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CIRCULATION.

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CONTENTS.

LONG LIVE THE KING!

The Coronation of King George and of his consort Queen Mary will have taken place in a few days. From all parts of the Empire British citizens have flocked to London to see the imposing pageant. From Canada alone, hundreds of official representatives and many private persons are now eagerly awaiting the day in London. But not in London will all loyalty be concentrated. Throughout Canada, as throughout all the Imperial domains, there is evident the warm throb of an Empire's devotion.

To Canadians the event is fraught with deep significance. The fates have ordained that of all Great Britain's self-governing children Canada should now be the strongest and most assertive. We have thrown off the swaddling clothes of infancy and are becoming conscious, perhaps too conscious, of waxing strength and growing bulk. But no diminution is apparent in the whole-heartedness with which we acclaim the accession of our titular head to the Imperial throne. Not even does the proposed readjustment of international trade relations dim the lustre of the occasion. But the fact that Canada has so large a voice in the Imperial Conference and the fact that weighty matters affecting the whole Empire are now under discussion at a time when the eyes of all civilized nations are turned towards London, make the present momentous.

It is not to be doubted that our cautious and astute Premier will refuse to commit his country to any fantastic antipodean scheme. Commerce and sentiment rule the world. Sentiment is apt to hold the reins when excitement runs high. Hence the danger at such a time as this.

But there is also the danger of failing to read the real meaning of a nation's existence. Commerce is not everything. We are perhaps quite as much swayed by considerations that have nothing to do with worldly gain, as by those that have. And, first and foremost, we neither wish nor intend to beg commercial or other favours of any nation on the face of the earth. A nation young, vigorous, and neither morbidly modest nor vauntingly vain, we desire above all to retain our identity, to work out our own destiny, and to live in harmony with our neighbours.

Yet, like the unassuming porcupine, an animal that goes its own way without molestation, we must prepare ourselves for self-defence. On the Atlantic and on the Pacific we possess vast coal resources. What the capture of these by a hostile power would mean may be left to the imagination. In this and other respects we are a standing temptation to any probable rival of Great Britain. Hence the tremendous import of the deliberations in London.

The pomp and circumstance that mark the Coronation are not idle display. The whole huge ceremonial will be not alone an opportunity for the exchange of courtesies between Great Britain and her sister nations—it will be a majestic demonstration of the fact that in power, in prestige, and in dignity Great Britain has gained ground. And it is peculiarly inspiring to think that from what were "colonies" and now are "Dominions" comes the moral and material support that the Mother Country needs.

There is another side, however. To Great Britain we owe the most profound debt that nation can owe to nation. Without Great Britain in the background our treaty-making, our plans for defence, and, indeed, our commercial development were a farce. To her navy, and to her gold, must be attributed a surprising proportion of our prosperity. The debt of obligation is still ours. This is sentiment, but it is sentiment that can be utilized as an impelling force in regulating, first, our commerce with the Empire, and, second, our commerce with other nations.

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The King is soon to visit Canada. The welcome that he will receive here, unbounded as it may be, will express but feebly the desire of every true Canadian to be true to Canada and to the Empire.

A MODERN INSTANCE.

As an illustration both of the urgent need of revision of the regulations under which the Department of the Interior, Ottawa, administers Federal lands, and also of the anomalous situations that may arise, we shall recite here an actual instance that took place a few weeks ago.

Two men made application for a coal mining location in the west covering 5,160 acres. All the requirements of the regulations were fulfilled as regards staking, making proper application, and making the necessary deposits of $5 each. The stakers had then thirty days from the date of staking wherein to put in their application. After that application had been considered favourably by the Department at Ottawa, a process covering two months, they were given another thirty days in which to make payment of the annual rental of $1 per acre, a total of $5,120.

Being unable to raise the money, the men went to the place and, on the morning when their claims would have been cancelled for non-payment of the rental, they restaked the claims. Thus they succeeded by a very simple evasion of the law, in postponing payment of the rental for another three months.

This process might go on indefinitely. For obvious reasons it would be neither practicable nor seemly for anyone else to attempt to jump the claims. For equally obvious reasons it is not well that the regulations encourage this kind of evasion.

It has been suggested that the immediate payment of one years' lease—$1 per acre—be required, and that provision be made to return this money in case the lands prove not available. No doubt this would be more business-like. It might, of course, become a hardship to the prospector. But, as under present conditions the prospector is legally obliged to pay this acreage tax and as only by acting contrary to the spirit of the regulations can he avoid payment, it is illogical to continue the system that now obtains.

The loss of time, the sickening delay, the misunderstandings that arise in trying to control from Ottawa, coal lands in the far west, are no longer tolerable. Had the Minister of the Interior a knowledge of mining investment, or even a sense of humour, he would voluntarily forego the privilege of breeding confusion, strife, and all the ills that are engendered by long-distance maladministration.

PROSPECTING FOR GOLD.

In our issue of April 15, 1911, we referred editorially at some length to a paper read by Mr. W. H. Prest on the subject of prospecting in Nova Scotia. The paper in question was a short and succinct presentation of the problems that confront the prospector and of the methods that had best be followed.

In this issue of the CANADIAN MINING JOURNAL our readers will find an ampler and far more comprehensive view of the matter. Not only do the principles and points enunciated bear specifically upon Nova Scotian gold mining, but they also apply with equal force to certain large tracts in New Brunswick and Quebec that are known to be gold-bearing.

The moral that is deducible from Mr. Prest's article is that prospecting must be controlled by commonsense. The vague wanderings of the boulder-cracking bushman are of little use. The academic meanderings of the pure geologist are of less use. Only the ardent and intelligent labours of the trained modern prospector are calculated to bring results. The thoughtful man will know instinctively just what geological lore is of use to him, and he will use it along with his own excogitations.

We firmly believe that, if the right steps are taken, Nova Scotia will yet vindicate itself as a gold-mining country. In any case, nothing could be more opportune than Mr. Prest's paper. We commend and endorse it.

The Ontario Bureau of Mines has made an addition to its staff in the person of Mr. T. F. Sutherland, who is to be Assistant-Inspector of Mines. Mr. Sutherland is a graduate of the Kingston School of Mines. Some years ago he suffered his apprenticeship in the gold mines of Eastern Ontario. Since graduation he has spent seven or eight years in mining in south-eastern British Columbia and Portland Canal. He also is familiar with Cobalt and Porcupine. Mr. Sutherland's appointment, we confidently expect, will meet with approval.

THE NATURAL ASSOCIATIONS OF GOLD.

