less differentiated lamination of the fossiliferous sediments through which the eruptive has burst up, or rather the sediments have been differentiated and laminated through heat and lateral pressure from the eruptive and at the same time the border-zone of the eruptive has become sheeted by the reaction. The cooling effect from the sediments together with the raising of the melting point of the eruptive border through reactive pressure from the sediments, have combined to accelerate the solidifying of the eruptive border, thereby causing the fine grained more or less clastic structure of the same and its bedded state vertically to the direction of the reactive pressure. The igneous "sandstone" and the silurian sediments are now found conformably "stratified" and are gradually merging one into the other, and both are dipping under the rhombe-porphyry. The jointage of the granite at Eidanger, near Porsgrund, is conformable to the "stratification" of the adjacent Silurian, and they gradually merge one into the other, partly because the jointing of the granite is accompanied by closer grain, partly because the sediments adjoining the granite have been in a state of fluidity increasing with the proximity to the molten granite. Such a process of differentiated sheeting of sediments largely resembles the analogous differentiated lamination of igneous rocks. Sediments in a half molten and igneous rocks in a half cooled state under peculiar conditions of pressure will behave alike. Special conditions of heat and pressure will put sediments in a state of fluidity sufficient to allow of a very extensive rearrangement of substance, at the same time as they remain solid enough to prevent all traces of organic life from being obliterated. By strong and regular differentiated sheeting of sediments the fossils contained are largely obliterated; certain of the beds formed by the lamination are comparatively intact and show the fossils well; other beds formed by the lamination of sediments under heat and pressure have been entirely liquified and appear, as if they were actually constituted of originally igneous matter. The first stage of the differentiated lamination of calcareous fossiliferous sediments, as at Ringerike, gives them a certain nodular structure, in the next stage they show lenticular lime-balls in regular rows, in the next stage the marl-balls have as it were coagulated into bands of calciferous matter, in the next stage these bands of hard calciferous matter are very thick and well defined and have as their complement proportionally wide series of thin shale. The original sediments will be found relatively intact under certain conditions of several crossing directions of lamination. Thus, for instance, I found near Sundvolden three crossing systems of lamination enclosing a wedge of sediments with fossils relatively very well preserved. As an analogy, I may mention that at Lottivara and Lemmivara, in Laxely in Finmarken, at numerous places right in the middle of hornblende schist three crossing directions of jointage are found to enclose a pyramid with the point down, consisting of crystalline gabbro often carrying in the middle of it a lump of native copper weighing half a pound, and such wedges of gabbro would be found in quite isolated positions here and there in the hornblende-schist. Where such nearly unaltered portions of relatively calcareous, fossiliferous matter were found, they showed the original fossiliferous sediment to have been an amorphous mass without any stratification and consisting of corals and shells of other marine animals imbedded in a mud. Where pure fossiliferous limestone is now found, it is partly made up of

The Hall Mine Smelter.



The Heberlein Converters, Hall Mines.

the original fossils in situ, but the balance of the lime has come there by replacement. That replacement of substance can take place to a very large extent without obliterating the fossils contained in the sediment can be seen at the hematite mines at Clinton in New York State: in the so-called fossil ores the fossils as well as the mud in which they have been imbedded have all been turned into hematite ore. Similar instances can be had from the hematite deposits in Cumberland, where brachyopods and corals have been converted into hematite retaining their form. In Konerudkollen zinc mines near Drammen one finds corals filled with crystals of idocrase. Ore deposis are largely formed by diffusion and migration of igneous emanations of metalliferous matter having taken place within the sediments adjacent to an eruptive, according to laws analogous to those obtaining for the segregation of ores within eruptives. Thus effects of pressure play a similar role also for ore deposits in sediments. The sediments have been able to get into a state sufficiently fluid to allow of the migration of metalliferous particles, but not sufficiently fluid to obliterate all the fossils.

The "post-silurian" eruptives of the Christiania district, geologically speaking, have their porphyritic rim and their border sheeting, in red sandstones as at Krokkleven and Holmestrand or in dark hornblendic slate as at Krekling, Eker. The sediments of the Christiania territory having been differentiated and laminated through the agency of heat and pressure from the very large "post-silurian" field have afterwards been altered into alum shale in the regions nearest to the "Archean" under the influence of heat and pressure from the latter (the Archean), which is of igneous and comparatively recent origin. The "Archean" has partly altered the previously laminated "silurian" sediments nearest to it into alum shale, partly it has melted these sediments forming the so-called Oslo porphyry (formerly also called oligoclase-porphyry, eurite porphyry or felsite porphyry). The fossiliferous ellipsoides of "stink-kalk" contained in the alum shale have got their ellipsoidic form and their contents of bitumen, hydro-carbon, through the eruptive action of the "Archean" upon limestone beds previously existing. The same action of the "Archean" accounts for the carbon contents of the alum shale, the bitumen of the lime ellipsoides being volcanic products diffused from the magma of the "Archean." Alum shale and Oslo porphyry are often found to merge one into the other. At Vikesund, Modum, the Oslo porphyry stands up in the alum shale as a wall parallel to the boundary plane between the alum-shale and the "archean." The conglomerate at Fure north of Vikesund is found forming the transition between the eruptive "archean" and the sedimentary alum shale. This conglomerate at Fure is one of the most remarkable geological occurrences in Norway.

The most striking instance of differentiation and lamination of igneous rocks through effects of pressure in cooling that I know of is the so-called Ottfjall diabase from the Ottfjall Mountain in Jamtland, Sweden, and described by Professor P. E. Holmqvist in the transactions of the geological society of Stockholm, vol. 16, (for 1894, page 175). The sandstone formation of Dalecarlia consists of sandstones, conglomerate, and "intrusive" diabase beds. All these rocks are igneous, and the formation is a product of the differentiation lamination of a cooling magma through pressure, such as has been the case by the above mentioned Ottfjall diabase. Certain beds formed by the differentiation and lamination of the Christiania sediments have become melted in the process and are now found as layers of diabase following the stratification of the sediments and merging by imperceptible gradations into the same.

Sheets of molten rock which have been considered as intrusive eruptives are found all over the world as one of the products of the differentiation and lamination of sediments through heat and pressure from eruptives of the neighbourhood. As instances can be given: the toadstone of the Derbyshire lead mines, the celebrated Whin Sill in the North of England, the diabase beds in the iron mines of Pervukhina in Southern Ural, Russia, the younger "Schalstein" and diabase-amygdaloid of the Buchenberge iron mines near Eibingerode, Harz, the grey porphyry at White Cap Chute, Leadville, Colorado, the porphyry of the Eagle River mines, Eagle County, Colorado, the Eagle Hill porphyry at Mercur, Utah, the Leadville white porphyry, the white porphyry of the London mine in Mosquito gulch in Colorado, the "white porphyry" (diorite) on Aspen Mountain, Colorado.

The results of the borings for coal at Andoen in Nordland go to show that the Tromso marble-mica-schist-group or the "Archean," or whatever it would be called, of this part of Norway is younger than Brown Jura. The bitumen forming the chief constituent of the coal found there is an igneous emanation from the eruptive below.

Good mines are proverbially watery. This is easily explained, because ores have had a general tendency to diffund to zones or localities of stress, pressure, jointing, shearing and shattering within eruptives or adjacent sediments. "Lettengange" often carry ore. Both genuine "Erzgange" and pyrites deposits of the Vigsnaes type very often have "gouge," "selvage," "gangletten," "salbander" accompanying the ore, which is one fact to indicate the common genetic origin of "erzgange" and lenticular deposits of pyrites as found at Vigsnaes and many other places. At Rodklev mine (situated about one kilometer from old Vigsnaes mine) going through one of the crosscuts worked vertically on the "stratification" one can step by step follow the saussurite gabbro, passing by im-

perceptible gradations through foliated fine-grained gabbro and green chlorite schist to clayey matter, "Gangthonschiefer," in lenticularly shaped inclusions within the green schist. The normal crystalline saussurite gabbro has little or no regular jointing; as regular jointing comes in, the minerals of the gabbro get a certain orientation parallel to the jointing; as the jointing planes get closer and closer, the foliated gabbro gradually passes into green chlorite-schist, and by very strong and close lamination the chlorite-schist gradually passes into fat clayey matter. Thus this clay is, at it were, the final stage of laminated saussurite gabbro. Jointing planes are a product of contraction by the solidifying of a molten magma. Where such solidification is precipitated by stresses, jointing vertically to the direction of the pressure will be the result, also finer grain and a certain more or less pronounced orientation, parallel to the jointing, of the crystals formed. Clastic structure also often is found as the result of solidification precipitated through strains and stresses. Jointage and related phenomena are common in sedimentary as in igneous rocks, which shows that contraction has taken place also by the passing of the first-mentioned from the semifluid into the solid state.

Ores are preferably found in pressure-zones, because metals have a tendency to diffuse towards the portions of a magma that consolidate first.

The Christiania Valley is traversed by an extensive system of diabase dykes running NW.—SE. These dykes are not originally igneous, consisting of molten matter from the sediments and being formed through the agency of pressure-forces ("Druckkrafte") acting normally to the strike of the sedimentary "strata." The "dykes" of diabase locally called blabest at Konerudkollen zinc mines near Drammen are of sedimentary origin, the Silurian having been partly melted by heat from the underlying granite in zones with peculiar conditions of stress or pressure. These same conditions have also tended to favor the deposition of ore diffusing from the underlying "post-silurian" granite into the "Silurian" floating on the top of the granite. The rhombe-porphyry at Tyveholmen in Christiania also is melted sediment.

Concentrically laminated portions of foliated eruptives usually are found to enclose very heterogenous masses of rocks of extraordinary composition: pegmatite, ores, dolomite, conglomerates, etc. Instances are: The iron deposits on Lango Island by Kragero, the norite field by Ertelien, Ringerike, with its contents of nickeliferous pyrhotite, the Storgrufva mine at Persberg, Sweden, Ammeberg zinc-mines in Sweden, Pitkaranta in Finland, Gap nickel mine, Lancaster County, Pennsylvania. The Sudbury nickel district in Ontario, Canada, offers an instance of concentric lamination of eruptives on a colossal scale. The elliptic or perhaps ellipsoidal lamination here encloses a so-called Cambrian field of peculiar rocks that have been called vitrophyre tuffs, gray clayey sandstones and black slates. In the black slates are found irregular veins of anthraxolite. Somewhat similar geological conditions as in the Sudbury district, although everything is on a much smaller scale, obtain by the Langsev—Thorbjornsbo iron-ore field at Arendal, Norway. See. *Nyt Magazin for Naturvidenskaberne*, volume 11, for 1861.

Nickeliferous pyrhotite is often found in the company of norite; but the nickel ore at Ertelien, Ringerite, has no more been magmatically segregated out of the norite, than gold has been magmatically segregated out of the quartz of a gold-quartz-vein. Still less are the Sudbury nickel deposits segregated out of the occurrences accompanying them of norite which are often very small.

Semicircular lamination of eruptives and sedimentary rocks equally with concentric lamination has favored ore deposition. It seems as if the forces at work to cause irregularities in the differentiatory lamination have served also to attract ores to their locus of activity. As instances of ore segregations accompanying semi-circular or irregular lamination can be given: The Dunderland iron ore deposits, Witwatersrand banket i Transvaal, the Marquette iron ore mines Lake Superior, Schmiedefeld iron mines near Grafenthal in Thuringia, Eise nerz iron mines in Austria, the saddle reefs of Bendigo, Australia, Broken Hill, New South Wales, Rammelsberg by Goslar, Harz, the pyrites mine at Meggen on the Lenne, Germany, Paulus iron mine at Moravicza, Hungary, Low Moor iron mine, Virginia, Cherry Valley mine, Missouri, Franklin Furnace zinc mine, New Jersey.

At the Fehn iron mines, near Ulefos, the dolomite is found to pass into granite by transitional stages showing all gradations. The limestone called Hedekalk in Sweden and Biridkalk in Norway are also of igneous origin. By the differentiatory lamination of sediments they have largely been charged with foreign substance which emanating from the active eruptive has been deposited in the sedimentary so-called "strata" by replacement, or whatever one would call a process which evidently has much in common with the processes of magmatic segregation and rearrangement of substance which are observed to have taken place within igneous rocks. While sedimentary limestone beds will partly have got the lime from fossils in situ and from lime of organic origin concentrated into the limestone beds from other parts of the sediment dolomite is an igneous product, diffused into the sediments from the eruptive, settling there by replacement; so also is the greater part of the carbonic substance constituting the coal-seams. Only part of the carbon in the coal-seams is of organic origin, the rest has come from the nearest eruptive wandering into the sediments and has settled there according to laws which are, at least at

present, hard to understand. The fire-clay following the coal seams give one indication of their genetic origin, same as "Gangletten," gouge and kaolin afford one indication of the ordinary genetic origin of ore deposits. If the coal in the coal-seams is largely an emanation from eruptives, it follows naturally that petroleum and natural gas must also be volcanic emanations.

The copper bearing shales of Mansfeld have been formed genetically on somewhat the same lines as a coal seam (they also contain carbon, the copper having diffused into the sediments, from the nearest underlying eruptive. (Such diffusion is not entirely inexplicable on everyday actual experience. In two pieces of two different metals in close contact metallic substance will sometimes diffuse from one piece into the other at ordinary temperature, when sufficient time is allowed for the process.) At Mansfeld also cross-pressure indicated by the system of strong joints locally called "Rucken" is found to have influenced ore deposition. However, it is not sure that the systems of cross-jointing so common in coal-mines has not also influenced the deposition of carbon.

Most of the ore deposits of the world owe their existence to eruptives. They are, with few exceptions, either found as segregations within eruptives or as emanations from such eruptives deposited in neighboring sediments.

By the differentiatory lamination of sediments the fossils contained in the same sediment have had variable fates according to their different chemical compositions and to the special kind of replacement which has taken place at the particular spot where each fossil has been located. Some of the "strata" produced have become melted. In these "strata" and many others the fossils have been entirely obliterated. Lime-shells have fared the best in zones of calcareous replacement, also they have fared well in localities of iron-ore replacement. Parts of plants have had the best chances of preservation in the zones of carbonaceous replacement, that is to say, in the coal seams. On the other hand, it seems likely that the carbon of volçanic origin has had a tendency to diffund towards localities which have already been rich in vegetable matter, thereby making the frequency of fossil plants in the coal-seams more pronounced. Fossil wood often is found in a state of good preservation by silicious replacement. In the Leeds mine, near the South East corner of Nevada, horn-silver has diffused into and impregnated vegetable remains such as wood, twigs and leaves. The nature of the fauna and the flora as found in a sedimentary "stratum" is then chiefly determined by purely accidental circumstances, and the historical part of geology, palaeontology, and palaeobotany has to be revised.

The position of the small remnants of fossiliferous sediments that have escaped the universal destruction occasioned by the eruptive upheaveals that have made Fennoscandia goes to show that this gigantic volcanic activity has taken place in stages, and that the outburst of the "Archean" marks the last stage of this activity. The Thelemarken formation represents the surface development and the Bamble formation the border facies of the great "Archean" eruptive field, and they are both highly differentiated, same as the Huronian and Algonkian facies of the great "Archean" eruptive field of tertiary age in Canada.

It has been remarked that the Great Lakes have been the making of the United States. If that is so, it is the sheeting of the border of the large Northern American "Archean" eruptive field in contact with equally sheeted adjacent sediments which has been the making of the Great Lakes. Also the sea between Jutland and Norway, the Gulf of Finland, Lake Ladoga, Lake Onega and the White Sea owe their existence to the sheeted, by erosion easily destructible, condition of the border of the Fennoscandian "Archean" in contact with equally strongly sheeted sediments.