Because in some senses the geology and metallurgy of gold are simple in principle there are many simple facts that are either overlooked or not co-ordinated.

To the current number of Economic Geology, Mr. Francis Church Lincoln contributes a long monograph on the natural associations of gold, dividing his subject into two parts—the associations of gold with rocks, and the associations of gold with minerals.

It is impracticable to touch upon more than a few features of Mr. Lincoln's paper. All of it deserves close study.

Discussing the impregnation and replacement of rock in the neighbourhood of a vein, the writer points out that in all probability the extent of these phenomena is not yet fully appreciated. Gold reported as primary may in reality be secondary. Samples that are taken at a safe distance from known mineralization may really represent rock that has undergone secondary enrichment. Microscopic examination of thin sections is the only certain means of determination.

The assayer's "trace" usually means less than ten cents per ton avoirdupois, equivalent to 166 milligrams per metric ton. In 46 tabulated assays of igneous rocks only four are recognized as absolutely indicating primary gold. The rest are set down as either "probable" or "possible." Of 25 of these rocks, seven are basic, six are intermediate, and twelve acid. Disregarding abnormally high results, the normal gold content of these igneous rocks appears to be between 60 and 80 milligrams per metric ton. The distribution of gold seems to be somewhat even, irrespective of the chemical composition of the rocks. But the data collected are too incomplete to admit of drawing definite conclusions. What evidence there is tends to prove an irregular distribution of minute amounts of gold and silver in igneous rocks, the gold averaging about four cents per ton avoirdupois, and the silver about six cents. There is no marked difference in gold content as between acid and basic igneous rocks, while in silver content basic rocks are probably slightly higher than acid rocks.

Sea water, sub-crustal waters, rock salt, clays, coal, and many organic substances contain gold in ponderable amounts. One coal has been reported from Wyoming containing $1 to $5 per ton.

Gold occurs in sedimentary rocks almost universally. From determinations reported the value is roughly one cent per ton. The general conclusion appears to warrant that the coarser the rock the higher the gold content.

The origin of gold in completely metamorphosed rocks is a matter of speculation. Primary gold has been mined in metamorphic rocks and has been won commercially from important placer deposits.

Generally, no evidence can be adduced to show that the gold of igneous rocks segregates in the more basic or the more acid members. It has been seen that there are few authentic occurrences of primary gold in igneous rock. The concentration of 3½ cents in gold per ton in the same ratios that have obtained in known magmatic segregations of iron, nickel, and chromium, would develop ores running from a few cents to $144 per ton. No such segregations of gold have been found. The Klondike gold has been estimated by Mr. Lincoln to represent a saving of 2 cents per ton of rock (sedimentaries) eroded. But no commercially important placers derived from igneous rocks are known. Thus the assumption of extensive magmatic segregation of gold in igneous rocks is not justified by available facts.

We have outlined above, with many serious gaps, the trend of the first section of Mr. Lincoln's article—the section dealing with associations of gold with rocks. The last paragraph synopsises the geologic history of gold — the distribution through the igneous magma, the concentration by erosion, the formation of coarse- or fine-textured rocks with higher gold content, the metamorphism of these sedimentaries, etc. It is pointed out that, though of economic interest, veins are quantitatively unimportant.

The second part of the paper space does not permit us to cover. A lengthy discussion of the mineral associations of gold, well illustrated with diagrams and photogravures of rock slides, is followed by conclusions that briefly outline results so far attained. As throwing light upon the extraordinary richness of many ores in which no gold is visible either to the unaided eye or under the microscope, it is suggested that the same relations exist between gold and other minerals on a sub-microscopic scale as exist on microscopic and macroscopic scales.

* * * *

Few more instructive essays have appeared than this of Mr. Lincoln's. It should be read and digested.

THE DIFFUSION OF CAPITAL.

Mining booms are not unmitigated evils. They stir up public interest, and are instrumental in disseminating all kinds of mining news. From the Rossland boom there have survived several strong organizations. Likewise has the Cobalt boom brought into existence scores of prosperous operating companies. Both booms taught their lesson, and both brought ultimate good to the country. This does not by any means imply that we approve the boomster.

Looking back over the rise of Cobalt there are many incidents that, considered together, prove that New Ontario has done considerably more for Old Ontario than has the Old for the New. The impressive array of new houses built by Cobalt money in the best residential sections of Toronto, not to speak of multitudinous motor cars, is direct evidence. Some millions of dollars of money made in Cobalt have been invested in real estate in Toronto. Montreal, also, can

boast more than one modern business structure that owes its existence to Cobalt profits.

There is evident now another effect of capital created in New Ontario. Cobalt men and their associates are purchasing and developing mines in British Columbia, in Western and Eastern Ontario, in Quebec, and in Nova Scotia. Sheep Creek, B.C., Sturgeon Lake, Ont., and Killag, N S., are some of the most notable illustrations. At these three localities investors who have been directly identified with Cobalt are supplying the necessary money.

Porcupine is really the child of Cobalt. In what condition Porcupine would now be were it not for Cobalt shekels we can only surmise. Porcupine, however, will be the means of infusing life into other mining camps, more especially, we think, into old mining camps that have fallen by the wayside.

Thus Cobalt and Porcupine are not provincial but national in their influence. The boom that is impending in Porcupine will carry in its train less of misfortune and more of good exactly as the investing public is correctly informed as to facts. If the camp survives the boom, every other gold-mining region in Canada will, sooner or later, reap the benefit.

This is the large meaning of successful mining. No other industry calls into play such immediate enthusiasm, nor does any other industry diffuse so widely the wealth that it begets.

EDITORIAL NOTES.

In our report of the annual general meeting of the Maritime Oilfields, published in our issue of May 15, we omitted mention of the fact that Dr. J. A. L. Henderson was the chairman. As his brother, Mr. W. Hope Henderson, is also on the board, the correction is made to prevent confusion.

The Canada Refining and Smelting Company's plant at Orillia is the latest addition to our Cobalt ore smelters.

BOOK REVIEW.

THE DAVIS HANDBOOK OF THE PORCUPINE GOLD DISTRICT—WITH A DIRECTORY OF INCORPORATED COMPANIES—By H. P. Davis—131 pages — Illustrated — Price, Paper Cover, $1; Cloth Cover, $1.50 — Published by H. P. Davis, 25 Broad Street, New York.

Mr. Davis' work in connection with Cobalt is known to many of our readers. The Davis Cobalt Handbook proved to be a boon as a ready source of reference. The Porcupine Handbook should be equally useful. Among its contents are an historical review, a directory of incorporated companies, an outline of the geology of the region, a description of some important properties, and a claim-map.

It is Mr. Davis' intention to revise the book from time to time.

As mentioned in our editorial columns, this volume is not to be confounded with the book now being brought out by the Canadian Mining Journal. The two books are of widely different character. To a large extent they supplement each other.

PERSONAL AND GENERAL.

Mr. Mosco Vici, mining engineer of Montreal, against whom suit was brought by Mr. James A. Brook, of the same city, was honourably acquitted recently by Judge Langelier in the Court of Sessions. The case had been decided some time ago; but, on Mr. Mosco Vici's request, a re-hearing was granted. The former decision did not completely exonerate him; the latter decision does.

Mr. R. B. Lamb is in Porcupine.

Mr. Frank Loring is inspecting properties around Sturgeon Lake.

Mr. O. N. Scott has returned from Europe.

Mr. J. Eakins, formerly manager of the Foley-O'Brien, is in Toronto.

Mr. J. W. Astley has taken an office at 13 Manning Arcade Annex.

Mr. George F. McNaughton is staying for a short time at the Arlington Hotel, Toronto.

Mr. Robert S. Stewart, of Trail, B.C., general manager of the Consolidated Mining and Smelting Company of Canada, Limited, was in Toronto during the latter part of May.

Mr. Frederic Keffer, of Greenwood, B.C., mining engineer for the British Columbia Copper Company, Ltd., has been to Franklin camp, north fork of Kettle River, to arrange for commencing exploratory work on the McKinley group, lately bonded by the company under option of purchase.

Mr. H. Mortimer-Lamb, secretary of the Canadian Mining Institute, has returned to Montreal from a visit to British Columbia.

Mr. Alexander Sharp, of Orient, Washington, U.S.A., mining engineer for Mr. P. Burns and associates, is about to remove to Calgary, Alberta, where his headquarters will be in future.

Mr. H. G. Stehli, superintendent of the Dwight & Lloyd Metallurgical Company, of New York City, has been at Trail, B.C., superintending the starting of one of the company's sintering plants, put in at the Consolidated Company's smeltery.

Mr. Albert I. Goodell, formerly manager of the Montreal & Boston Company's copper smeltery at Boundary Falls, B.C., and afterwards of the Le Roi Mining Company's smeltery at Northport, Washington, U.S.A., is now buying ore for the International Mining and Smelting Company, of Salt Lake City, Utah.

Mr. C. P. Hill, managing director of the Hillcrest Coal and Coke Company, has returned to western Alberta from a visit to Porcupine, Ontario.

Mr. I. L. Merrill, of Los Angeles, California, president of the Hedley Gold Mining Company, and Mr. T. Walter Beam, of Denver, Colorado, have returned to the United States from a visit to the company's Nickle Plate mine and stamp mill in Similkameen district, British Columbia.

Mr. R. P. Williams, for many years representative in western Canada of the Canadian Rand and Jenckes Machine companies, has entered the joint employ of the Canadian Rand Company, Montreal, and the Ingersoll-Rand Company, of New York. He will work in connection with the Vancouver, B.C., and Seattle, Washington, offices of those companies.

PROSPECTING IN NOVA SCOTIA.

Written for the CANADIAN MINING JOURNAL by
W. H. Prest.*

Having been asked to contribute a short paper on prospecting in Nova Scotia, I find it difficult to separate the actual work from the geological problems with which they are intimately associated. In fact, the methods and distribution of work can hardly be described without giving the reasons for such distribution and these reasons are chiefly geological. The mere sinking of pits and opening of trenches without system is not prospecting. Systematic work in this line means a programme arranged after a fair preliminary knowledge of rock structure, surface distribution, and origin of debris. This is all that can be learned by a surface examination and only serves as a guide to the location of trial pits. The first work in jobs of this kind in Nova Scotia is nearly always experimental and only lays bare local peculiarities of drift distribution. Only then can a method of working be devised that will ensure economy and success. The following working programme seems to me to be most suitable for deep surface such as we have in Nova Scotia.

Location.

Prospecting in Nova Scotia is as a rule a far different matter from prospecting in Ontario and the west. In our circumscribed areas the wandering prospector has little place. The chance surface finds are nearly all made, and the prospector makes his home in or near an established mining camp. The largest area not intersected by good roads is a tract of about 1,000 square miles in the western part of the province, and it is only there that the prospector goes to his work in western style. The prospector's duties are now chiefly confined to tracing float and, as this is usually done in deep surface, his sphere of operations is limited. Within the limits of each district are usually two or three localities noted for the discovery of rich float. This is usually held under lease or license as our too liberal mining laws have resulted in nearly all mining land of any value being held without working conditions. This state of affairs leaves little new land worth prospecting, and if the owner does not or cannot do the work it remains undone. Rich float was found on some properties nearly 50 years ago, the source of which has not yet been discovered. Therefore the prospector is usually hired as he can seldom afford to work on shares and pay those who help him.

As a rule, the gold mining districts are well defined and surveyed, and within the limits of these districts nearly all the prospecting in Nova Scotia is done. The five counties of Guysboro, Halifax, Hants, Lunenburg, and Queens, contain nearly all the gold mines in Nova Scotia. In these counties are 50 or 60 localities in which rich float has been found, indicating the existence of still undiscovered veins. The search for these hidden veins is the work of the prospector of the future. It is not likely that much more rich float will be found on the surface, as even the farmers invariably examine and break every piece of quartz or heavy rock they find. But the float already found points to many years of trenching and shaft sinking. In them we have the source of much probable profit as some of this float is very rich.

*Mining Engineer, Bedford, Nova Scotia.

Outfit.

In the early history of gold mining in Nova Scotia a prospector's outfit would not have called for much comment—a pick, a pan, a kettle, an axe, a few pounds of food, and the inseparable pipe, tobacco, and matches. Tent and blankets were luxuries to be despised by any man who desired an honourable reputation for hardihood. Camp and dishes grew on every white birch tree and every prospector had Indian lore enough to strip the bark and make them.