Some of the richest mines in the United States, the Lake Superior iron mines and the Lake Superior copper mines, are found about the contact of the great North American eruptive "Archean" field with the sediments to the South of it.

The Alps and the Himalayas have been formed by the eruption of the "Archean" in the tertiary age.

THE COBALT MINING DISTRICT.*

Dr. Robert Bell.

This district has an area of about fifteen square miles and is situated on the line of the Timiskaming & Northern Ontario Railway, its centre being three or four miles west of the northern part of Lake Timiskaming on the Ottawa River. Its surface is undulating, partly rocky and partly drift covered, and is well wooded. On the large scale, it has a generally even aspect and is interspersed with numerous small lakes.

The rocks of the district in general, provisionally classified with the sub-Huronian or Keewatin series, are mostly of igneous origin, consisting of granites, greenstones, agglomerates, volcanic tuffs, etc., and are favorable to the occurrence of metallic ores, should any veins exist among them. It was, therefore, considered to be only a matter of time in the evolution of the country from a state of wilderness, when important deposits of ores would be discovered anywhere among these rocks.

To the southward of the igneous rocks of the Cobalt district, quartzites, crystalline schists, etc., of Huronian age occur around Lake Temagami and

* From the Summary Report of the Geological Survey Department of Canada for 1905.

southward, and still farther south quartzites of the same series, while still farther, in the same direction, several varieties of Laurentian gneiss are developed all the way to Lake Nipissing. To the northward of Cobalt, one large and several smaller inliers of unaltered, horizontal fossiliferous limestone of Niagara age rest upon the igneous and metamorphic series.

In 1887 and subsequent years, the writer made a geological reconnaissance of the region around Lakes Timiskaming and Temagami and westward. In November, 1905, and again in April, 1906, he visited the Cobalt mining district for the purpose of studying the rocks of this particular area and the modes of occurrence of the ores associated with them.

Native silver and its associated minerals were discovered early in the summer of 1903 by Messrs. McKinley and Darragh, at the sout' west extremity of what is now called Cobalt Lake. These men were then engaged in taking out ties for the new railway under construction. Having had some experience in prospecting, one of them, in breaking the rock at the southern angle of the lake, close to the right-of-way, discovered small pieces of a white metal embedded in it. On removing the moss and black loam in the vicinity, numerous small thin blackened plates of this metal were found. About the same time, native silver was recognized in a vein at the northeast end of Cobalt Lake and some large and small rough blackened nuggets of the same metal were washed out of the earth on the outcrop of the vein. The construction of the railway was, therefore, the direct means of making the discovery of what is turning out to be an important mineral district. The "finds" above mentioned, however, attracted but little notice, as the men who made them were directing their attention to the discovery of copper ore and not thinking of silver, none of which had previously been found in this part of Canada, and they were not impressed with the possible significance of what they had found.

In November of the same year, the attention of Prof. W. G. Miller, Provincial Geologist of Ontario, was called to this discovery and he paid a visit to the locality, returning with specimens of the silver and its associated ores. As these had been found in only two or three spots at that time, Prof. Miller could not forsee the numerous discoveries, over a considerable area, which have since been made, but he thought that the prospect already located was distinctly promising.

I considered the discovery sufficiently important to have it thoroughly investigated by the Geological Survey, and accordingly I engaged Prof. Parks, of Toronto University, to undertake the work immediately on the close of his college duties the following spring. In the meantime, the Ontario Government had sent Prof. Miller to the same ground very early in the season, (about the beginning of March). After Prof. Parks had worked for some time on the same ground as Prof. Miller, the latter proposed a division of their operations, so as to avoid duplication. As it appeared that the silver-bearing district might extend a considerable distance to the northward, he suggested that Prof. Parks should explore in that direction, while he himself would operate to the southward.

At the present time, openings, showing more or less native silver, have been made in probably nearly a hundred different spots within the fifteen square miles above mentioned as comprising the productive silver district of Cobalt. With few exceptions, these openings have been made in what is locally called a "conglomerate," but which is more properly an agglomerate, containing numerous irregularly distributed angular and rounded fragments, mostly of gray, and red granite, and of the porphyrite itself in a somewhat soft bluish and greenish gray matrix of hornblende porphyrite or porphyritic tuff. The fragments are seldom large, and they are generally very irregularly distributed, partly in bunches, but in other parts they are sparsely disseminated.

The agglomerate has a general horizontal aspect, but there appears to be little or no evidence of aqueous stratification in the agglomerate itself, or of the action of water in the arrangement of the fragments, which are scattered through the mass at all angles. The weathered surfaces have the character and appearance of a volcanic rock and not of a conglomerate. The fragmental character of this rock prevails at the surface throughout most of the silver-bearing area, but, in the deepest workings, it shows a tendency to become non-fragmental. The colors of fresh fractures are generally bluish and greenish gray, but at some localities the color is a dirty drab and, on close inspection, this shows a mottled character of lighter and darker shades. It is doubtful if this agglomerate is equivalent to either the Lower or Upper slate conglomerate of the Huronian system north of the St. Mary River.

At some places in the district, the agglomerate passes into or includes fine grained gray or drab slaty rock, and at others gray arkose or greywacke, grading in·) a variety of impure quartzite. The total thickness of these rocks has not been ascertained. At the Larose mine, the upper stratum consists of about twenty-five feet of the fragmental agglomerate, underlain by an equal thickness of gray slate, which together form a cliff fifty feet high. The surface then slopes down from the foot of the cliff for thirty or forty feet to the collar of the shaft, which has been sunk on a group of small silver-bearing veins, separated from one another by the country-rock, and having an average width of four or five feet. At the time of my visit last November, this shaft had been sunk through the agglomerate to a depth of ninety feet, and a drift run for about 100 feet to the northeast and 350 feet to the

southwest. The country-rock on either side of the vein was seen to carry metallic silver at many places throughout this length. At one point to the southwestward of the shaft, the vein-group bulges to a width of about twelve feet and shows distinct parallel veins in the roof of the drift. Within fifty feet of the southwestern extremity of the workings, at that date, the vein divided into two branches, both of which were rich in silver. During the winter the shaft was continued to a depth of 205 feet from the collar to the bottom of the sump, and at 200 feet, a tunnel was driven forty feet N.E. and 50 feet S.W. from the shaft. A winze was also sunk from the 90 to the 200 feet level, at a distance of 150 feet from the shaft. In the 200 feet level are two veins of calcite, separated by dark slaty country rock. This latter as well as the veins, is rich in native silver in the form of plates and rough nuggets. The rock breaks into lumpy schist-like fragments with smooth surfaces showing numerous thin leaves and scales of native silver on a large proportion of them.

Both the natural exposures and the artificial openings show that the agglomerate formation is divided into approximately rectangular blocks by two sets of dry vertical joints. Lines of fissure follow the courses of some of those joints and along those the mineralized veins occur. Their gangue consists of calcite. Sections of the veins are sometimes completely filled by metallic ores, especially smaltite or diarsenide of cobalt.

With the agglomerate and slate ash series, above described, are associated arkose or greywacke, quartzite and crystalline diabase. The slaty ash rock is not identical with true or argillaceous slate, but consists of the finer material derived from the modification by water of ashes and other volcanic materials, which became broken up and assorted when they came under the influence of the primeval sea. They are generally dark-colored and obscurely banded parallel to the horizontal cleavage. In the country to the westward of the Cobalt district, along the Montreal River, around Lady Evelyn Lake, etc., it is a common thing to see alternations of strata of considerable thickness, consisting of quartzites, arkose and this slate-like rock, which have evidently been separated by water from the volcanic materials that were being produced in abundance at that period of the earth's history and assorted into separate deposits of the coarser and finer materials.

The thickness of the agglomerate and slates, tuff or porphyrite probably varies considerably. At the Larose mine these rocks have a known depth of at least 295 feet, made up as follows: Upper half of the cliff above the mine, 25 feet of agglomerate; lower half of cliff, 25 feet of slates; slope from foot of cliff to collar of shaft, agglomerate about 40 feet; same rock to first level, 90 feet; from first level to bottom of sump, porphyrite tuff, 115 feet.

Along some of the joint-planes of either of the sets already mentioned as traversing the agglomerate, a disturbance accompanied by fissuring has occurred and these constitute the broken-up veins carrying the silver and other metals. It was observed that the stronger joints with slicken-sided walls often run in pairs close together, with a silver-bearing calcite vein in one or both of them. These joint-veins sometimes curve round through considerable angles up to 90° and they also give off branches. Examples of this may be seen at Little mine, from which a greater quantity of silver is said to have been extracted than from any other opening in the district. Some branching cracks, only about a quarter of an inch wide, filled with a fine red earth, run from one of the veins into the wall rock. This red earth was found to be very rich in silver, although no visible grains of the metal, or of any of its compounds, could be detected by washing it.

On the same vein which runs N. 23° W., a shaft has been sunk to a depth of 106 feet, from which a cross-cut has been made for 60 feet east and 70 feet west. The rocks cut by the shaft are blue agglomerate at the surface, followed by bright gray arkose, approaching quartzite, with an occasional rounded fragment of granite. Below this is the slaty rock which, on weathering, shows dull lines of stratification. Its color is from dark bluish and greenish gray to nearly black.

Horizontal thrusts, dislocating the veins from two to ten feet, have occurred in some places. Examples of these may be seen at Little mine, Cobalt Hill mine and in the tunnel into the cliff just above the Larose mine.

A considerable portion of the eastern part of the Cobalt district is occupied by dark greenish-gray crystalline diabase in proximity to the agglomerate. In places this greenstone is probably intruded as dikes and masses in the agglomerate and its associated rocks; while in others it may occur as sills or overflows, lying in or upon these rocks.

Silver-bearing calcite veins, which also carry smaltite and resemble those in the agglomerate in some other respects, traverse the diabase at several localities in the district. Veins of this character occur on the following properties:—Violet or Handy, Welsh and Giles (north of the Foster mine), the Jacobs mine, the Hargraves, or McMillan, (south of the Jacobs). Diabase also occurs at the Watts or W. A. Allan mine. The Ben mine on the shores of Lake Timiskaming, now owned by Mr. Hotchkiss and associates, is in the agglomerate, but a greenstone rock occurs not far from it.

The majority of discoveries of silver, so far made in the Cobalt district, occur along lines running about northeast and southwest. But there is another set of veins crossing this course nearly at right angles. Two veins of this set traverse the property of the Larose Mining Company, the more northeasterly of which has been worked by running

a tunnel along the vein into the cliff which rises a short distance to the south-eastward of the shaft. The other cross vein outcrops on the flat top of the hill at about 200 yards to the southwestward of the last. Here the earth has been removed so as to expose the glaciated surface of the agglomerate. In one part of the smoothed surface, the vein shows itself as a reticulated shining streak of polished silver and rock, three or four inches wide. A neighbouring part of this vein has been opened and a considerable quantity of rich ore removed.

The silver-bearing veins of the agglomerate throughout the district are themselves small, but since much of the ore is derived from the branch veins and the country rock adjoining them, they are more important than might be supposed at first sight. The gangue consists of calcite, derived from the agglomerate, with rarely a little quartz. The vein-matter is generally much split up, fractured, faulted and brecciated and many miniature horses are included. Branches are sent off, which often follow the secondary dislocations accompanying the main disturbance that caused the vein. Yet there is usually a continuity of productiveness along the general plane of fracture. On either side of this broken-up and interrupted plane the wall-rock on either side may contain much native silver in the form of plates, sheets and leaves, filling small fissures or gashes.

The values are mostly in the silver, all the other ores being worth comparatively little. From the information I could gather as to the output of the different mines, the total value of the silver produced in the district, from the time the first openings were made until the beginning of April of the present year, amounts to upwards of $1,500,000 and it may approach, but does not exceed, $2,000,000.

The following twelve metals have been found in the veins above described:—Silver, cobalt, nickel, copper, lead, arsenic, antimony, bismuth, iron, manganese, zinc and, lastly, gold in small quantity in one or two instances. Most of these metals have here entered into numerous combinations, among themselves and with sulphur and oxygen, to form a variety of somewhat uncommon mineral species.

The presence of such a number of different metals is a hopeful sign and one of the proofs that the containing rocks are essentially of igneous origin, notwithstanding the local modification of parts of them by water.

For convenience, I use the word "mine" in the same sense as do the prospectors of Cobalt, namely, to indicate any artificial opening in the rock, such as a shaft, an open cut, etc., instead of restricting it to its true meaning.

The silver and the ores of the other metals usually occur irregularly in bunches or scattered through the calcite and also through the country rock between the small veins of the groups, as well as for some distance inward from the walls. Most of the metallic silver is found in flat plates with extremely ragged and irregular edges, which, judging from a parcel of 150 or 200 pounds in the office of the Nipissing Mining Company, will weigh, on an average, from one-quarter to one-half pound each. In the open cut, called No. 26, on this company's property, I saw, at a depth of 30 feet, a vein of coarse crystallized calcite 4 inches wide, thickly studded with bright silver to the extent of fully 20 per cent. of its weight. Only 4 feet in height as rich as this was exposed, but it passed into the rock below maintaining its width and value. A specimen of this vein weighing 130 pounds was taken to the company's office. Specimens of pure silver, weighing from a few pounds up to twenty or more, have been obtained in a number of the mines and several pieces rich enough to be called "nuggets" have been found. A piece of rich ore, 5 inches thick and weighing 258 pounds, was found in the surface debris lying upon the outcrop of the Larose vein on the west side of the shaft. It originally formed a part of the full width of one "rib" of the vein and has a somewhat laminated structure, the layers being composed of smaltite, niccolite, native silver and calcite. This specimen was purchased for the Museum of the Geological Survey and, in order to ascertain the value of its silver content, five holes were bored through it. The drillings from these, on analyses, were found to contain about 18 per cent. of silver. The high specific gravity of the smaltite and niccolite gave rise to a belief that this "nugget" might contain a larger percentage of silver. A mass of calcite and silver, said to weigh about 700 pounds, taken out of the Larose mine, was described as being so strongly held together by the silver as to require the use of cold chisels to cut it into pieces of convenient size to ship. "Nuggets" of mixed silver and calcite, weighing upwards of 100 pounds, are exhibited in the banks at Cobalt and in some of the mining companies' offices in the district.

As a striking example of the numbers of heavy pieces of native silver which may be picked out of the ore after it has passed through the crusher, I may mention that Mr. W. H. Linney, Superintendent for the Nipissing Mining Company, informed me that last year he had made a shipment to Mr. Ellis P. Earle, 31 Nassau street, New York, one of the partners in this company, of a petroleum cask containing 3,977 ounces of metallic silver and a large mass of niccolite with native silver protruding from it on all sides, and which was afterwards found to contain 780 ounces of this metal. The value of all, at 60 cents per ounce, was $2,854. At the offices of nearly all the mines in the district, the visitor is shown numbers of heavy pieces of native silver taken out of the respective mines.

The concentration of the silver in the metallic form near the present surface or at a moderate depth has no doubt been due to a chemical or elec-

tro-chemical process during a considerable period in former geological times, by which compounds of silver were reduced and deposited in their present form. It is not, therefore, to be expected that such heavy native silver will continue to any great depth. In the deepest parts of the Larose mine, 200 feet from the surface, a notable increase in the proportion of argentite has already taken place, dark red silver (pyrargyrite) has made its appearance and the changes due to surface influences in the wall rocks, gangue and ores, are less noticeable, as all these have assumed a firmer and fresher appearance.