Now, however, all this is changed. The work is harder, the surface is deeper, and the prospector more particular. Now an outfit for ordinary work will include, say, one dozen heavy cast steel single pointed picks, one-half dozen long-handled pointed steel shovels for surface work, three short-handled pointed steel shovels for underground work, one stone hammer, one striking hammer, one blacksmith's hammer, one crowbar, one prospecting pick, one half-dozen short drills, one miner's spoon, two axes, three zinc pails, one gold pan, one pocket lens, one pocket compass, one handsaw, one blacksmith's file, two saw files, one cold chisel, one pair tongs, one 1½-inch augur, one keg (100 lbs.) of mixed 5 and 7-inch spikes, 25 pounds 3½-inch nails, ⅜-inch rod iron, hoop iron, one iron bound rock tub, one water barrel, 50 feet 1-inch rope with grummet, one 5-foot x 5-inch windlass with cranks and standards, one portable forge, one combined anvil and vice, one diaphragm hand pump with 2½-inch suction. Repair material for forge, pump, tub, and windlass. Lumber (1-inch) for spouts and other purposes; 1½-inch lumber for lagging, dump box, etc. Dynamite fuse and detonators, say enough for 20 shots. Camping and cooking outfit for at least four men. At least one month's provisions. A boarding house or even an empty house near by will greatly facilitate the work. The modern prospector in Nova Scotia must be prepared for trenching, shaft sinking, or tunnelling as conditions demand. The outfit also includes to an extent that it never did before, a knowledge of structural and glacial geology. In the new order of things the wandering prospector occupies but little space, therefore I can be excused for not describing farther a fast-vanishing phase in this occupation.

Before leaving this part of the subject I may say that the pay of a cook is often saved for more effectual work by including a few barrels of hard bread in the provision list. Not the kind that weak-mouthed home-stayers usually call hard tack, but those that the old-time British tars used to repel boarders with. Compact and nourishing, but durable as wood, I pity the martyrs to toothache who cannot eat them or will not try. My toothache stopped when I began their use twenty years ago.

Mapping.

This important preliminary to prospecting is usually neglected here, as elsewhere. If the Government maps have been published they are often used. The general maps are drawn on a scale of 1 inch to 1 mile, the district maps on a scale of 1 inch to 250 feet. These maps, which I may call Mr. Faribault's life work, cover about three-quarters the area of our gold bearing rocks and are well worth the time spent on them. Once done, the work will last for many generations. The struc-

tural geology and details of past mining operations are given with as much detail as the scale will allow. But for the prospector's use this information must be supplemented by much greater detail in depth of surface, distribution of drift, and surface contour. Therefore, a special survey should be made connecting with the nearest Government marks, and the results embodied in a map on a scale of at least 40 feet to 1-inch. This will enable details to be noted down even as small as one or two feet. On this plan should be noted down details of geological structure, surface contour, drainage, depth of drift, course of glacial transportation, and distribution of gold bearing float. Position and depth of pits already dug should be noted. These pits, as well as others to be dug, should be numbered and details of each as far as known entered in a note-book for comparison with other work. Previous work should furnish valuable information, but as a rule, through careless observation or exaggeration, the exact truth is hard to get at. Under these circumstances verification is necessary and this can only be obtained by sinking new shafts. A mere sketch map will hardly do, as the amount of money involved is often too much to risk through careless work of any kind. A little practice with an ordinary land compass will enable almost anyone to make a fairly accurate plan of the locality chosen for the work. Mr. Faribault's excellent maps can be used as a basis for a larger and more detailed plan, though it will be some years yet ere his work will reach the western end of the province. One day's surveying should furnish ample information for a working plan.

Panning.

Panning lessens the heavy preliminary work by making the mapped information more effective. It draws within closer limits the boundaries of gold distribution, defines the areas of coarse and fine gold and gives the prospector a centre of distribution as a safe location for pit sinking and trenching. It usually confirms the conclusions derived from the surface distribution of gold bearing quartz and saves the waste of time and labour on large barren areas which formerly characterized prospecting in Nova Scotia.

Panning can be done on samples from old dumps, surface soil, beds of brooks, and the sides of pits and trenches when above water level. About 200 pans, if possible, should be taken and a strictly exact record be kept of all results, viz.: location of samples and number of pans from each location, character and composition of drift (as a clue to its source), and number of colours from each pan. When this is done it will furnish two valuable bits of information, viz.: 1st, where your rich vein probably is, and, 2nd, almost equally important, where it is not.

Information derived from panning to be classified as follows: 1st, colours—divided into four sizes, the smallest seen only with a pocket lens, represented as a,b,c, d; thus 7a, 3b, 4c, 2d, means seven colours of the size a, three colours of the size b, etc. 2nd, sights, divided into four sizes, e,f,g,h; 3rd, shotty gold, divided into four sizes, i, j, k, l. 4th, nuggets, divided into four sizes, m, n, o, p.

Enter on your map a summary of these results by drawing a line around the outer limit of gold distribution. Draw another line enclosing the outer limit of the shotty gold and largest sights. This inner line will enclose your centre of distribution, within which, or at the northern extremity of which, the most of your future work will be done. The character of the debris in which your coarsest gold is found will in most cases represent the character of the rock in which your rich vein is located. Two men, a panner and a helper, should put this part of the work through in four or five days.

Test Shaft.

Another important part of the preliminary work, especially where little or no work has been done before, is a test pit. This, in order to find out if the float gold is present in the upper, middle or lower portion, or throughout the whole depth of the debris to be cut through in future work. If gold is present in only the upper layers of drift the source of it is probably some distance away and the pits can be placed at considerable distances apart and much labour saved. If the upper layers only contain gold there is no need to sink through the barren drift below. If gold is present only in the bottom layers of deep drift the vein searched for is probably not far away and great care should be exercised in the selection of ground for new pits. Various other important facts may be brought to light which would affect largely the cost and location of future work. A test shaft should always be sunk to bed rock within the limits of the richest pannings or float ore, but near its northern or upper margin. A sectional plan should be made on a scale of 1 inch to 1 foot, or at least large enough to contain marginal notes, thus saving constant reference to a note book. The following facts should be noted:—

1st. The sub-divisions of drift, with depth, thickness, slope, mode of formation, and composition of each. Number each layer for future reference.

2nd. Pan tests of each layer with results graded as before mentioned, and noted on plan of shaft and on map of areas.

3rd. Absence or presence of gold bearing float, quantity and apparent value per ton, number, size, degree of wear, and character of each variety, with associated minerals, as a means of identification.

4th. Details concerning bed rock, such as dip, strike, cleavage, and results and courses of glacial action.

5th. Depth of water level, estimated quantity of water per day. This item often bears strongly on the cost of work.

6th. Size of shaft and number of tubs of muck hoisted.

7th. Cribbage-cost of material and time.

8th. Number of days' work with estimate of time for each part. The last four items are necessary to a fair estimate of the cost of future work.