The following notes on some of the individual mines of the Cobalt district are partly from personal examination and partly from descriptions given me by reliable persons, mostly the agents or the original owners of the properties. Up to the beginning of April, about forty different properties had been or were being worked. With three exceptions the depth attained was less than 100 feet, and in most cases it did not exceed 30 feet. At the Larose mine, the shaft (including sump) was 205 feet deep; at the Trethewey mine (J.B. 6), 100 feet, and at Little mine 106 feet. The company which has, so far, produced most silver is the Nipissing, which owns 900 acres of mining land to the southeast of Cobalt Lake. Its mining operations have, as yet, been confined to one lot—RL 404—comprising only 10 per cent. of the whole, but which includes the Cobalt Hill mine on its north side and Little mine in its southwest corner. Twenty-five other separate openings have been made on this lot, all in agglomerate rock. They have been numbered in the order in which work was commenced upon them, and more or less silver has been extracted from each. Only three of these openings exceed 30 feet in depth. According to the records in the books in the local office of the company, these workings have produced, since operations began in 1904, silver, with a small proportion of other metals, to the value of $1,045,000, of which about $145,000 worth is still in the storehouse at the mines.

From Little mine, a shipment of 20 tons was sent to market a year ago. It assayed 4,800 ounces per ton. At 60 cents per ounce this amounted to $57,600 and was the best car-load which has yet been exported from the Nipissing Company's mines.

At the working on the company's property, called No. 19, there is an open cut 50 feet deep and about 200 feet long with a breadth of 6 or 7 feet. It is said that out of this cutting 200 tons of ore were taken, worth $1,200 a ton or a total of $240,000, which is more than has been produced by any other single opening in the district.

In the southeastern part of Lot R. L. 404, and close to the shore of Petersons Lake, are situated the open cuts called Nos. 12, 13, 15 and 21, at two of which work was going on at the time of my visit. Very rich ore has been found in No. 12, and the superintendent stated that $25,000 worth of silver had been taken out of it; also that some of the dressed ore of No. 13 assayed as high as 3,500 ounces per ton, and none less than 2,500 ounces.

Three car-loads of 30 tons each, or 90 tons in all, of cobalt and nickel ore were reported as having been sent last year from the Cobalt Hill mine. The company received almost nothing for the nickel and arsenic contained in the ore. It was rather a singular fact that this ore contained less than half an ounce of silver to the ton. From the same mine, in 1904, the Nipissing Company's books show that 397,310 pounds of smaltite, containing only 5½ ounces of silver to the ton, were sent to New York. The heaviest single mass of cobalt ore found upon the Nipissing Company's land was in No. 8 open cut, which about 100 feet long and runs about east and west. From this opening 132,000 pounds of cobalt ore, containing 10 per cent. of the metal, were taken out. One large slab of solid smaltite was removed which was 16 inches in thickness and weighed over two tons. In this cutting, great quantities of cobalt bloom were uncovered along the south wall. The laborers threw it out in shovelfuls, in the form of a plastic mass.

The workings known as the Trethewey mines are situated on lots J.B. 7 and J.B. 6. Silver was discovered by Mr. W. G. Trethewey on both of these lots on the same day, 23rd May, 1904. The more northern lot, J.B. 7, which belongs to Mr. Trethewey personally, is called the New Ontario mine. The principal vein on this location is 8 inches wide and runs nearly east and west. A shaft was sunk upon it to a depth of 70 feet. On driving eastward at this depth, the vein soon forked. The drift was continued 40 feet on the northern and 190 feet on the southern division. This again split up into branch veins comprised in a breadth of 7 or 8 feet, between which the wall-rock was well charged with silver, and the small branches were also "shot through" with the native metal. After much work had been done on the south fork, an experimental break was made into its southern wall and after crosscutting only four feet a larger vein than the one being worked was struck, which materially increased the output. A good deal of stoping was done on the small veins and adjoining rock, and prior to November, 1905, 44 tons of ore which had been taken from these workings had been sent to New York in two cars and sold for $110,000. Two other car loads of lower grade ore were also sent. Immediately adjacent to the veins, the wall-rock holds sheets or plates and nuggets of silver. One of the former had a superficies of about 25 square inches. Some small boulders of granite, about the size of a man's head, taken out of the agglomerate had been fractured *in situ* and were penetrated by veins or sheets of native silver. The gangue of all the veins here is calcite and, besides the native silver, it holds smaltite and niccolite.

Captain Reddington, in charge of these properties, informed me on the 13th of April, 1906, that since last November, two car loads of ore had been sent to New York, one consisting of 28 tons of rich material, which sold for $68,000. The second car carried about 30 tons, but he had not, at that date, received the return for it. These shipments, together with some ore on hand at the mine will, it is said, make a total yield, so far, of about $200,000.

On lot J.B. 6, immediately adjoining, to the south, the property last described, seven silver-bearing veins have been discovered, all of which run nearly east and west. On vein No. 1, where the initial discovery was made at the time the claim was staked, a shaft has been sunk to a depth of 100 feet at a point 200 feet southeast of the 70 feet shaft above described on J.B. 7. From the bottom of this shaft a drift has been run 60 feet east and 40 feet west following the vein. The latter consists of a group of stringers, all much broken up and mixed with the wall-rock. Sometimes there is a streak of vein-matter on one or both sides of this group. Native silver, in the form of bright leaves, occurs in the rock among the stringers, but most of the metal is found in the walls adjoniing them. Open cuts have been made on the other six small veins and native silver has been found in all of them in the form of large disseminated grains, which sometimes occur in considerable bunches. The largest of these open cuts is 50 feet south of the above shaft and is 70 feet long by 30 feet deep. The country-rock at the openings on both J.B. 7 and J.B. 6 consists of a blue-gray, soft, fine-grained or amorphous tufa, which, towards the surface, holds rounded and angular fragments of volcanic ash-rock and of gray granite.

Among other openings visited in this part of the district, were the Timiskaming and Hudson Bay and the McKinley and Darragh mines. The last named has been already mentioned as the site of the first discovery of silver in the district. Only a small amount of work had been done on this property, but an opening which had been made on a vein at the water's edge in the southern angle of the lake, showed a promising amount of native silver, together with some smaltite.

At the Timiskaming and Hudson Bay Company's mine the silver-bearing vein which was worked runs northeasterly and is four inches wide, with silver also in the walls. I was informed that here a stope, only 30 feet long and 25 feet high, had yielded two car loads of ore, which sold in New York for $32,500 and $7,000 respectively.

The Jacob's mine, already mentioned, lying to the southeast of Petersons Lake, affords one of the best examples of a silver bearing vein cutting the dark greenish-gray crystalline diabase of the district. The vein, which is of calcite, runs north and may be seen along the west side of an adit which has been driven 120 feet on its course into the side of a hill. At first the vein is only two or three inches wide, but in advancing into the adit it is seen to increase to four and eight inches, and in one part, where it is split up and brecciated, it has a width of ten inches and holds bunches of native silver. In another part also the vein was observed to be rich in the metal. Higher up the hill, an open cut has been made along the same vein with a depth of 25 feet, for a distance of 70 feet, from which it is continued on the adjoining White-Hargraves property. Smaltite and a mineral like niccolite also occur along this vein.

The captain in charge informed me that 23 tons of ore, containing about 3,000 ounces of silver to the ton, besides a little cobalt, nickel and arsenic, had been shipped from the mine during the present spring; also that last year two car loads of ore had been sent from this vein and three from another one, which had been previously opened on the property.

Mr. Henry Richardson, manager of the McLeod and Glendenning (or Hanson) mine, informed me that two calcite veins occur on that property, 300 feet apart, both running northeast and southwest. The one to the northwest is in diabase and is rich in silver, with smaltite; while the other is in slaty agglomerate and carries no silver. The widest part of the productive vein is four inches. The mine consists of an open cut 60 feet long. Ten tons of ore have been shipped.

Mr. Richardson also informed me that the Violet mine, on the lot adjoining the Hanson to the north, is entirely in diabase. Some of the rock is here rather coarsely crystalline, while some of it is fine-grained and as darkly colored as that of the Jacobs mine. The Violet mine has a shaft 90 feet deep and a cross-cut level has been stared to the southward. A little silver ore has been taken out of an open cut. Both the Hanson and the Violet mines show a good deal of smaltite.

The Drummond mine is at the east end of Kerr Lake. Here two smaltite veins occur about 8 feet apart. Between these, horizontal streaks of silver are found in the agglomerate which constitutes the country rock. There is an open cut about 20 feet deep and a shaft is being sunk.

The northern angle of the Lumsden and Booth, or Gillies, timber berth protrudes from the south into the centre of the silver district. This has not been disposed of by Government for mining purposes and it has not been referred to in the above descriptions of silver-bearing properties, although some rich veins are known to occur in it.

The number of veins or vertical zones of fracture carrying silver, which have been already found in so limited an area as the Cobalt silver district, must be considered large, and the question is asked—what are the prospects for further discoveries within the district in the future? Where so many discoveries have been made, while so large a propor-

tion of the surface of the rock is covered with earth and this again by a thick growth of coniferous trees and deep moss, it is reasonable to expect that many more will follow when the timber is removed and extensive costeaning is undertaken.

The Nipissing Company is installing heavy machinery for the purpose of pumping water from Petersons Lake to high levels, with a view to washing the earth entirely off the surface by the hydraulic process. This will allow of a complete search being made for the outcrops of the vertical silver-bearing zones, which are often inconspicuous at the surface and might escape discovery by the ordinary methods of prospecting.

From our present knowledge it would appear that the silver has a regional environment as well as certain local geological relations, resembling the mode of distribution of the richer nickel ores in the Sudbury district. There, outside of a certain area, although the geological conditions may be similar, no one ore rich enough to work can be found. Similar phenomena obtain in other parts of the world in regard to other metals, such as tin and mercury. Although diligent prospecting has been carried on throughout a large area outside of the silver district immediately around Cobalt, no discoveries of similar occurrences of silver have been made. I may, however, mention that traces of native silver have been discovered recently on the east side of Lake Timiskaming at a place which lies in a line with the northeasterly course followed by the successive silver mines in the centre of the Cobalt district. This discovery is close to the Wright silver-lead mine, which is in a very pronounced volcanic agglomerate. A thorough exploration of this part of the lake shore and the country behind it might bring out interesting results.

Small quantities of smaltite have, however, been found in different localities beyond the silver district. It now appears that the silver is not necessarily connected with this mineral. It has been mentioned on a previous page that in the Cobalt district the largest bodies of smaltite so far tested contain only traces of silver. Unless the conditions necessary for the production of the silver itself are repeated in some other locality no further important discoveries of this metal may be made in this part of Canada.

One of the most vital questions in connection with the silver mining in the Cobalt district is that respecting the depth to which the deposits may continue. The direct evidence afforded by the main vein of the Larose mine carries us down only 205 feet from the collar of the shaft, but the silver-bearing character of two other veins, which cut the 80 feet of agglomerate, etc., above the level of the collar, may be considered in this connexion, which would give us a depth of nearly 300 feet. The ore and rock brought up from the lowest workings of this mine show that the vein has undergone no material change so far, being about equally rich and varied in its contents all the way down; but, as above mentioned, there is in the lowest workings an increase in the proportion of argentite, and the vein and its walls have a firmer and fresher character. Good-sized flattened nuggets continue to be found among the native silver. At the 800 feet level the line of fracture is marked by two parallel calcite veins of 5 and 7 inches respectively, separated by an interval of slaty tufa, rich in native silver, which also extends, as thin plates, into the wall-rock on either side, as far as four feet in some parts.

It may be reasonably supposed that the farther a vein can be traced on the surface, the deeper it is likely to go. Although nearly all the individual veins are small, they may be regarded as only one manifestation of a mineralized plane or zone of fissure or disturbance. The fact that these fissure-planes, or lines of fracture, are vertical, and that they coincide with the prevailing system of strong joint-planes are circumstances favorable to persistence in depth. The agglomerate and its associated rocks have been found, by means of the shaft and boring at the Larose mine, added to the height of the rocks above the shaft, to have a depth of at least 300 feet, but it may be much greater than this. The thickness of the jointed agglomerate may be found to have some influence, not only on the depth of the fissures, but also on their argentiferous character, as the silver appears to have been derived from the country-rock in which the veins occur. If the veins prove to pass down through the agglomerate into some underlying rock their sliver contents may continue downwards with them.

If a comparison be made between the geological and mineralogical conditions at Cobalt, and those of the Thunder Bay silver region, it will be found that there are more points of difference than of resemblance in regard to the principal group of mines in the latter region, which embraces the Rabbit Mountain, Silver Mountain, Porcupine, Beaver and West End mines. In all these the silver occurs, both native and as argentite, in well-marked brecciated veins of quartz, which cut down through a heavy sheet of diorite into a great thickness of darkly colored unaltered shales, lying horizontally. These belong to the Animikie series, which is much newer than the rocks of the Cobalt district. The conditions at the Shuniah and Thunder Bay mines a short distance northeast of Port Arthur, have some resemblance to those of the mines just mentioned, and both of them were rich in native silver at the surface, but on sinking, it soon gave out. At the Silver Islet mine the conditions were quite different. A broad dike of a peculiar variety of diorite, which can be traced for miles parallel to the northwest shore of Lake Superior, cuts through a great thickness of nearly horizontal gray and nearly black unaltered shales. A very strong vertical calcite vein cuts this dike almost at right angles. Ex-

The Station at Cobalt.

Group taken in the outcrop of a Cobalt vein.

cept where traversing the dike, the vein holds nothing but a little galena. But the part which lay within the dike, and constituted a perpendicular square prism, proved to be rich in argentite and native silver, to a depth of about 1,000 feet, when it began to fail and at 1,200 feet it had become so poor as to be no longer worth working. The total value of the silver taken from this mine amounted to about $3,250,000. The rock of the dike itself, on analysis, was found to contain a variety of metals in notable quantities.

On the shore of Thunder Bay, a short distance to the northeast of the Shuniah and Thunder Bay mines, a rather small vein which cuts both the Huronian and Animikie rocks was worked to a limited extent under the name of the 3A mine. It was noted for producing occasional specimens of nickelite.

COPPER STATISTICS.

The fourteenth annual issue of Messrs. Aron Hirsch & Sohn's Copper Statistics gives the copper production of the world for the preceding twelve months. The following extracts should be of interest to all connected with the mining, smelting and refining of copper:—

The most complete estimate of the world's copper production is published by Henry R. Merton & Co., Ltd., of London, whose figures for 1905 are not yet available. We give their figures for former years for comparison:

1880: 153,959 t, 1885: 225,592 t, 1891: 279,309 t, 1892: 310,472 t, 1893: 303,975 t, 1894: 324,405 t, 1895: 334,565 t, 1896: 373,363 t, 1897: 397,390 t, 1898: 424,126 t, 1899: 470,866 t, 1900: 486,084 t, 1901: 518,788 t, 1902: 542,470 t, 1903: 565,828 t, and pro 1904: 640,935 t.

STATISTICS OF THE PRINCIPAL COPPER CONSUMING COUNTRIES.

Germany.

	1904.	1905.
Importations, except ores:		
From United States	98,417	90,202
From other countries	30,555	33,830
Total	128,972	124,032
Less re-exports	14,343	17,663
	114,629	103,369
Production, including prod. from imported ores	30,456	30,533
Home consumption	145,085	136,902
Exports of manufactures	64,085	77,993

The apparent decrease in German consumption, contrary to the evident better business of the copper consuming industries, is explained by the fact that the high prices ruling in 1905 caused consumers to reduce their supplies to a minimum, while in 1904, foreseeing the advance in prices, consumers had bought freely forward.