All the gold bearing quartz from the test shaft should be kept for comparison with that from other shafts. They should be numbered and arranged in an orderly manner in boxes.

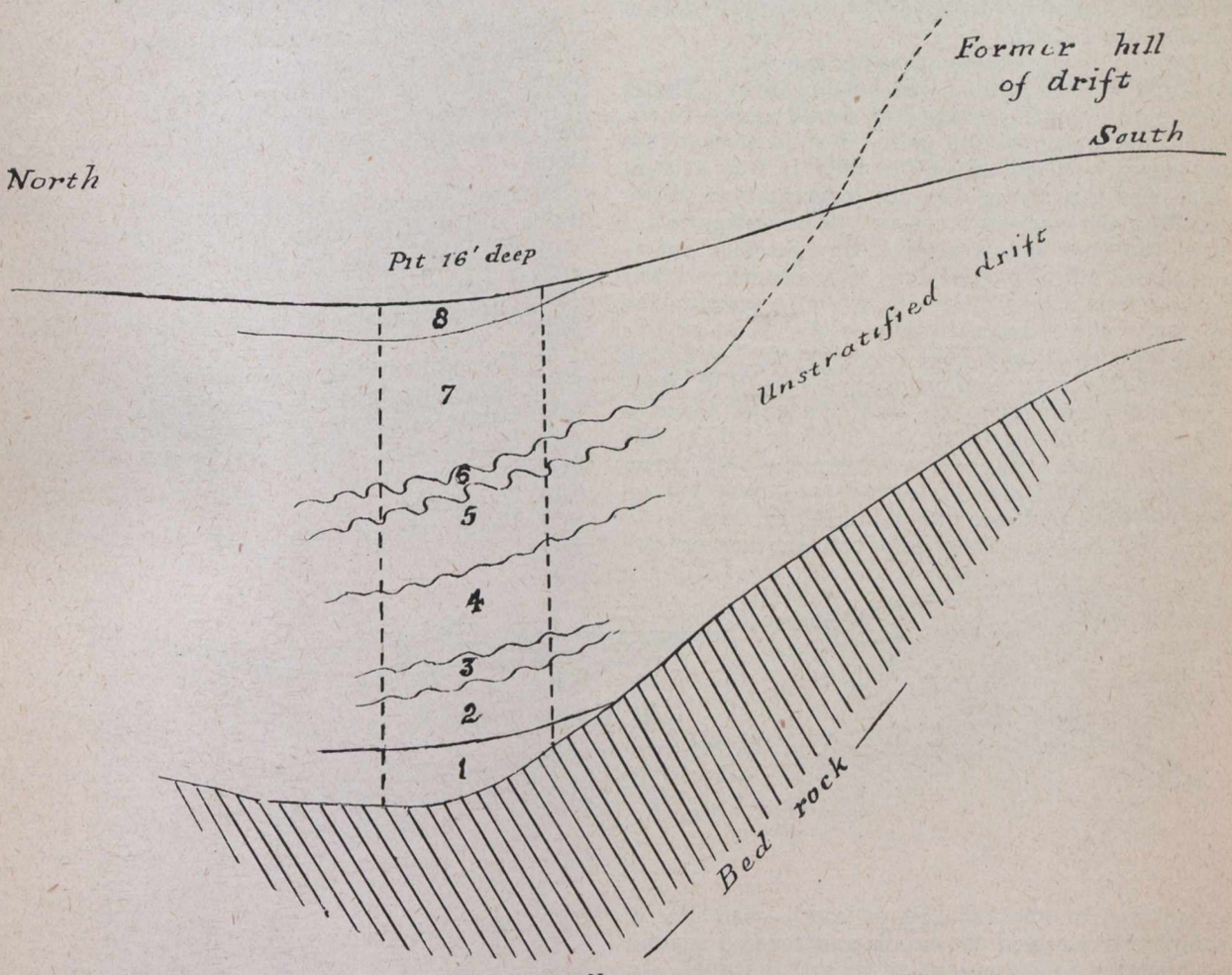
Sectional Plan.

The test shaft finished and the regular work begun, there should be some simple way of showing clearly and at a glance the progress of the work. For this purpose a sectional plan should be made on a scale of at least 40 feet to 1 inch. In deep surface such a record of facts is very necessary as mistakes under such conditions would be costly. On this plan should be put the test shaft as well as every other pit that can be included in its line of section. The different layers of drift could thus be traced through each pit and their contents compared and much valuable information gained concerning the origin and distribution of the

float gold. Details should be entered in a note book for comparison whenever necessary.

The Regular Work.

With the understanding that deep surface is as usual to be operated in, we will describe the next step in the programme. If help is plentiful two or three pits could be started in the most likely direction to save time. These pits need not be sunk any deeper than the gold bearing layer, unless strong evidence of post-Glacial action leads us to suspect that the original course of the rich float has been deflected or reversed. Should all these pits be in gold bearing drift, the next set of pits could be put down in the same direction, abreast of each other as in the former case. Should the pit to the right contain no gold the next set of pits should be sunk farther to the left, and vice versa, in order to keep on the course of the drift transportation. The float gold being distributed from the pay-streak in a somewhat fan-shaped form, the area to be prospected will become more and more contracted as we proceed. At last a single pit at each advance will be all that is necessary, except in case of deviation of the float gold from the general course of drift transportation. Approaching the source of the gold the richest float is usually on or near the bed rock. Here the utmost care is needed in tracing the float, as it is often entirely absent near the vein from which it came. The above procedure is best for deep or fairly deep surface, the sinking of pits only to the gold bearing stratum and their location in well chosen positions saving much time and money. In shallow surface, however, an open trench well bottomed would not be costly. If the sectional plan is on a small scale a plan of each pit should also be kept on which all details of stratification, composition, panning records, and finds of rich float could be entered. These could be compared from time to time and the information gained applied to the work in hand. Of course, we must not expect to find a perfectly orderly arrangement of beds in any one section of mining land. Some pits will contain more or less strata than others, and the corresponding layers may be identified, sometimes by means of a peculiar kind of ore or rock, or by its waterworn condition, or the general composition of the layer, or perhaps by its state of oxidation. Then it is not uncommon to find two beds containing float gold from the same vein, but these are usually the product of two different periods of erosion and hence are transported in somewhat different directions.



No 1

Problems in Prospecting—No. 1.

Inseparable from prospecting in Nova Scotia is the necessity of being able to explain some of the numerous problems in glacial and structural geology, which are continually coming before the prospector. They oppose him at every turn and unless he has a particular aptitude for the study of nature's lessons, fate usually marks him for a failure. Having no capital, it is of little use to talk to him about the employment of a specialist.

Some of these problems are quite simple, while others tax the knowledge of the geologist. The above from Gold River, N.S., is a sample:

1. Deposit of coarse mixed debris with gold bearing quartz, much waterworn and with a current of water running through it to lower land farther east. It was evidently the bed of a brook running over a rich vein farther west.

2. Unstratified drift of quartzite, sand, and clay.

3. Stratified drift, gravel, sand, and clay, with a little gold bearing quartz.

4. Unstratified drift of same character as 2.

5. Stratified drift becoming more sandy and finer in its upper part where it contained some clay.

6. Fine dark clay with pine and spruce cones, beech nuts, birch bark and various seeds and leaves, and remains of water plants and water bugs. The whole was crumpled into small folds.

7. Unstratified drift.

8. Stratified drift, chiefly granite gravel.

This shaft showed gold in the bottom layer. Under ordinary conditions the prospector would search to the north for the source of the gold. But in face of the unusual conditions shown in the plan it was evident that here was a problem needing investigation. Without detailing the various steps in this investigation, I will give the conclusions arrived at. Surface conditions—a high bluff of glacial drift to the south, a lower one to the north, a miry bog—the site of a former lake to the east, a slight ascent to the west. West of this pit about 250 feet was a gold bearing vein. A brook ran from the vein to the pit carrying with it fragments of gold bearing quartz and fine gold, forming bed No. 1, and undermining the bluff or hill to the south. Then came a fall of earth from the bluff forming bed No. 2. This partly stopped the brook but allowed some fine gold bearing material to flow down and form bed No. 3. Then followed another erosive stage resulting in another fall of earth—bed No. 4. This completely stopped the brook and formed a pond which afterward found an outlet toward the west. In this pond the wave wash stratified the upper portion of the last fall of earth into bed No. 5. Then succeeded a period of quiet during which a forest grew and grass, flags, and other water plants filled the pond. Water bugs crawled, cones, nuts, twigs, and leaves fell and were buried and humus accumulated. The presence of beech nuts here led to the further discovery of a former brook flowing north into the pond from a former lake one-half mile to the south. This lake is now a miry bog with a hill on its western side, the only place in the neighbourhood where beech trees can be found. The brook leading from this former lake is now filled with sand carrying gold, the source of which has not yet been discovered.

After a long and quiet period, the whole bluff to the south slid down the slanting surface of the glacier planed rock corrugating the muddy pond border. Then it suddenly gave way and buried the shore line with its vegetation under 5 feet of unstratified drift, forming bed No. 7. Then followed a slow surface wash from the hills on both sides forming the partly stratified bed No. 8. As this shows stratification, the water to work it over must have been turned to the east because of the stopping of the western outlet.

Here is an example in which a moderate knowledge of glacial geology is of great importance. Here was gathered together debris from different sources, transported from different directions, and under different conditions. The source of the rich float in the lower bed would, under ordinary conditions, have been searched for to the north, whereas it came from the west.

Problems in Prospecting—No. 2.

This example is from West Caledonia, N.S. Its solution was an accident. For a long time the source of the rich float found here was supposed as usual to be to the north. Though two plans should illustrate this, a careful reading of the text will make it understood.

1. Lead, course N. by W., and S. by E.; the source of the rich float found in the neighbourhood.

2. General course of float transportation during Glacial age.

3. Deflected course of transportation in post-Glacial times.

4. Unmodified drift without gold.

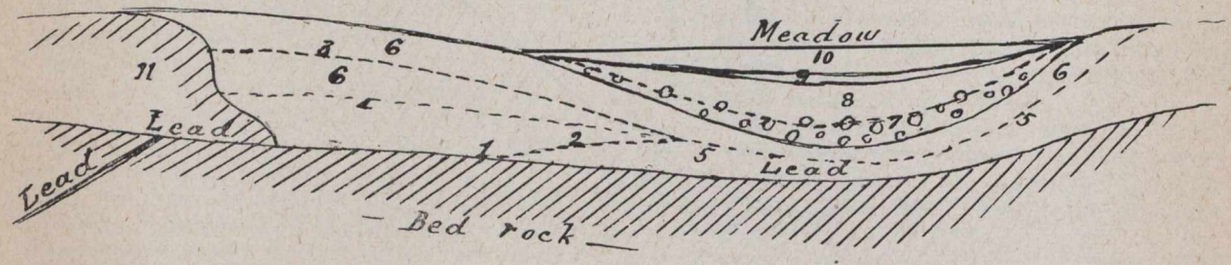
5. Unmodified drift containing gold.

6. Partly stratified drift containing gold.

7. Barren sand, gravel, and boulders from a higher level up stream.

8. Quicksand.

9. Fragments of wood, leaves, water plants. and shells.



No. 2.

10. Peat and swamp muck.

The true explanation in this case seems to be the following. The debris from the vein was pushed up a gentle slope to the south by the general glaciation. Then during post-Glacial times the gold bearing drift was cut away near its source, by a stream flowing from the southwest. This removed a large part of the float to the northeast, jamming a gold bearing boulder into a crack in the south side of the bluff or ledge 11. As this boulder could not have been thrust in from the north, I was convinced that this portion of the gold bearing came from the south. In pursuance of this new idea, the vein searched for was soon afterward found. The expansion and transporting power of ice doubtless was accountable for a large part of the transportation to the northeast. After a time the debris formed a dam about 100 yards down stream. Behind this, gravel and sand accumulated until the brook, turned in another direction, left a pond behind. In this, peat grew and the water gradually drained away until a forest covered the peat, which finally gave way to the present meadow.

Problems in Prospecting—No. 3.