A careful investigation of the different branches of consumption of copper in Germany has resulted in the following estimate:—

	1904. Tons	p. cent.	1905. Tons	p. cent.
Electrical machinery and copper wire	59,000	40.50	57,500	42
Sheet copper; Copper rolling mills.	23,000	16	24,000	17.50
Brass mills	37,000	25.25	35,000	25.50
Chemical industry and blue vitriol makers	2,000	1.25	2,000	1.50
Shipyards, railroads and miscellaneous casting	25,000	17	18,500	13.50
	146,000		137,000	

The above figures of consumption do not provide for the movement of old metals in Germany. We estimate that about 20,000 to 25,000 tons of old metals pass annually back into consumption, and this quantity has to be added to above figures in order to arrive at the figure of actual consumption.

There is no Metal Exchange in Germany and consequently no stocks of copper are accumulated, the quantities imported going practically all into the hands of consumers.

The outlook continues to be an excellent one.

England.

	1904.	1905.
Imports of copper in ores, pig or refined.	157,897	139,313
Domestic production	225	200
	158,122	139,513
Decrease of stocks	.....	3,047
Increase of stocks	3,048	.....
	155,074	142,560
Exports of crude copper	21,794	35,162
Domestic consumption	133,280	107,398
Exports of manufactures	34,617	31,590

(In figuring up the English copper consumption, the increase or decrease of stocks carried in public warehouses is taken into consideration.)

United States.

	1904. Tons.	1905. Tons.
Production: Reporting mines	366,522	397,545
Production: Outside sources	.....	.....
Imports (less re-exports)	79,910	94,211
	446,432	491,756
Home consumption	214,285	277,053
Exports to Europe	247,421	239,863
Stocks at the end of the year	79,094	56,762

The figures of consumption for 1904 are estimated on the following basis:—

January to March	40 millions lbs.	monthly	120 mil. lbs.	
April to June	38 "	" "	114 "	"
July to September	39½ "	" "	118½ "	"
October to Dec'ber	42½ "	" "	127½ "	"
			480 "	"

or 214,285 gross tons.

The figures of consumption for 1905 are estimated on a basis of a consumption of 50,000,000 lbs. per month, but as good authorities think this basis was exceeded in certain months, we add an amount of 5,000 tons for the year, viz., 600,000,000 lbs. equal to 272,053 tons plus 5,000 tons making a total of 277,053 tons.

Details of Production.

	—1904— corrected figures, according to the Geological Survey.	—1905— Our own estimation.
Lake Superior	208,309,130 lbs.	218,000,000 lbs.
Arizona	191,602,958 "	231,000,000 "
Montana	298,314,804 "	325,000,000 "
New Mexico	5,368,666 "	5,000,000 "
California	28,529,023 "	21,000,000 "
Utah	47,062,889 "	58,000,000 "
Colorado	9,506,944 "	10,000,000 "
Alaska	2,043,586 "	5,000,000 "
Wyoming	3,565,629 "	2,500,000 "
Idaho and Nevada	2,158,858 "	1,000,000 "
Tennessee and Southern States	15,211,086 "	12,000,000 "
Other States	863,694 "	2,000,000 "
	812,537.267 lbs. = 362.740 t.	890,500.000 lbs. = 397.545 t.

In our last year's issue, we pointed out the importance of the American production upon the world's copper market, and paid a tribute to the far-sighted policy which guides the actions of the able leaders of the principal producing companies.

Stocks on 31st December, 1905, are shown to be 56,762 tons; we would, however, call attention to our last year's observation of the fact that, of the total American production of Electro Copper, two months' production is always partly in course of transit to smelters and partly in the process of electrolytical refining, being thus withheld from the market.

We ascertain the production of electrolytical copper by deducting from the total production, those quantities which were either delivered in the form of unfinished products, such as Matte or Blister Copper or subjected to the fire process, as Casting or Lake Copper.

	1904.	1905.
Production, including imports	446,432 t	491,756 t
Unrefined Pig-Copper exported to Europe	20,143 t	14,953 t
Mattes exported to Europe	466 t	50 t
Production of ordinary Casting Copper (estimated)	25,000 t	35,000 t
Production of Lake-Copper (estimated)	78,000 t	85,000 t
	123,609 t	135,003 t
The Electrolytical Copper production is consequently	322,823 t	and 356,753 t

This latter figure of 356,753 t, arrived at by indirect method, is confirmed by the fact that the capacity of the ten largest American electrolytic refineries amounts, as we know, to about 350,000 tons.

One-sixth of this amount, i.e., two months' production, is about 55,000 t, after deduction of which it is seen that the apparent stocks of 56,762 tons are actually not available.

Last year we drew attention to the fact that a total of 25,000 tons available stocks with a production of 446,432 tons, was dangerous. It is immediately clear that this year, with no stocks at all, the position is accentuated.

We add detailed comparative figures for the principal producing districts:—

	1904. Tons.	1905. Tons.
Arizona	85,267	103,128
Michigan (Lake)	93,750	97,321
Montana	139,280	145,088
All other States	48,225	52,008
	366,522	397,545

France.

	1904. Tons.	1905. Tons.
Imports of crude copper:		
From United States	40,096	35,943
From other countries	19,478	22,188
Imports copper in ores (contents estimated)	6,000	5,600
	65,574	63,731
Decrease of stocks	.....	1,279
Increase of stocks	1,340	.....
Consumption	64,234	65,010
Export of manufactures	11,315	8,556

(Our estimates of French copper consumption have differed for the last ten years from those compiled by other statisticians, but our method of getting up the figures for France is the same as for all other countries and, therefore, preferable for purposes of comparison).

Austria-Hungary.

	1904. Tons.	1905. Tons.
Imports of crude copper:		
From United States	13,418	13,648
From other countries	9,114	8,886
Imports of copper contained in ores, old metal, etc.	4,849	5,530
Total imports	27,381	28,064
Brought forward	27,381	28,064
Domestic production	1,150	1,500
	28,531	29,564
Exports of crude copper, etc.	2,165	3,734
Home consumption	26,366	25,830
Export of manufactures	1,977	2,369

Russia.

	1904. Tons.	1905. Tons.
Imports of crude copper	20,326	19,688
Imports of manufactures	344	409
Domestic production (1903, est.)	10,700	8,700
	31,370	28,797

Italy.

	1904. Tons.	1905. Tons.
Imports	14,190	16,051
Exports	195	155
	13,995	15,896
Domestic production ....estim.	3,500	3,300
	17,495	19,196

SUMMARY AND REVIEW.

During the last few years, we have regularly been able, when looking back upon the last year, to describe same as a record year of the copper mining industry. It would seem as though this phrase is becoming a permanent one, for each year exceeds the preceding one, in quantity of production:—

We recapitulate the figures of the world's production:
1904—640,935 tons. 1905—697,845 tons.

Of late years, the copper production has been growing at the rate of about 8 to 10 per cent. per year; it is, however, worthy of note that the increase in the production of 1905 over that of 1904, viz., 56,910 tons (640,935 : 697,845) was proportionally smaller than that of the years 1891 : 1892, viz., 31,163 tons (249,309 : 310,472).

Note the increase of over 100 per cent. in ten years from 1894—324,405 tons to 1904—652,522 tons.

According to our information one may reckon upon an increase during 1906 of 55 to 60,000 tons in the world's production, of which 50,000 tons approximately may be reckoned as being the increase of the United States, Mexico and Canada together.

Consumption of Copper.

	1904. Tons.	1905. Tons.
Germany	146,006	137,975
France	64,234	65,010
United Kingdom	133,280	107,393
United States	214,285	277,053
Austria	26,366	25,830
Russia	29,624	28,794
Italy	18,162	20,314

Estimated figures of the consumption of the less important European countries:—

	1905. Tons.
Belgium	8,000
Scandinavian countries	3,000
Spain, Switzerland, Levant	2,500
	13,500

As to the Far East we have taken special care to arrive at a fair estimate and give the following figures as approximately correct:—

	1904. Tons.	1905. Tons.
Asia	38,175	85,743

The two latter figures are compiled as follows:—

	1904. Tons.	1905. Tons.
Japan's production (minus exports to Europe)	25,000	29,400
Australia's exports to Asiatic countries.	7,000	10,000
United States exports to Asiatic countries	4,675	43,343
Europe and other countries exports to Asiatic countries	1,500	3,000
	38,175	85,743

Recapitulating, we arrive at the following comparisons of consumption and production:—

	1904. Tons.	1905. Tons.
Germany, United Kingdom, France, United States	557,805	587,436
Austria, Russia, Italy	74,152	74,938
Other European countries	13,500	13,500
Asia	38,175	85,743
	683,632	752,617
Production	652,522	697,845
Excess consumption	31,110	54,772

In consequence of bad trade, there were at the end of 1901, large stocks of copper on hand; since then, however, stocks have been regularly diminishing. Of course, the large quantities of old copper which are always in existence add appreciably to the world's supply, and, as explained in former issues, renders the giving of exact figures impossible. The phenomenal Asiatic consumption of last year, is an event which is unique in the history of copper statistics.

Prices.—The copper trade of the world knows four principal grades and qualities of copper, viz., in the United States. Lake and Electrolytic-copper, in Europe: Best Selected and Standard copper. As "Standard copper" is known the staple article which is dealt in on the London Metal Exchange, and which fluctuating widely, serves as a plaything for speculators while the trade in the other grades mentioned is carried on in a quiet and steady manner merely for the purpose of supplying the legitimate wants of consumers. Owing to the continued decrease of supplies of so-called Standard copper as compared with the increasing trade in other grades, and in order to prevent a corner which might have been easily engineered with stocks down to 4,277 tons Dec. 31st, 1903, the London Metal Exchange has since 1904 adopted a rule permitting the delivery of the three trade qualities against Standard contract on a fair basis, viz., high conductivity copper assaying 99.80 per cent. and more, deliverable at a premium of £1.—, Tough, Best Selected and Casting copper grades assaying 99.30 and over, at a premium of 10s—p. ton, material assaying 99—99.30 per cent., at par, if below 99 per cent., but minimum 96 per cent. at £1.10—discount. The discount of 2½ per cent. heretofore customary has been abolished.

Although deliveries of refined copper against Standard contracts are not frequent, we consider the rule adopted an excellent one and wholesome for the market, because it tends to lessen the dangers of a corner. The market for Standard copper, subject to nervous fluctuations like every market made on an open exchange, remains, however, in spite of the above mentioned rule, too small to be considered a fair criterion for the price movement of the real copper used by consumers; stocks at the end of 1905, amounted only to 4,223 tons. Nevertheless everybody interested in copper all over the world looks at the quotations made twice daily on the London Metal Exchange and is influenced more or less by the ups and downs of this market, in his decision as to the course to pursue regarding purchase or sale of crude or refined copper. While this attitude is justifiable in a way, we wish to warn all parties interested not to place too much importance on the daily fluctuations and small variations of the London quotations, which, as a rule, do not foreshadow coming events, but are the outcome of speculative opinions.

We add comparative figures for the four principal grades of copper for 1905:—

Electrolytic in Cents:	Jan.	Febr.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Average price
Lowest price	15.—	15.20	15.20	15.12½	15.—	15.—	15.—	15.45	16.22½	16.37½	16.50	17.07½	—.—
Highest price	15.20	15.20	15.20	15.20	15.—.—	15.—	15.17½	16.62½	16.50	16.50	17.75	18.75	—.—
Average price	15 15	15.20	15.20	15.18	15.—	15.—	15.11	15.87½	16.22½	16.50	16.84½	18.59	15.82.3
Above mentioned price for Electrolytic equiv in £ per ton	69.14.7	69.18.5	69.18.5	69.16.7	69.—	69.—	69.10.1	73.—.6	74.12.7	75.18 —	77.9.9	85.10.3	72.15.9
Lake in Cents	15 28	15 32.5	15.32.6	15.27	15.—	15.—	15.11	15.87.5	16.22 5	16.50	16.87	18.59	15.89
Lake equiv. in £ per ton	70.5.9	70.9.10	70.9.10	70.4.10	69.—	69 —	69.10.1	73.—6	74 12.7	75.18	77.12.—	85.10.3	72.19.5
Best Selected £ per ton	7 .17 9¼	71.5.—	72.6.1¼	71.8.9	69.14.5¼	70 10.6¼	71.10.7½	74.18.11	75.13.4	76.17.9¼	79.6.10½	86.—	74.5.10
Standar t £ per ton	68.8 7½	67.19.8¼	68.3 8	67.0.7½	64 19.8	66.—3	66 17.8	70.—.11	69.16.6½	71.18.3¼	74.17.10	79.—6¼	69 12 0¼

In our last year's statistics, we gave it as our firm opinion that the world's demand during the year 1905 would be very great, and that the phenomenal demand of Europe in particular would be sustained. We further stated that the United States of America would require 50 million pounds monthly, i.v., 300,000 short tons, in the course of the year and that the production, greatly increased as it was, would be entirely absorbed, especially in view of the expected far larger demand of Asia.

All this has come to pass; still further, the demand has greatly surpassed the production, for not only the European, but also the American stocks were almost exhausted at the end of 1905.

The English and French stocks sank from 10,009 tons at end of 1904, to 5,687 tons at end of 1905, and since then have fallen by a further 1,500 tons, whilst the American stocks fell from 79,094 tons to 56,762 tons during the same period.

This proves clearly that not only is the world's production which rose in this one year from 640,935 tons to 697,845 tons entirely exhausted, but also that consumers had to fall back upon the supplies, already so scanty at the end of 1904. It may, too, be mentioned that about two-thirds of the stocks of England and France consisted of the less valuable "Standard Copper," which is rather an article of speculation than a material which can be used by the majority of consumers.

We have explained that of the 56,762 tons, of which, according to our statistics, the American stocks exist; about 55,000 tons must be considered as an unavailable quantity, as this amount is withdrawn from use, being either in the course of refining or en route.

One must also take note of the fact that the Geological Survey in Washington fixed the supplies on 31st December, 1904, at only 119,215,597 lbs., or 53,221 tons, which is again a reduction of 25,000 tons as compared with our last year's estimate of 79,094 tons.

All these facts taken together afford absolute proof that at no time in the modern history of the copper market was there such a dearth of supplies and did copper consumers so strongly feel the consequences of a copper famine, as at the present time. In December, 1905, it was often not so much a question of price as an actual lack of material which consumers felt so keenly. Many works had to curtail the extent of their manufactures, it having been impossible to obtain sufficient raw material in time, although the mines and refineries sent off supplies, so to speak, hot from the oven. Contrary to all previous experience, consumers demanded delivery at the beginning of a month of copper, which, under contract, was due only in the course of that month. Producers

were of course for the most part entirely unable to accede to this wish. It is therefore quite natural that relations between producers and consumers often became strained, without either party being actually to blame.

Now—end of February—the situation is in a somewhat better position, in as far as sellers are better able to conform to the wishes of purchasers regarding deliveries of quantities which had been contracted for in advance. Nevertheless, the fact remains that copper for prompt delivery is unpleasantly scarce.

Under these conditions, the development of all copper consuming industries was periodically considerably affected; it is, however, to be hoped that occurrences of such a nature will not reappear during this year, as the expected increase in the world's production, which we tax at 50,000 to 60,000 tons, will aid matters considerably.

We predict with the utmost confidence that the excellent conditions of the industry in Europe and America will be sustained, and base our opinion on that fact that orders have been booked for months in advance, and besides many large new undertakings have to be supplied with material. Even a bad condition of the stock markets, which might be caused by dear money, would have no adverse effect of any importance upon the healthy conditions which now reign in the copper consuming industries.

The reason for the insufficient material which European manufacturers have in hand is as follows:

In the months of September and October, 1904, when copper in New York rose from 12¾c to 13¾c, a further advance of price was foreseen, in view of the increased demand, and consumers bought in advance to cover their requirements for some months to come, in order not to have to pay the expected higher prices. It was indeed a fact that the months of November and December brought prices of 15c to 15½c. Hence the tactics of consumers proved to be correct. They then thought, however, that by adopting a waiting policy, they would induce the American producers to come down to their ideas. This expectation was not realized, for they had reckoned without their host, America having meanwhile developed a home-demand, which prevented a fall in price. Thus in the summer of 1905, prices remained over 15 cents, in August they advanced to over 16 cents, and by December, had risen to between 18 and 19 cents. Prices have not yet (end of February) suffered any decline and a continued firmness of the market must be expected.

It is worthy of attention that the Chinese, in view of the advance of price witnessed during the last quarter of 1905, were able to make considerable profit by re-selling large quantities of copper to Europe. The total amount of these unexpected European supplies—consisting partly of re-shipments from China, partly of direct shipments to Europe, from America, of quantities bought by China but not yet delivered—was more than 15,000 tons. But even these unexpected considerable supplies, were only sufficient to temporarily somewhat depress price; these facts offer further proof of the scarcity of the world's supplies.

Another effect of the Chinese re-sales is that China is now almost without any copper at all, and will have to reappear in the world's market, directly she experiences any fresh demand.

The industrial demand has too certainly not yet arrived at a standstill. As a rule, after such a big rise, a reaction sets in or there is at least a temporary pause, in the present case, however, there are sure indications of a large demand in 1906.

Railroads, shipbuilding, electric railways, etc., all require large supplies; the electrical trade all over the world is expecting extension of trade.

The Boston News Bureau, a well-informed organ, states on the 6th Feb. of this year that whereas the General Electric Company had in 1899 8,000 workmen, they now have 24,000; this company is so well supplied with orders even up till the autumn that is already partly covering its requirements in spite of the present high level of prices.

Similar conditions reign in Germany. The Allgemeine Elektrizitats-Gesellschaft has seen its staff advance during the same period from 13,000 to 30,000 men; we agree with this company in their opinion that a far greater consumption took place in Germany in 1905 than in the previous year, although the copper imported fell from 134,972 to 130,532 tons.

Of England the same tale may be told. In spite of the lesser amount imported in 1905, viz., 139,313 tons as compared with 157,897 tons, in 1904, the consumption in this country has not grown less. Every kind of material has everywhere been consumed. The Americans are most sanguine when they affirm that their own production of pig iron, which amounted in 1855 to but 563,000 tons, in 1905, however, to 22,000,000 tons will increase to 40,000,000 within the next 10 to 15 years. As for copper, it is expected that the present American demand of 300,000 tons will advance to 1,000,000 tons in the same period. Even if we Germans are not so extravagant in our forecasts, nevertheless when one looks back, one must perforce admit that the ideas of our friends over the water may after all not fall so short of the mark.

Germany's consumption of copper amounted in 1880 to 19,622 tons; 1891, 56,888 tons; 1900, 116,900 tons; in 1905, 137,975 tons. A glance at the figures of production teaches us that the consumption is capable of considerable increase. As already stated, these figures were in 1800, 9,000 tons; 1830: 21,000 tons; 1860: 90,000 tons; 1870: 100,000 tons; 1880: 200,000 tons; 1890: 269,000 tons; 1900: 480,000 tons; 1905: 697,765 tons. Again, one must certainly take into consideration the doubtlessly developing demand of Asia. Central and North America are also coming more and more into the scene of action.

The development of the German coal production of pig iron rose (reckoned in million tons) from 2.1 in 1876 t 8.5 in 1902 and 10.9 in 1905.

Reckoned per head of the population, the coal demand rose from 1,170 kilos. in 1876 to 2567 kilos. in 1902 and 2,893 kilos in 1905, and that of pig iron from 51.6 kilos in 1876 to 141.1 kilos. in 1902 and 181.6 kilos. in 1905.

The North Americans reckon their present pig iron demand at 630 lbs. = 283 kilos. per head. This latter high figure can be well understood when one considers that the length of the North American lines of railroads amounted in 1902 to 325,777 km. (in 1905 to 362,000 km.) as compared with 296,051 km. for the whole of Europe, of which Germany's share is 53,700 km.

The growth of German trade statistics also shows healthy and encouraging signs of development. Since 1893 our imports have risen (reckoned in million tons) from 35.1 to 54.3 in 1905, and during the same period, our exports have risen from 25.9 to 40.5.

These general statistical determinations may serve to enable one to judge the copper statistics in combination with events connected with other commodities, and not narrow-mindedly and from the standpoint of the article itself alone.

We expect this year to be a year of peace and believe one may expect that the great demand which is expected will meet with adequate supply to the blessing of the mining industry and the copper industry in general.

COBALT CAMP.

Shipments of silver ore from Cobalt during the month of September amounted to twenty-five carloads, divided as follows:—

The Kerr Lake Mining Co.	2 cars.
Nipissing Mining Co.	9 "
University Mining Co.	2 "
Buffalo Mines	4 "
Drummond Mines	2 "
Larose Mining Co.	3 "
Silver Queen	1 "
Violet Mines	1 "
Nova Scotia Mines	1 "

It is probable that these carloads of ore were fully as valuable as those that have been shipped

heretofore, though, at present, it is impossible to be certain of this. The list does not include, by any means, all the mines that have shipped ore, as several of them are holding back awaiting smelting facilities.

Seeing that the mines that are now sufficiently developed to ship, are down but a few feet it is evident that the possibilities of the camp are very great, for, though Cobalt in itself has produced a large amount of valuable ore, better still, it has stimulated enquiry as to the vast regions upon the outskirts upon which it is situated. Hundreds of men have been in the northern woods this summer, and within a few weeks we may hope to hear that some of them have been successful. The latest report as we go to press, is that gold has been found in paying quantities on the north shore of Larder Lake. This lake is on the Ontario side of the Interprovincial Boundary, a few miles south of the Height of Land. The officers of the Geological Survey are to be congratulated, that in a recent report, they indicated the probability of gold being found in these regions, although, they seem to have inclined to the belief that Lizard Lake, east and south of Larder Lake, would be the probable scene of the discoveries—and it is quite possible that their predictions may be verified in the near future.

RENEWAL OF MINING ACTIVITY IN THE THUNDER BAY DISTRICT.

Mr. E. D. Ingall, mining engineer of the Geological Survey, has just returned from a tour amongst the copper mines of northwestern Ontario. The conclusions at which he arrived will shortly appear in the Department's Summary Report, but meanwhile it is no secret that Mr. Ingall was considerably impressed by the renewed activity in the copper districts, due to a large extent to the present high price of that metal, but also to their being more easily accessible than formerly.

Mr. Ingall says that prospecting for copper ores is just now very active and that development and exploratory work are being prosecuted at a number of points along the north shores of Lakes Huron and Superior.

Underground development is being actively continued at the Tip Top mine, near Lake Shebandowan, west of Thunder Bay as well as at the Herminia, Deal Lake, Superior, Echo River, and at various points distributed along the range of country lying adjacent to the north shore of Lake Huron and between the well-known nickel-copper ore district of Sudbury on the east, and the eastern shores of Lake Superior.

The wide distribution of copper ores throughout this region was pointed out in the earliest publications of the Survey and interest attaches to the recent reopening of the Bruce mines series of veins. These were operated as far back as the year 1847. and mining was successfully continued for a period of some twenty-eight years when the difficulties due to their isolated situation and the drop in the price of copper caused a cessation of mining. Now after a long period of rest and various vicissitudes these old and interesting mines are being reopened by an English Company and it is believed that, with higher prices for the product together with the great improvements in methods and machinery and in the general conditions of the district, operations can be carried on with profit.

The already proved prevalence of copper ores over so extensive a territory, together with the present activity in exploring and the promising nature of some recent discoveries, justifies the hope that the problem of profitably treating the sulphuret ores of northwestern Ontario will be solved at an early date.

CORRESPONDENCE.

OUR NOBLE HERITAGE.

The Editor Canadian Mining Review:

Dear Sir,—Your extra copy of the Mining Review for August was duly received on my return from Europe, where I was sent for a few weeks' rest.

I notice that you have honored me with a review of my little work compiled at the time that the Parliament of Canada wanted information on the resources of the country between Quebec and Winnipeg, along the line of the National Trans-Continental Railway.

From the notes of the surveyors and the accounts given me by them along the same line since the blue-book was prepared, I can state that the most sanguine expectations as to the resources — mineral, agricultural, and others, have been realized and even surpassed.

I firmly believe that we shall have areas of untold mineral wealth in the various belts of Huronian rocks which are to be traversed by the new Trans-Continental Railway. Iron, copper, nickel, silver, and gold will be the chiefest, whilst rarer elements, including the precious metals and stones, and gems, may be expected.

Ever since Prof. Hobbs has advanced his report on the occurrence of diamonds in the drift of the Northern States, I have been a firm believer in the likely discovery somewhere in Canada of a diamond-bearing field. It is a simple bit of inductive reasoning, a clear piece of logical deduction from the facts and phenomena observed and discovered by Prof. Hobbs's researches.

The 14,000 copies of this blue book prepared and the demand for the same have shown how eagerly such a report, even though a Government blue book, is sought after.

The amount of further information which has been asked of me at the department since the publication of the same, and the large amount of material which has been gathered in the way of samples of rocks and minerals of economic value show clearly what a mineral-bearing belt the Huronian is throughout the region in question, and the Great or Abitibi Belt of Huronian rocks carrying minerals will form an area of enormous size and wonderful wealth as the country is being opened up. The discovery of minerals will lead to the development of the agricultural capabilities which, I truly believe, will not be inferior to the mineral wealth. The vast areas of loamy soil and good agricultural ground in the Hudson Bay Basin, the character of the climate as well as the attendant conditions, must some day soon be developed. There are many persons who prefer settling in districts

where there are trees and diversified features of the land rather than settle on the treeless prairie. These will find a suitable place in the silver and gold region of the country traversed by the Trans-Continental Railway, especially where the marine sediments of the Bay have been laid over the flat-lying rocks of the Palaeozoic Basin, or over the old crystalline and mineral-bearing formations.

The fact that Hudson Bay does not freeze across, any winter season, but only along a margin or fringe of some nine or ten miles (as we have been credibly informed by explorers), which bay covers an area of not less that 367,000 square miles of salt water, which attracts and draws heat-rays and heat within its bosom during the summer-time, this fact, means that a most powerful influence is exerted by the waters of this bay upon all the country around, the whole year round.

The resources of Canada are only beginning to be made known and to be appreciated. Legitimate mining can and will be carried on in this country soon which will astonish even the most enthusiastic. To have faith in our own resources as the result of personal observation is not a difficult task. It is for those who have the means to develop—to go-ahead with the financing of the enterprises in opening the bosom of Mother Earth and obtaining the treasures that are therein stored up.

I have great faith in the future of the North Country between Quebec and Winnipeg a long the line of the national Trans-Continental Railway and its coming ramifications which will tie together the two great basins and give us an area of forest lands and picturesque scenery. There will be Trans-Laurentia and a Cis-Laurentia. We in the older settled portion of Eastern Canada occupy Cis-Laurentia, whilst the new basin of the James Bay region, with its great alluvial plains and fertile belts, will constitute the Trans-Laurentia, a fair rival with fine possibilities.

Yours very sincerely,

H. M. AMI.

Ottawa, August 28, 1906.

THE MINING PROMOTER.

We have all met the persuasive individual who, armed with a prospectus full of glittering promises and holding out roseate hopes of the "get-rich-quick" order, goes about seeking his victims among people chiefly in moderate circumstances. We have also read the literature which he hands about promiscuously, and wherein a so-called mining expert draws upon his vivid imagination in describing the enormous extent and depth of the ore bodies. In such literature we generally encounter our old friend, the true fissure vein, which is supposed to go down to immeasurable depths, of course becoming better all the time.

We have also met the matter-of-fact business man, who was willing to give full information about the mining properties which he has, clearly stated his reasons for believing in their value, and was willing to submit them to expert examination. Unfortunately the first class is more in the public eye, and they have done a great deal to hinder the development of legitimate mining enterprises.

It has come to pass that among certain classes of even otherwise well-informed people, investment in mining stocks is considered little else than a form of gambling, with the odds greatly against the investor. Of course the element of chance and the possibility of getting quick returns for the money invested is one of the prime incentives for investment in new or partially developed mines. If that element were removed people might as well invest their money in Government bonds or other sources from which they derive a small but sure income. Before a certain stage of development is reached there is in all such propositions that element of speculation which is inseparable from mining enterprises. Confidence in the future is required to make a paying mine out of a hole in the ground. The legitimate development of mining propositions is, however, very far removed from mere gambling. There is no question that the honest bona-fide promoter, notwithstanding the bad repute into which this title has fallen, in his capacity as the man who stands between the miner and the investing public fills a useful and very necessary place. The mining engineer in active practice of his profession seldom has time and very often lacks the opportunity to attend also to the financial details. The point on which the honest promoter differs from the dishonest one is that the latter does not give the investing public a correct idea of the chances which they have to take when they go into the enterprise. It is not the question as to what the chances are which have to be taken, but the man who invests his money in a mining property which is to be developed, certainly has the right to know and clearly recognize what the chances are that he is taking. If the venture is a gamble, he should know it and govern himself accordingly.

Recognizing the deleterious influence which the unscrupulous promoter exerts on legitimate mining, it is the plain duty of every mining engineer who takes pride in the good reputation of his ancient and honorable calling, to do his share toward exposing any fraudulent schemes that come to his knowledge.—Mining Magazine

We are in receipt of Volume 14 of the Transactions of the Association of Civil Engineers of Cornell University. It contains the addresses made by non-resident lecturers, miscellaneous papers, and a list of members of the Association. Most of the papers are well thought out, and that on the "Requisites of a Civil Engineer," by Gen. W. S. Smith, is as pertinent to mining as to civil engineering.

SIX MONTHS' COPPER.

We are in receipt, through the courtesy of Messrs. L. Vogelstein & Co., New York, of the figures of the German consumption of foreign copper for the months from January to July, 1906, inclusive:—

Imports of copper in July	8,163 tons		
Exports " " " "	619 "		
Consumption " " "	7,544 "		
Imports of copper, Jan. to June.	66,679 tons		
" " " July	8,163 "		
		74,842 tons.	
Exports of copper, Jan. to June.	5,564 tons		
" " " July	619 "		
		6,183 "	
Consumption, January to July		68,659 "	

Out of the above, 7,183 tons were imported from the United States.

CAPTURED THE WEST.

The Canadian Society of Civil Engineers promoted a pleasant party to the Pacific Coast. Visits were made to Fort William, Winnipeg, Vancouver, Victoria, Nelson and other cities. In each engineering works and mines were inspected. The personnel of the party was made up as follows:—

Mr. A. Amos, Mr. C. W. Archibald, Mr. and Mrs. W. D. Baillairge, Mr. N. T. Bertrand, Miss Bray, Mrs. Boyd, Mr. W. Bucke, Mr. R. deB. Corriveau, Mr. E. L. Cousins, Mr. and Mrs. Chanute, Mr. F. A. Drought, Mr J. Duchastel, Mr. G. H. Frost, Mr. J. C. Greey, Mr. S. Groves, Colonel Jones, Mr. and Mrs. T. H. Jones, Mr. F. S. Keith, Mr. J. Kennedy, Captain B. Lindsay, Mr. W. Kennedy, Mr. and Mrs. La Violette, Mr.