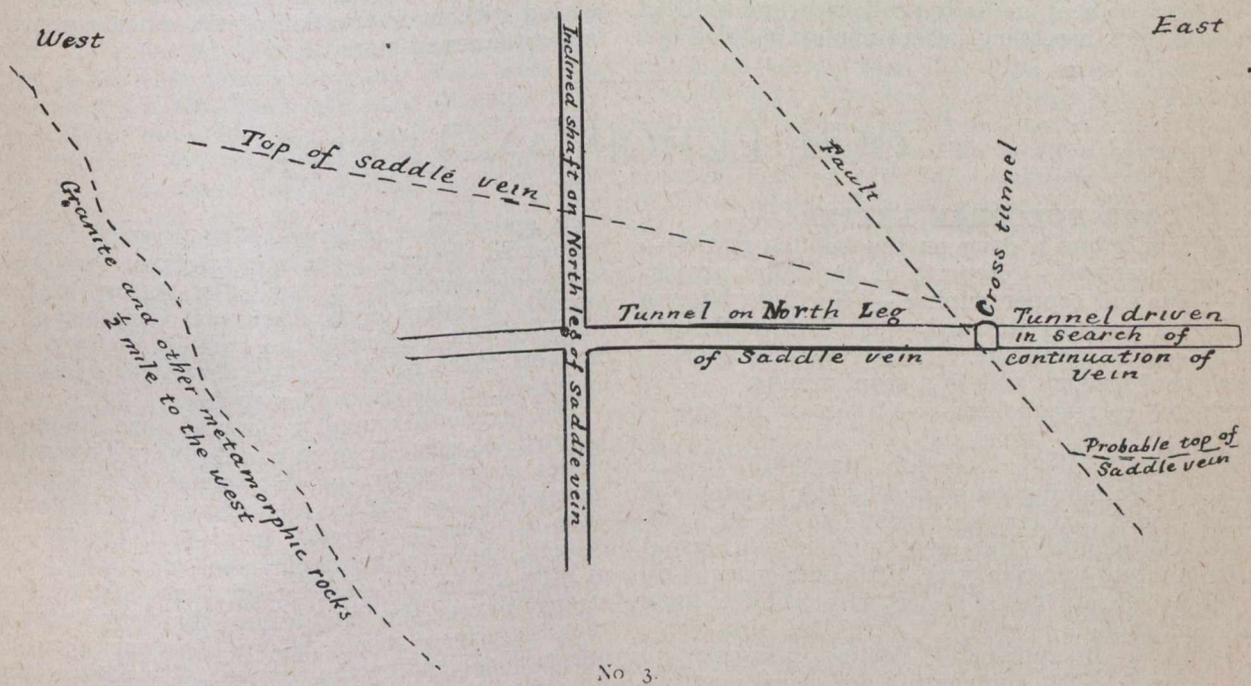
Underground section in Mooseland, N.S.

While angles of dip and proportionate length of tunnels are only approximate, this sketch will give a fair idea of a problem that cost the Mooseland Gold Mining Company much money and disappointment. Their prospectors despised geology, and the eastern extension of the vein still remains unopened. The prospecting tunnel was first carried east along the course of the anticline in the belief that the apex of the saddle vein would be cut in its downward pitch to the east. Failing in this, the tunnel was turned to the south to cut the south leg of the vein. This plan also failed for the simple reason that the vein was not there.

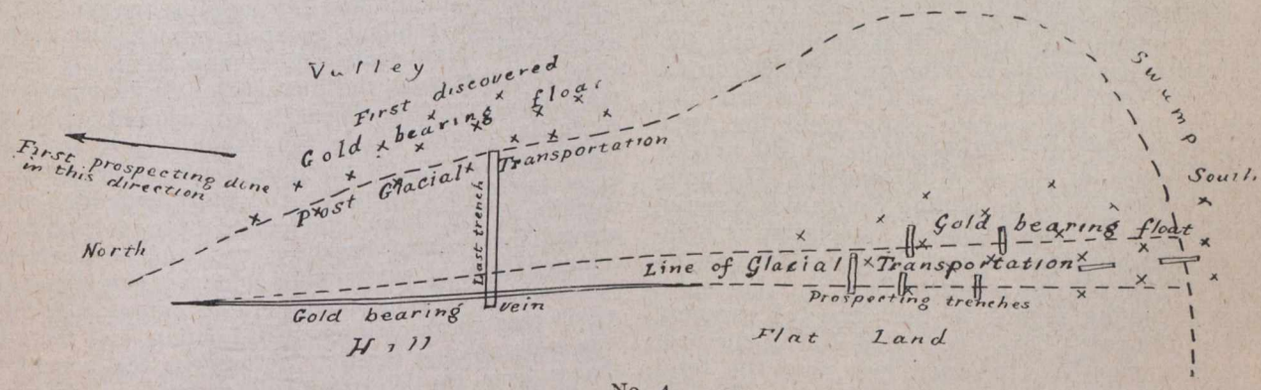
Problems in Prospecting—No. 4.

Spectacle Lakes, Lunenburg Co., N.S., Surface plan.

About 20 years ago large gold bearing boulders were noticed along the west side of a valley near Spectacle and Dares Lakes, and considerable prospecting done; as usual, in a northerly direction. At a short distance the boulders disappeared and no vein was found. About 15 years ago I found, about a quarter-mile further south, another deposit of float ore, and put down a couple of trenches parallel to the line of drift. Becoming convinced that the vein ran north and south, I put the next trenches across the line of drift. Then, as an examination of the other deposit of float ore made it evident that both came from the same vein, I transferred my operations to the long trench which



No. 3.



No. 4.

The evidence available points to the following as the true explanation of the problem. Maintaining the metamorphic origin of the granite of Nova Scotia, this rock on cooling contracted. This contraction resulted in a fault parallel to the boundary of the formerly molten mass. The western side of the fault being drawn toward the shrinking granite, left an opening into which the overhanging eastern side settled, thus bringing the higher strata on the eastern side opposite the lower strata on the western side. The vertical displacement is still unknown.

crosses the vein. The deposit of float at the foot of the hill was evidently the result of erosion by subaerial influences in post-Glacial times. The discovery of the vein the next day, up the hillside and beneath only two feet of soil, confirmed my views. The general course of glaciation during the Glacial age was south a little east. Then came the retreat of the continental ice sheet, while the province was still submerged; the deposition of the clays and sands which underlie the post-Glacial ore deposit here shown; then the deposit of the ore as mentioned in the valley east of the vein,

after the elevation of the land had made some progress. The action of frost, the flow of water, and the force of gravity, were ample causes for the transportation of ore from the higher to the lower level. This is a common occurrence in hilly countries, but is not often taken into consideration in this land of deep drift, where the finding of a vein so near the surface is a very unusual event. This problem is given as a sample of one of the simplest we have, but difficult only because we seldom expect it. However, there are in some of the eastern districts deposits of glacial debris modified by post-Glacial influences to a far less extent than in the above case, owing to the land being level, the surface deep, and brooks or lakes absent.