C. deB. Leprohon, Mr., Mrs. and Master Miller, Mr. C. H. Mitchell, Mr. G. D. MacKinnon, Mr. W. A. Murray, Mr. T. C. McConkey, Professor C. H. McLeod, Miss McLeod, Mr. and Mrs. R. F. Ogilvy, Professor R. B. Owens, Mr. and Mrs. Papineau, the Misses Paverley, Professor J. B. Porter, Mr., Mrs., and Miss Ross, Mr. S. F. Rutherford, Dr. E. Seaborn, Mr. F. P. Shearwood, Mr. and Mrs. Frank Simpson, Miss Smith, Mr. and Mrs. W. J. Sproule, Mr. L. A. Surveyor, Mr. and Mrs. Sweet, Mr. E. VanWinkle, Mr. and Mrs. Walker, Mr. and Mrs. James White, the Misses Wicksteed.

A VISIT TO HADFIELD'S STEEL FOUNDRY.

These works at the present time cover 80 acres in extent, the foundry being the largest steel foundry in the world. It is 1,020 feet long; in addition to which there are the machine shops, with an area of 124,690 square feet, and other large shops.

The Hecla Works of the company, which are situated at Attercliffe, are now used principally in the production of projectiles, of which Hadfield's are very important manufacturers.

In addition to projectiles, the company manufacture steel castings and forgings for all branches of mining and engineering work; and to meet the demands of their customers, the East Hecla Works are set apart specially to deal with the manufacture of steel requisites for collieries and mines, locomotive and rolling stock requisites, general engineering castings, hydraulic cylinders, up to 27 feet in length, marine castings, dredger castings, railway and tramway points and crossings, including the construction of special work for junctions, crossovers, etc.; complete crushing, elevating, and conveying machinery.

For many years Messrs. Hadfield's have enjoyed a world-wide reputation for the superiority of their castings, and have done an exceedingly large business in the wearing parts of crushing machines, these parts being made of Hadfield's Patent "Era" manganese steel, of which Mr. Hadfield is the inventor and the company the sole manufacturers. The striking characteristic of "Era" manganese steel is its combination of extreme hardness and great toughness. It is so hard that it cannot be machined for ordinary use, and is of uniform hardness throughout its entire mass. In fact, it is the supreme material for resisting severe wear and tear; and amongst the many purposes for which it has been adopted, in no direction has it been more successful than when applied for the rims of road roller wheels, as it reduces the cost of maintenance to the least possible figure.

Hadfield's have always been inseparably associated with colliery and mining work of every description, and furnish all classes of castings incidental to this class of industry. Among the miscellanea may be mentioned wheels and axles fitted by Hadfield's special fast method; Rowbotham's self-oiling wheels and axles, colliery tubs fitted up complete, patent appliances, such as Sylvester's prop withdrawer; tub greaser, tub controller, and pedestal and guard. The company also manufacture all kinds of steel for mining and quarry work, amongst which may be mentioned Hadfield's special cut-quick tool steel, patent "Heclon" mining drill steel, and patent "Hecla" tool steel, for ordinary turning tools.

Messrs. Hadfield also supply complete crushing, elevating, and conveyor plants.

In the Hadfield crushers it will be noticed that the defects existing in breakers of similar types have been abolished. Great improvements have been introduced, inasmuch as the frames, instead of being of ponderous cast-iron are of patent construction in the Hadfield solid cast-steel, and as the breaking strain of steel is almost six times greater than cast iron, the whole machine is much lighter than any other in the market. This latter advantage is of paramount importance when the cost of transport has to be taken into consideration.

The machines produced by Messrs. Hadfield's are about half the weight of similar sizes of like type in cast iron, but then they are three times the strength of the ordinary machines.

Next in importance to strength and durability is the cost of the up-keep of machines of this description, and it is a question that is often lost sight of when making comparisons in the prices of different makers' machines. In the Hadfield patent jaw crusher the cost of maintenance is reduced to a minimum. The jaw faces and the side cheeks are the parts that have to be most frequently renewed, and they are made of Hadfield's patent "Era" manganese steel.

The jaw faces are made of a patented design, and, whilst being of ample strength, they are much thinner than is permissible with chilled cast iron. Therefore, in this patent crusher the weight of the jaw faces and cost of renewals are reduced to a minimum. These are decided advantages over the ordinary type of machine, even where the Hadfield patent "Era" manganese steel is substituted for the thick and heavy chilled iron jaws, as, in order to properly fit the machine, the "Era" manganese steel jaws have to be made of the same depth, thus being much thicker than is necessary.

Space limit prevents us giving further information regarding Messrs. Hadfield's works and products, but we believe the remarkable prosperity of the company is primarily due to the personality of Mr. R. A. Hadfield, who has worked unremittingly to keep the vast establishment, of which he is the chief, in the foremost rank of industrial communities.—Journal of the British Society of Mining Students.

PERSONALS.

Horace Mayhew, president and promoter of the Cape Breton Coal, Iron and Railway Company, has resigned.

Mr. G. G. S. Lindsey, general manager of the Crow's Nest Pass Coal Company, and wife; Mr. C. J. R. Bethune, of Ottawa, and Mr. V. B Wadsworth, of Toronto, have visited Victoria, B.C.

W. L. Austin, the New York metallurgist, who recently made an exhaustive examination of the Granby mines, completed an investigation of the B.C. Copper Co.'s Mother Lode mine recently.

Norman Fraser, manager of the Roche Percee mine at Estevan, has been appointed inspector of mines in the Province of Alberta. Mr. Fraser was formerly manager of a mine at Carbonado, Alta.

George W. Wooster, treasurer of the Granby Consolidated, has left the Boundary for a trip east, to visit his old home in Illinois, and to be present at the annual meeting of the company, in New York.

Mr. E. Drayton Grimke-Drayton, of London, Eng., Chairman of the Board of Directors of the Le Roi Milling & Mining Company, of Rossland, and Mr. A. J. McMillan, managing director, have paid the coast cities a visit.

Sigmund Rothschild, president of the Canadian Klondike Mining Company, operating at Bear Creek Dredge, Yukon, was in Winnipeg recently on his way to New York, to buy equipment for a general electrical plant to be used on the Yukon River next year.

Mr. R. Brown has resigned from the position of manager at the New Winnipeg Sydney No. 1, of the Nova Scotia Steel & Coal Co. There will be no filling of the position meantime. Mr. J. Johnston in addition to his other duties will undertake oversight of No. 1.

Many will regret to learn of the death of Mr. John McFee, of Belleville, Ont. He died on September 22nd, after a long illness. Mr. McFee, who was born in Glasgow, Scotland, sixty-three years ago, came to Canada with

his parents, who located in Galt, whence he came to Belleville over forty years ago. A few years later he engaged in gold mining in North Hastings and was successful in his venture. Some years later he returned to Belleville and had since resided there. His wife died two years ago. Three daughters and two sons survive hnm.

Mr. Philip Ferdinand Kobbe, director and assistant secretary of the Westinghouse Electric & Mfg. Company, died at his summer home at Stockbridge, Mass., on Friday, September 21st, aged 64 years. Mr. Kobbe was one of the pioneers in the electrical business, his efforts always having been devoted to the financial end. In 1883 he was elected treasurer of the United States Electric Lighting Company, which position he held until 1890, when the United States Electric Lighting Company was absorbed by the Westinghouse Electric & Mfg. Company, at which time Mr. Kobbe was made treasurer of the latter company. In 1896 Mr. Kobbe was made vice-president in addition to his duties as treasurer, and in 1902 he became a director of the company.

MINING NOTES.

NEWFOUNDLAND.

Engineer Powell, of the Reid Co., has gone on a cruise along Canadian Labrador, in the S.S. "Dart," prospecting for minerals. It is said that there are some valuable deposits along the coast.

The recent statements in the press that work had ceased at Baie Verte and Betts Cove and that that these mines were being abandoned are not correct. The shut down is only temporary. These mines, and that at Pilley's Island, have been worked by American capitalists incorporated as the Newfoundland Syndicate. It spent a large sum last season also in exploring the old Little Bay mine, but operations there have been abandoned as no sufficient indications of ore were found to warrant further outlay. At Baie Verte work has been shut down until next spring and at Betts Cove work underground is suspended but exploration and development on other parts of the property will go on. At Pilley's Island work is proceeding as usual but, as soon as the shipping of ore is completed, underground work will be confined to development. This temporary curtailment is due to difficulty connected with the treatment of the ores and not to any want of faith in the properties. Besides sulphur the pyrites ore handled by the syndicate contains iron, copper and a small value in gold. The sulphur is roasted from the ore without difficulty, but there has always been trouble in the resulting cinder, which contains the iron, copper and gold. Some time ago the syndicate secured patents in the United States for an improved process for treating the cinder which called for the erection of expensive reduction plants. One of these is located near Jersey City and will soon be ready for work. The other is being erected at Pittsburg, but has been delayed by a labor strike, during which the buildings were dynamited and wrecked. Consequently a large stock of cinder has accumulated and is still accumulating from the ore now being shipped, which means the locking up of just so much capital. The sulphur does not cover operating expenses and the syndicate has decided to confine operations during next winter to developing the different properties pending the completion of its reduction plants. This will mean that a much smaller number of men will be employed in the mines the coming winter, but the syndicate has no doubt as to the ultimate success of its operations in Newfoundland and as soon as its new plants are running smoothly, mining will be resumed on the former scale.

COBALT.

In order to expedite and facilitate operation at the Columbus Cobalt silver mines the manager is now installing a complete steam power plant, consisting of boiler, steam drills, pumps and air blower, with a complete outfit for rapid mining. White sinking the big shaft, at 52 feet deep, a blind cross vein running out at right angle from the big main vein was discovered.

Some idea of the enormous interest that has been aroused in Ontario by the rich mineral discoveries in the Cobalt district may be gathered from the fact that during the months of April, May and June something like fifty companies were formed, with an aggregate capitalization of $32,000,000, to exploit the mineral resources of the new mining area.

Prof. Hidden, the American geologist, is of the opinion there is no doubt of the so-called permanency of the camp, that is, the ore will be found at great depths. Under similar conditions in Germany the ore is being successfully mined at depths of 1,500 and 2,000 feet. Other mining men in camp will not risk their reputations as to the continuation with depth of any particular deposit.

Prof. Manley B. Baker, of the School of Mining, who has returned after acting as Government Inspector at Cobalt for the past four months, states that when prospectors and capitalists became aware of the object of the inspection, they were perfectly satisfied. "The real prospector, the real mining investor and the better class of people in the district are all satisfied with the new system," he said. Professor Baker looks for deep working mines in future.

G. Parry Jenkins and H. Barnard have returned from the gold fields of Northern Ontario, where the recent find has been made on Larder Lake. Notwithstanding the secrecy with which this find has been guarded, a large number of prospectors have crept in, with the result that a very large area of the gold-bearing ridge has been staked, extending probably four miles along the north shore of the lake, by two miles or more back.

Hon. Geo. T. Baird, Senator, of Andover, Victoria county, N.B., has been in New Ontario since the closing of Parliament in early July, and has his face now turned homeward for the first time since that event. In the meantime, with a reliable force of picked men, taken from New Brunswick, he has been prospecting the Cobalt district, and while he speaks quite moderately of his success, there are rumors that he is the owner of some valuable property in the silver region.

Rich ore has been found in a crosscut of the 300-foot level of the Timmins mine. This is thought to have an important bearing on the question of the permanency of the camp deposits with depth. Most of the mining in the Cobalt region, so far, has been on the surface, that is to say, few shafts are down over 50 or 60 feet. The 200-foot level of the Timmins mine showed the vein wider than and just as rich as on the surface, and this discovery on the 300-foot level, therefore, means much.

Superintendent McMillan, of the Foster mine, states he has seven car loads of ore that he expects will run from $20,000 to $35,000 a car load stored and ready to ship. The mine is now being actively worked though in primitive fashion. The ore shipped last fall realized about $50,000. A. W. Scott, of Pioche, Nevada, a mine manager of experience, is now in charge, putting a larger force at work and arranging for the installation of the necessary machinery. Mr. Scott was brought from Nevada to examine the property. As soon as he saw it he invested and was in-

duced to take the management. The mining engineer in charge, F. C. Loring, says $700,000 is already blocked out, and ready for extraction. The Foster mine is in the south belt, adjoining the Lawson, the Jacobs and the Drummond mines, all very rich properties.

The Temiskaming & Northern Ontario Railway Commission have made a new deal for the right of way mining claims in the Cobalt district, in place of the deal with the Ottawa syndicate. Of the original syndicate only Messrs. J. P. Dickson, A. W. Fraser and T. A. Bement are included in the new one. The other members are Messrs. J. G. Turriff, M.P., Edmund Seybold and George Goodwin, contractor. The negotiations were with Messrs. Bement and Dickson. The terms of the new deal are exactly the same as the former ones. These terms were better than the advertisements had called for. The syndicate is to pay a royalty of $50,000 and a flat rate of 25 per cent. on the ore taken out of the mines. The original advertisement provided for payment of a $50,000 royalty, 10 per cent. on ores assaying less than $400 gross value a ton at the mouth of the mine, 25 per cent. on ore assaying $400 and up to $1,000 per ton, and 50 per cent. on ore assaying over $1,000.

The first thing I noticed about Cobalt on revisiting it after an absence of five months is that the town itself has become quite sobered up, writes Mr. Wallace Maclean, special correspondent of the Globe. Last spring the evidences of intoxication were visible on all sides. Scores of abandoned foundations and half-built, rickety shacks remain to remind one of the wild dreams of the townspeople but the business part of the town has now become well-defined, being centered around the public square, while the town has got well rid of a more or less numerous collection of boomers and fakirs. Cobalt is becoming —it almost has become—a purely local camp, identical with the other towns along the line of the T. & N. O. Railway. Cobalt has become a working camp exclusively, and its growth henceforth will be in direct proportion to the growth of the mines that surround it. It is perhaps a good thing for the town that the speculative boom of last summer did not materialize as expected. The business men of Cobalt are well satisfied with the progress that has been made. More men are at work, more genuine mining is going on, and more goods are being consumed than at any previous time in the history of the camp. And everyone is optimistic of the future. It is anticipated that before long a couple of thousand men or more will be employed at the mines surrounding the town. It seems almost certain that Cobalt will become one of the most important mining camps of the country. The speculative end of the Cobalt camp has shifted from the camp itself to Toronto and New York. The excitement that was anticipated in Cobalt last spring is due to reach Toronto and New York this fall. The preliminary symptoms are observable already in these two cities, and a wild flurry may set in at any moment. Cobalt still remains a very indefinite proposition. It is hard to form any definite idea of the wealth of the mines. There are no precedents for determining values.

ONTARIO.

At the Laurentian mine, in the Manitou, the shaft is now down to a depth of 272 feet, with drifts at the 80-foot and 200 foot levels. These drifts are being made primarily to establish the extent of the rich ore shoot. At the 80-foot level it was encountered and 30 feet of good ore passed through. An upraise was then made for fifty feet, and drifting towards the shaft is being made from that point.

A new mining district has been constituted on the recommendation of the Minister of Lands, Forests and Mines.

It embraces the districts of Parry Sound and Muskoka, exclusive of the islands lying west of these districts in Georgian Bay. It will be known as the Parry Sound District, and Henry F. McGuire has been appointed mining recorder at a salary of $500. The head office will be at Parry Sound.

Charles W. Belyea has been appointed recorder of the Kenora Mining Division with head office at Kenora; salary, $500.

Four mining leases have been cancelled for default, one each in Nipissing and Algoma, and two in Rainy River North.

BRITISH COLUMBIA.

The recorder's office at Conrad is working over time issuing grants for properties in the Wheaton, Watson and Mill Haven districts.

Two of the new furnaces have been installed at the B.C. Copper Co.'s smelter, and smelting operations, after many unforeseen delays have been resumed.

The Northern Mines Limited, on Spruce Creek, have closed down their steam shovel. Several liens have been fyled against the company, which may account for the shut down.

The main shaft at the Crescent mine is now down to a depth of 155 feet, and will be continued to the 200-foot level. An order will soon be placed for an air compressor for the property.

The first payment, amounting to $3,000, has been made by the Dominion Copper Company on its option of the Gloucester group of claims in the Boundary districts of British Columbia.

An assay of ore sent to Baker & Co., of Newark, N.J., by McRae Bros., owners of the Hamilton claim, Kennedy Mountain, Similkameen, returns 60 ounces in platinum per ton and 28 per cent. copper.

The Vault, near Conrad, is looking better every day and with the completion of the tram this month it will also be a regular shipper. Ore is coming down via the Montana tramway every day from the Big Thing and is being shipped from the company's dock.

The forty-two foot ore shoot which was shown to the members of the Canadian Civil Engineer's Association, who visited the Centre Star recently, and which was advertised at the Nelson fair by two large pieces of the ore, is probably the most important find that has yet been made in the Centre Star mine.

In the north drift in the lower tunnel at the Venus, on Windy Arm, the best ore yet encountered is being taken out, showing that the vein in the lower tunnel is richer and larger than in the upper tunnel, and proving beyond a doubt that the Venus is a real mine and will continue to ship ore steadily from this time on.

The latest report from the manager of the Cariboo Consolidated says:—"During August, washed 501 cubic yards of gravel, yielding 87 oz. of gold. Have just struck very rich gravel, drive 2 E. 17 cubic yards of gravel, yielding 19 ozs. of gold. The width of the pay streak is 50 feet. Exceedingly wet; must be drained before working on a large scale; prospects are grand.

The Atlin Consolidated Mining Co., whose steam shovel and electric dump car system has been in operation on Tar flats since July, has had their first clean-up and the amount of gold obtained was very satisfactory. The company's shovel is now working to good advantage and the yardage moved is daily being increased. It is hoped to soon be able to handle 2,000 yards in 24 hours.

The copper vein on the Britannia property on Howe Sound has been cross-cut in the Mammoth Bluff tunnel, and the expectations of the officers of the company are

realized. It means that the vein runs consecutively through the whole of the claims comprising the property. The lead has been traced a distance of 9,000 feet, nearly two miles, and averages about thirty feet in width.

It was because the vein was present in the Jane claim that the management determined to undertake work involving an expenditure of a million dollars.

"Zinc," says G. O. Buchanan, the well known president of the Associated Boards of Trade of the Nelson district, "is now in about the same position as was lead a few years ago, before the bounty was granted by the Dominion Government. It is languishing. The market is uncertain, the 20 per cent. duty imposed by the United States Government is operating against producers and the unfinished condition of the new zinc smelter at Frank, which works will probably absorb a quarter of a million dollars to put upon a fair working basis, is not encouraging.

A rich quartz strike has been made eight miles from Log Cabin, on Too-Chi Lake. Fifteen claims were staked and have been bonded to New York capitalists. The whole country will soon be covered with stakes. A town-site has been located at the head of Too-Chi Lake. It is quite possible that the White Pass Railway will build a branch road to Conrad City by way of Too-Chi Lake to tap both on these rich camps. The ore in the vicinity of Too-Chi Lake carries value in gold, silver and copper. Surface assays show $25 to $40 per ton value in the three metals. A government road will be built from Log Cabin to the mines.

YUKON.

One hundred and one ounces of gold, worth $1,616, taken out in three days by seven men is the result of a clean-up made in the Yukon on the hillside claim on the right limit of Hunker, opposite No. 26 below. The claim is owned by Messrs. McLeod and McLaughlin. This is among the richest pay ever struck in the Klondike.

In the course of an interview given in Victoria a few days ago, Mr. J. H. Rogers, traffic manager of the White Pass & Yukon Railway, stated that, although the pick and shovel have given way to gigantic dredges in the Yukon, Dawson will continue in its present prosperity. Five dredges are already working in the district; one on Bear Creek, owned by the Rothschilds; the Bonanza Basin Company's dredge now working on the lower Klondike; the Ogilvie dredge built for the Stewart River, but now working on the lower Klondike; the original Klondike dredge built by the Lewis River Gold Mining & Dredging Company, and the Canadian Forty-mile dredge owned by a Toronto syndicate, headed by Dr. Grant and W. J. Smith.

The Guggenheims are now assembling three dredges for work next season. Two of these will be located on 104 below on Bonanza, and the other on 90 below on the same creek. A dredge for Col. Budd and Russell King is now on its way down river to Dawson. It will be taken to the mouth of Forty-mile and hauled up that stream to American territory. The Allen dredge, also for the American end of the Forty-mile, was shipped the other day on the steamer "Al-Ki." Mr. Rogers states that at least five other dredges, apart from others the Guggenheims are likely to build, will be sent north next season.

COAL NOTES.

NOVA SCOTIA.

Shipments of the Springhill collieries, of the Cumberland Railway and Coal Company, during August amounted to 32,145 tons.

The approximate output of the Dominion Coal Companies collieries at Glace Bay, during September was 23,800 tons. Shipments were approximately 33,300 tons.

The Dominion Iron & Steel Co. have received a cargo of Gowrie coal for use in their blast furnaces. The latest analysis of this coal shows it to be well adapted for metallurgical purposes, and an excellent steam coal besides. The Dominion Steel Co., it is said, are making a practical test of this coal with the view of purchasing the entire output of the Morien collieries.

A new bank head will be erected at the Reserve mine, Dominion Coal Company, Glace Bay. The new structure will be slightly higher than the old one and will be built of hard pine. Construction work on this will be rushed with all possible expedition. The new bankhead will serve the French and East slopes and also the Emery seam. No more steel bank heads will be built by the Dominion Coal Co. Hard pine proves nearly as durable in Cape Breton and in cases where wood is used in building any changes or alterations needed can at any time be readily made.

Excellent progress is reported from the mine now being developed at Port Malcolm. About a hundred men are at present employed there and a shaft has been sunk to the depth of 325 feet; at a distance of 75 feet lower down it is expected that the principal seam of coal will be struck. The company are now reported to have seams 4, 6, 7 and 12 feet in thickness respectively. A peculiar feature of the seams here near the surface is the fact that they run perpendicular or nearly so. It is expected, however, that at a greater depth the coal will take a turn and the seams will be at a favorable angle for working operations. Tunnels are being driven from various points in the shaft. The full size of the coal basin is not determined but work is being carried on to determine accurately its extent which is believed to be great. The industrial development is making itself felt in Richmond County.

In connection with the report that negotiations are going forward looking to the merging of all the coal interests in Cape Breton, held outside the areas of the Dominion Coal Company, coupled with which the names of Henry M. Whitney, B. F. Pearson and Graham Fraser are mentioned, it can be said that Messrs. Pearson and Fraser have just visited Glace Bay and Fort Morien, and it is stated that the proposed amalgation is likely to be completed within a very short time.

The properties held outside those owned by the Dominion Coal Company include such well-known areas as those of the Gowrie and Blockhouse collieries, the North Atlantic Collieries Company, areas at False Bay Beach owned by Gen. Montgomery Moore, the property of the Cape Breton Coal, Iron and Railway Company at Broughton, areas of the Cumberland Coal and Railway Company, and other minor holdings, including submarine areas.

The project will involve a capital of several million dollars.

The proposal is to ship the product of the combined areas at Port Morien, and eventually to build a railroad to Louisbourg for winter shipments.

Surveys are now being made of some of the properties, which, it is said, will be taken over in the deal.

BRITISH COLUMBIA.

Coal properties in the neighborhood of Coulti, in the Nicola Valley, have been bonded to the extent of $100,000, the Diamond Vale Coal and Iron Mines, with head offices in Vancouver, being responsible for the deal. Sir Thomas Shaughnessy is reported to have said that the C.P.R. Company would take all the coal the Diamond Vale people could turn out. The Diamond Vale Company is composed largely of British Columbians.

Some idea of the increase in traffic that has taken place during the past year on western lines of the Canadian Pacific may be gleaned from the statement that so far this season approximately 75,000 tons more of bituminous coal have been received for the railway company

at Fort William than had been unloaded here at this time a year ago. Since the opening of navigation 268,482 tons of soft coal—nearly 50 cargoes—have come across the lakes, as compared with about 190,000 tons for a similar period in 1905. It is estimated that between 150,000 and 200,000 tons more of soft coal will have been received at this port for the company before the close of navigation than were handled last season, and nearly double the amount used in 1904. Their contract calls for 450,000 tons, and they have secured an option on an additional 100,000 tons, which will be delivered if a sufficient number of bottoms can be secured. The total amount used last year was 316,000 tons.

Of anthracite, most of which is consigned to Winnipeg merchants, about 45,000 tons have already arrived, and fully 10,000 tons are yet to come. Less than 50,000 tons were unloaded here in 1905.

During the season one record in the coal handling trade was broken. The steamer "Stanton" on her last trip up took 10,200 tons, the largest cargo by 600 tons that ever arrived at the head of Canadian lake navigation.

THE MINING AND INDUSTRIAL SHARE MARKET.

(Specially reported for the CANADIAN MINING REVIEW by ROBERT MERRDITH & Co., Mining Brokers, 57 St. François Xavier St., Montreal.)

Almost the entire interest in mining stocks is centered in the Cobalt companies. Several of them are being traded in on the "curb" market in New York, where there is the wildest kind of speculation. Prices are fluctuating widely, and soaring without any apparent cause except the tips given out by the promoters.

In the far West there has not been so much trading, but prices are firm, and the low priced stocks are being accumulated by Westerners.

The principal advance has been in California, Giant and Novelty, in the Rossland Camp. These properties are contiguous to the Le Roi No. 2 mine, and the buying has been stimulated by a report that efforts are being made to bring about a combination.

The market for the industrial shares is irregular, trading is very light, and there is almost an entire absence of speculation in these securities.

Coal stocks are somewhat lower, but the iron are higher, due probably to the high price prevailing in the metal trade.

The latest quotations are as follows:—

	Bid.	Asked.
Consolidated Mines	147½	150
Can. Gold Fields	7	7½
Granby Consolidated	14¾	15
Rambler-Cariboo	28	30
North Star	24	26
Monte Christo	3	3½
White Bear	9	10
California	6	7
Virginia	5	6
Deer Trail	...	2½
International Coal	57½	60
Sullivan	10½	13½
Jumbo	25	26
Cariboo-McKinney	3	4
Denoro	7	8
Novelty	2½	3
Diamond Vale Coal	17	20
Dominion Copper	6	6⅛
Dominion Coal (com.)	69	70
Dominion Coal (pref.)	...	...
Dominion Iron & Steel (com.)	29¼	29¾
Dominion Iron & Steel (pref.)	78½	81
Intercolonial Coal (com.)	...	...
Intercolonial Coal (pref.)	...	...
Nova Scotia Steel & Coal	67½	70
Nova Scotia Steel & Coal (pref.)	...	...

COMPANY NOTES.

The annual meeting of the stockholders of Allis-Chalmers Company, of Milwaukee, Wisconsin, represented in Canada by the Allis-Chalmers, Bullock & Co., of Montreal, held in Jersey City, September 6th, was marked by an unusually large attendance, more than sixty-five per cent. of the entire capital stock having been represented. The general feeling of harmony and satisfaction that prevailed in support of the present administration was particularly noteworthy. The re-election of Mr. W. H. Whiteside to the presidency, and his election to the directory to fill the longest term in the gift of the company, assures a continuance of his aggressive policy and will eliminate any feeling of uncertainty for some years to come.

In the following unanimous resolution the feeling of satisfaction felt by the stockholders is strongly expressed:

Resolved: "That the stockholders in annual meeting assembled express their appreciation of the services of President Whiteside and assure him of their cordial support for the ensuing year."

It is noticeable that the company has secured about $4,500,000 worth of orders for classes of machinery not hitherto manufactured by this company, and this amount would have been very largely augmented had the completion of the improvements and extensions of the West Allis plant not been delayed by the labor troubles to which the contractors erecting the new buildings have been subjected. Notwithstanding the fact that the volume of orders taken for Allis-Chalmers steam turbines has been beyond all expectation, the demand for Reynolds Corliss engines also shows an unprecedented increase over preceding years.

In the electrical field the large orders received have hastened the occupancy of the new shops at West Allis provided for this branch of the business, which, in spite of their unfinished condition, are already in partial operation. Some of the largest corporations in the country have awarded the Allis-Chalmers Company contracts for their complete power and electrical equipments, thus endorsing President Whiteside's policy in providing the new departments established during the past year, which now enables the Allis-Chalmers Company to take orders for complete installations and thereby save purchasers the losses and annoyance incident to the division of responsibility in the erection and operation thereof.

The acquisition by the company of the Christensen Air Brake and Compressor patents rounds out the list of products required to enable the Allis-Chalmers Company to enter the electric railway field fully equipped for that service.

INDUSTRIAL NOTES.

The Bell Asbestos Mines, of Thetford Mines, Que., and the Asbestos Mining & Mfg. Co., of Chrysotile, Que., have recently increased their hoisting plants, the former by the addition of three and the latter by the addition of two 9 x 13 special cableway hoisting engines, as built by The Jenckes Machine Co., Limited, of Sherbrooke, Que.

The Canadian Consolidated Mines at Trail, B.C., have found by careful comparison that the use of Westinghouse electrical apparatus for power and haulage actually increases the output of their mines, and at the same time cuts down their operating expenses. They are now using three Westinghouse 1,250 K.W. transformers, as well as a Westinghouse electric locomotive for hauling cars to and from the mines.

The Montreal Smelting & Refining Co., which is building an extensive customs smelter at Trout Lake, near North Bay, Ont., for treatment of Cobalt ores, has closed a contract with The Jenckes Machine Co., Limited, Toronto, for the complete steam plant which will be required. This will consist of four 150 H.P. high pressure

tubular boilers, two 250 H.P. heavy duty Corliss engines with feed water heater and boiler feed pump. The boilers are being built at the St. Catharines Works of the Jenckes Company and the balance at Sherbrooke.

The Ontario Power Company, which operates on the Canadian side of Niagara Falls, recently decided upon an enlargement of its power house capacity and contracted with the Westinghouse Electric & Mfg. Company for two of the largest power generators ever turned out at East Pittsburg. These machines are of 10,000 H.P. each and are called water-wheel generators. The Power Company has already installed four machines of a similar type, which were also furnished by the Westinghouse people. This last contract includes switchboard appliances. The additional power apparatus was made necessary by the great demand for electrical energy to operate manufacturing plants in the company's territory.

The Yukon Consolidated Goldfields Company, Limited, have contracted with the Canadian Westinghouse Company for the following electrical apparatus to be used in gold dredging in the Yukon Territory:—Three 100 H.P. 3-phase, 60 cycles, 400 volts, type F motors; three 15 H.P. 3-phase, 60 cycles, 400 volts, type F motors; three 50 H.P., 850 r.p.m., 3-phase, 60 cycles, 400 volts, constant speed induction motors; three 30 H.P. motors; three 20 H.P., 1,120 r.p.m. motors; three 15 H.P. 850 r.p.m. motors; three 7½ H.P., 1,700 r.p.m. motors; nine 75 K.W., oil insulated, self-cooling transformers; two 625 K.W., 3-phase, 60 cycles, 2,200 volts, 415 r.p.m., A.C. generators, and two 17 K.W., type S exciters for same; one 4 panel switchboard for controlling above; four 250 K.W., oil-insulated, oil-cooled transformers and four 200 K.W. transformers, same type.

The Allis-Chalmers Company is about to issue Bulletin No. 1415 on its Style "D" rock and ore breakers. This publication enters very fully into details of construction and contains much information which will be found of value by contractors, road builders, quarrymen, owners of ore reduction works, operators of rock crushing plants, and others interested in affiliated industries.

In the year 1885 the gyratory form of rock and ore breaker was finally developed into an entire success, after more than ten years of costly experimenting. No machine ever wrought a more complete revolution than did the gyratory breaker in the field of rock and ore breaking, supplanting to a large extent, as it did, the jaw breaker type, and opening up new fields of industry.

The Gates rock and ore breaker has been constantly improved from year to year in design, workmanship and material. These improvements have increased its capacity and longevity, added to its facility of operation and maintenance, and decreased the power required to crush a given quantity of rock.

Although these breakers are of necessity subjected to the severest tests of strength and durability, it is worthy of note that many of the original machines, now nearly a quarter of a century old, are still in active operation.

The Montreal Light, Heat & Power Company have recently contracted with the Canadian Westinghouse Company, Ltd., for a large addition to their power equipment. The apparatus contracted for is for their new Soulanges Canal power station on the St. Lawrence River. The equipment consists of three Westinghouse 3750 K.W. revolving field alternating current, two-bearing generators connected to water turbines. These generators are 7200 alternations, 4000 volts, three-phase, operating at 225 revolutions per minute. There are also two Westinghouse 150 K.W. direct current 125 volt exciter units. Westinghouse 2500 K.W. oil-insulated, water-cooled transformers to the number of thirteen are an important part of the equipment. Seven of these transformers will be used for raising the voltage at their generating station from 4000 to 44,000 volts, and six of them will be used at the lowering end of the transmission line, stepping down the voltage from 44,000 to 12,000.

The generators and exciters will be controlled by motor-operated rheostats and the complete switchboard apparatus, which the Canadian Westinghouse Company are furnishing for both the main and sub-stations, will involve the latest type of electrical control, representing the highest development of switchboard apparatus.

This contract is among the largest recently placed in the Canadian field, and the fact that it was awarded to the Canadian Westinghouse Company after the sharpest competition, speaks well for the estimation in which Westinghouse apparatus is held by large power users.

The merits of the Allis-Chalmers Steam Shovel, in design and construction, have been well attested in the number of orders received for shovels of various sizes and for shipment to various parts of the country.

Four seventy-ton shovels have recently been ordered for the Savannah, Ga., district by H. L. Pierce and the Electric Phosphate Company, one shovel each, and the Prairie Pebble Phosphate Company, which has two shovels on order. The Dunnellon Phosphate Company of Rockwell, Fla., has contracted for two 40-ton shovels.

The Toronto Construction Company, through the Canadian representatives of Allis-Chalmers Company, has ordered a 70-ton shovel for use in Canada. This shovel is to be built after designs which are peculiarly Allis-Chalmers and with the following characteristics:—

Weight	70 tons.
Capacity of dipper, struck measure	2½ yds.
Height of point of boom above rail	26 ft. 2 in.
Height of frame	19 ft. 1 in.
Clear height of lift	17 ft. 10 in.
Reach below rail	3 ft. 6 in.
Width of cut at 8 ft. elevation	54 ft. 6 in.
Gauge of track	4 ft. 8½ in.

Capacity 2,000 to 3,000 cu. yards per ten hours.

The hoisting engines are 12 in. x 12 in. of the link reverse type, direct geared to hoist drums, The swinging and thrusting engines are 7½ in. x 7½ in., reversing Duplex type.

The boiler is of the locomotive fire box type, 54 in. in diameter and 13 ft. 6 in. long, built for 140 lbs. working pressure.

The car is 9 ft. 8 in. wide and 40 ft. 11 in. long over all. The trucks are of the steel diamond pattern of the Master Car Builders. The draft rigging is equipped with tower automatic couplers and two link bar chains to drive both forward and rear trucks. A steel water tank, containing 1,100 gallons, completes the equipment.

MINING INCORPORATIONS.

NEW BRUNSWICK.

The Rothwell Coal Company, Limited. Head office, St. John, N.B. Capital, $12,000, in twelve thousand shares of $1.00 each. Incorporators: Hammond J. Evans, Minto, N.B.; E. G. Evans, of Hempton, N.B.; Gilbert C. Jordan, St. John, N.B.; Dr. H. B. Hay, Chipman, N.B.; Hugh Wilson, of Coal Creek and James L. McAvity, Fredericton, N.B.

QUEBEC.

Megadyne, Limited. Capital, $250,000, divided into two thousand five hundred shares of one hundred dollars each. Head office, Montreal. Incorporators: Charles A. Barnard, Casimir Dessaulles, Romuald Roy, Charles A. Sara and William F. Sharswood, all of Montreal.

The Montreal Reduction and Smelting Company of Canada, Limited. Capital, $2,000,000 in 400,000 shares of $5.00 each. Head office, 26 St. James street, Montreal. President, J. E. E. Leonard; vice-president and managing director, J. H. Brown; treasurer, B. Burland; secretary, L. J. Carter.

The Milton Hersey Company, Limited. Capital, $40,000, divided into four hundred shares of one hundred dollars each. Head office, Montreal, Que. Incorporators Milton Lewis Hersey, Montreal; Thomas S. Gladding, New York; Charles Ryerse Hazen, Cleveland, Ohio; Charles Henry Lester, Percy Carroll Ryan, Alfred T Bazin and Joel Bennet Saxe, all of Montreal

ONTARIO.

The Wright Silver Mining Company, capital, $200,000 Incorporators. Thos. Horder, F. C. Elks, Annie E Lloyd, E. B. Ryckman and C. C. Robinson.

The Canada Mines Company, capital, $1,000,000. Incorporators: H. C. Barber, Margaret Cairncross, James A. Gormaly, R. T. Shiell, H. L. Dunn, of Toronto.

The British-American Silver Co., capital, $50,000. Incorporators: Dr. Jno. E. Elliott, Wm. H. Wallbridge, Fred. Smith, Joseph E. Davies, and Harold N. Baker.

McWilliams Copper Mining Company, capital, $100,000. Incorporators: J. F. Lennox, D. A. Rose, F. W. Rose, Mildred W. Mayor, and G. T. Veale, of Toronto.

The Rochester Mining Company, Limited. Capital, $40,000, divided into forty thousand shares of $1.00 each. Head office, Toronto, Ont Provisional directors to be Ziba Gallagher, Ethel Maud Wilson and Helena May English.

The Twin Lake Mining Company, Limited. Capital, $500,000, divided into shares of $1.00 each. Head office, New Liskeard, Ont. Incorporators: W. J. Spencer, George Alexander, M. Gaughery, both of North Bay, Ont., and John Juby and H. Darrow, of New Liskeard, Ont.

The Interprovincial Mining Company, Limited. Head office, Haileybury, Ont. Capital, $1,500,000, divided into one million five hundred shares of $1.00 each. Incorporators: W. A. Weir, K.C.; J. A. Ewing, Montreal; Alex. Lay, T. H. Steele, both of Haileybury, and J. J. Labrosse, of Hawkesbury East.

The Golden Reed Mining Company, Limited. Head office, Sault Ste Marie. Capital, $1,200,000, divided into one million two hundred thousand shares of $1.00 each. Incorporators: R. J. Miller, St. Thomas; George Reed, Michipicoten; Merizo Gates and Albert Edward Sharpe, both of Sault Ste Marie, and F. M. Dole, of the same place.

The Canadian Coal and Navigation Company, Limited. Capital, $500,000, divided into five thousand shares of one hundred dollars each. Head office, Tillsonburg, Ont. Provisional directors: Eli Chadwick Jackson, George Whiting Tillson, Victor Albert Sinclair, Edwin Van Norman Tillson, Spence Hardy Betts and Charles Hamilton Denton.

The Huronian-Cobalt Silver Mining Company. Capital, $500,000, divided into five hundred thousand shares of one dollar each. Head office, Parry Sound, Ont. Incorporators: C. H. Phillips, G. G. Gladman, W. J. Beatty, A. B. Begg, J. R. Stone, W. L. Haight, George Moore, Alexander Logan, and James Caldar, all of Parry Sound; H. A. Agrar, and A. R. Smith, of Burk's Falls; J. J. Anderson, of Novar; J. Livering, of Coldwater and John F. Lennox, of Cobalt.

BRITISH COLUMBIA.

The Elk Valley Coal Company, Limited. Capital, $200,000, divided into two hundred thousand shares of $1.00 each.

The Bonanza Mining and Milling Company, Limited. Capital, $1,000,000, divided into one million shares of $1.00 each.

The Kootenay Amalgamated Oil and Coal Company, Limited. Capital, $1,000,000, in one million shares of $1.00 each.

The American Boy Mining Company. Capital, $150,000, divided into one million five hundred thousand shares of 10 cents each. Head office, Kaslo, B.C. W. E. Zwichey, attorney.

CATALOGUES.

The following catalogues have been received:—

The Year Book of the Michigan College of Mines, 1905-1906, Houghton, Michigan.

Stamp Milling Machinery, published by the Traylor Engineering Company, New York, U.S.A. (Catalogue I.)

Bulletin A. Lombard—Replogle Water Wheel Governors, Lombard-Replogle Engineering Co. Akron, Ohio, U.S.A.

Bulletin No. 132, Medium Speed Automatic Four-Valve Engines, published by the Allas Engine Works, Indianapolis, U.S.A.

The Blaisdell System of Automatic Cyaniding Machinery. Catalogue F, published by the Blaisdell Company, Los Angeles, Cal., U.S.A.

Mining and Quarry Cars, Ships and Buckets, published by the Allis-Chalmers Co., Chicago, Ill. (Represented in Canada by the Allis-Chalmers-Bullock Co., Ltd., of Montreal). Catalogue No. 17, sixth edition.

PROVINCE OF QUEBEC

The Attention of Miners and Capitalists in the United States and in Europe is invited to the

GREAT MINERAL TERRITORY

Open for Investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago, Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been specially framed for the encouragement of Mining.

All mines belong to the government of the Province on all unsold lands and on all those sold since the 24th of July, 1880, but gold and silver are always reserved, whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such licenses the first right to purchase the mines. In the case of lands where the surface alone is sold, the owner of the surface may be expropriated if he refuses an amicable settlement.

The price of prospecting licenses is $5.00 per 100 acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the government. The purchase price is as follows :

Mining for superior metals on lands situate more than 12 miles from a railway in operation, $5.00 per acre, and on lands situate less than 12 miles from such a railway, $10.00 per acre ;

Mining for inferior metals—the price and the area of the concessions are fixed by the Lieutenant-Governor in council.

The words "superior metals" include the ores of gold, silver, lead, copper, nickel and also graphite, asbestos and phosphate of lime ; and the words "inferior metals" mean and include all the minerals and ores not included in the foregoing definition and which are of appreciable value.

MINING CONCESSIONS are sold in entire lots in surveyed townships or in blocks of not less than 100 acres in unsurveyed territories.

Patents are obtained subject to the following conditions : The full price must be paid in cash : specimens must be produced and accompanied by an affidavit ; a survey at the cost of the applicant must be made on unsurveyed lands ; work must be bona fide begun within the two years.

Mining licenses giving the right to work the mine and dispose of its products, are granted on payment of a fee of $5.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres for one and the same person and must be marked out on the ground by posts. The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the government.

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made and through which the New Grand Trunk Pacific Railway will run.

The government has made special arrangements with Mr. Milton L. Hersey. 171 St. James Street, Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

The Bureau of Mines at Quebec, under the direction of the Superintendent of Mines, will give all the information asked for in connection with the mines of the Province of Quebec and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

Applications should be addressed to :

THE HON. MINISTER OF COLONIZATION, MINES & FISHERIES,

PARLIAMENT BUILDINGS, QUEBEC

DOMINION OF CANADA

SYNOPSIS OF CANADIAN NORTH-WEST MINING REGULATIONS.

COAL.—Coal lands may be purchased at $10 per acre for soft coal and $20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of 10 cents per ton of 2,000 pounds shall be collected on the gross output.

A person 18 years of age or over having discovered mineral in place, may locate a claim 1,500 feet x 1,500 feet.

The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey, made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square ; entry fee $5, renewable yearly

A free miner may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

W. W. CORY,

Deputy of the Minister of the Interior.

CONTRACTORS TO H. M. GOVERNMENT

ALLAN, WHYTE & CO.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

WIRE ROPES

For Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.
Wire specially selected for own exclusive use.
We have made many records with our Winding, Haulage and Crane Ropes.

Illustration of **Winding Rope**, 240 fms. long x 3½ circ. Galvanized Special Improved Patent Steel. Compound Make, supplied to Kenneil Collieries, Bo'ness, Scot., which gave a record life of 6 years and 2 months. Showing condition when taken off.

TELEGRAMS "Ropery Rutherglen." A B C, A I and Lieber's Codes used.

AGENTS IN CANADA:

Wm. Stairs, Son & Morrow, Ltd., Halifax, N.S.
W. H. Thorne & Co., Ltd., Saint John, N.B.
Drummond, McCall & Co., Montreal.
John Burns, Vancouver, B.C.

DRUMMOND, McCALL & CO.

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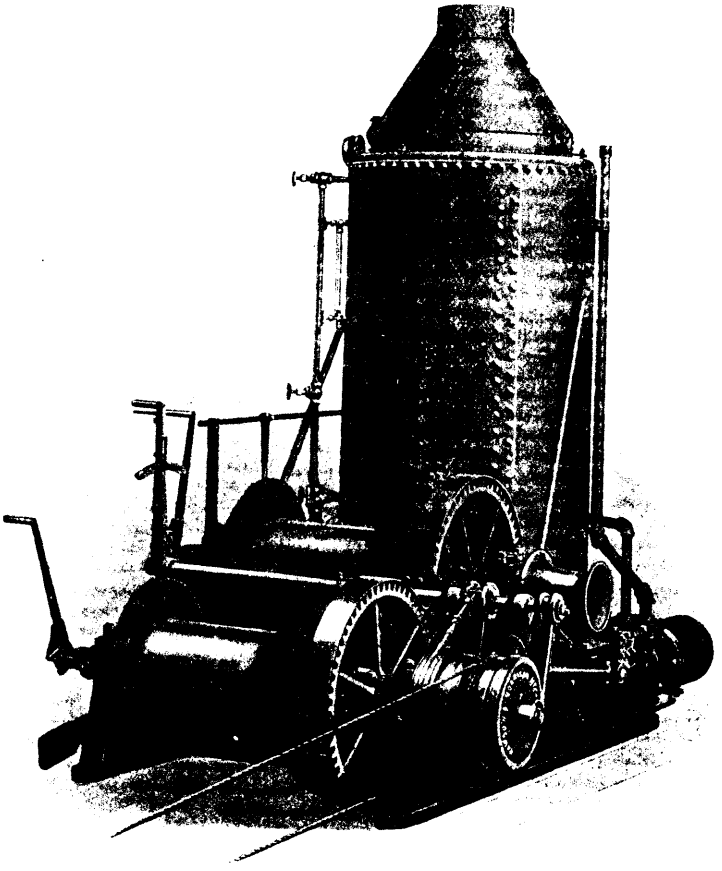

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