These few examples show the great variety of problems facing the prospector in Nova Scotia. Not only must he be a man of unlimited resource and skill in the manual work necessary, where money is doled out so sparingly as here, but he must be an adept in the solving of riddles in structural and Glacial geology. With a proper training on lines indicated in the foregoing article, I believe we would hear of fewer failures in prospecting. A revival of gold mining in Nova Scotia should result from the finding of some of our long-hidden bonanzas, without reference to present known values. A prospectors' handbook, shorn of all technical terms, and worded in the phraseology of the mucker, should find a ready sale here. Its use is indispensable to the modern prospector in deep surface, yet I do not know that such a special work as this has ever been published.

I shall close with the hope that the foregoing suggestions and examples may be of use to some one, who, like myself, has had to spend time and labour on the solving without instruction of the numerous problems facing the prospector.

OUR EUROPEAN LETTER

OUR EUROPEAN LETTER.

South African mines a drug on the London market—Reasons Discussed — Reports of important properties — Tin and copper mining — Northern Nigeria and its tin pressing forward — Revival of Russian mining — An echo of the Whitaker Wright smash—British coal masters and thin seam mining.

(Exclusive correspondence to CANADIAN MINING JOURNAL.)

London, May 19th, 1911.

South African mining companies on the London and provincial Stock Exchanges continue to be so negligible that the monthly statements of the gold output and labour situation have very little influence. Certainly very good returns are almost without effect upon the market, though possibly if very bad ones came there would be an appreciable decline owing to the lack of support. The gold output for April shows a decrease compared with March of 8,351 ounces, but this is considered satisfactory seeing that March contained one working day more. It is pointed out, too, that the return represents a value of $1,033,660 in excess of that of April last year, and is a "record" for a 30-day month. The average daily yield for April from the Witwatersrand mines alone, 21,280 ounces, shows an increase on March of 337 ounces. The number of natives employed by mining companies forming the Witwatersrand Native Labour Association is higher now than ever before, and at 213,111 shows an increase of 11,000 on the month. This is the more satisfactory, having regard to the expected growing efficiency of the raw "boys" recruited during the past three or four months. In April last year the total number of natives employed was 206,680, and since then the figure has been below 195,000. The Rand, therefore, has not missed the Chinese coolies.

Many theories are propounded for the absence of public interest. It has been attributed to the operations of the "shops" who are accused of artificially raising or depressing shares under their control as it suited their books; to the surfeit of gambling in rubber and oil shares; to the Wernher-Beit Rand Mines "deal"; to what was thought to be the unfriendly attitude of the Union of South Africa Government in bringing forward adverse legislation; and to a condition of labour shortage resulting in higher working costs and smaller returns. With respect to the last-mentioned factor, a private telegram was received from Johannesburg on April 21st stating that at the monthly meeting of the Transvaal Chamber of Mines the president expressed the opinion that by October 1st next there would be very few if any less natives employed on the mines than to-day.

The sixteenth annual report of the Rand Mines Limited, a very important and bulky document, includes a full report of the annual meeting held in March last. At this the remarks of R. W. Schumacher were of unusual interest. In view of the last labour returns, showing the employment of a larger number of "boys" on the Rand than ever before, it seems strange to read the Rand Mines' chairman's statements that scarcity of native labour does exist, and is the one serious cloud on the horizon. The natives now being recruited are, he says, of inferior physique and, at all events, for the first few months, are not very efficient workers, while a great drawback has been the exceedingly high death-rate among them. It is probable, too, that with the increase of development work more labourers than formerly are wanted. The remedy in the opinion of Mr. Schumacher, is to train more white men for using machine drills. The great progress made in mining by the more extended use of machine drills, the electrification of mine plants, improved methods of handling ore, and the better accommodation of white and coloured employees, was opening up, he said, a new era in mining. A matter which created great interest in London, and for a time was a depressing market factor, was the purchase of shares from the Wernher-Beit group. In defence of this the chairman pointed out that it is good policy for the Rand Mines to acquire such important interests and thereby extend the scope of their operations. The nine companies in which it is proposed that the Rand Mines should acquire interests are all mines with large areas, and of these the eight companies already milling have a grade above the average of the fields. The chairman's speech treated the whole subject of Rand mining most comprehensively, and a perusal of it would repay those interested.

The Barnato group of seven important Rand companies has just issued reports which compare unfavourably on the whole with 1909. Two concerns show

up well, but the remaining five have distinctly fallen back. The net profit of the Consolidated Langlaage Mines has fallen from $520,000 to $170,000; The Ginsberg Company, from $265,000 to $190,000; the Glencairn Company, from $200,000 to 125,000; the Unified Main Reef, from $185,000 to $85,000; and the New Rietfontein Estate, from a profit of $440,000 in sixteen months to a loss of $295,000 in twelve months. With regard to the members of the group that have done better, the Witwatersrand Gold shows an increase of net profit from $480,000 to $825,000, and the New Primrose an increase from $785,000 to $940,000.

The mining of tin and copper is making rapid headway in the Transvaal and if anything like the same rate of progress is maintained during the next few years the base metals of the Transvaal may form the foundations of industries which will be anyhow a very good second to the Rand both in volume and profit. Although it has been long known that there were deposits of tin ore in the Transvaal, they attracted very little attention, and were not taken seriously until what is known as the tin boom, which took place in 1905. In that year there were important finds of both tin and copper, and two years later the output was sufficiently important to figure in the official returns. As regards tin, the rapidity of the growth of the industry may be realized by noting that, while in 1905-6 the estimated value of the tin ore production was $22,370, the total produced up to the end of 1910 is recorded as $3,456,750. Up to date, it may be said that the value of the output is about $3,750,000, and fresh discoveries are still coming along.

The great bulk of the output of tin comes from the four companies working on a considerable scale, each company having a mill of ten stamps. The position of affairs in the tin industry and the tin trade of the rest of the world is sufficiently interesting at the present time to give the Transvaal development in connection with the metal a world-wide importance. The tin position generally presents an economic prenomenon that has perhaps never had a precedent in the history of mineral industry. Tin, notwithstanding the erratic fluctuations in price, has one of the steadiest and most persistent of markets, so far as bona-fide sales for consumption are concerned.

As the population of the world increases and civilization spreads, the demand for tin becomes greater and still greater. Meantime, the supply of tin remains practically stationary. While the output of the metal is constantly being added to by new discoveries, the older fields are being gradually exhausted, and, taking the world-wide result, there is so little change in the aggregate that it is difficult to see the probability of any considerable development in the future.

Whether copper-mining in the Transvaal will ever be of very great relative importance is still, perhaps, a moot point. There is known to be south of the Limpopo River, near the Rhodesian boundary, a large area in which copper exists, and one company at least is exploiting the deposits. At present there is a certain difficulty with regard to transport, but the company, which is finding very rich ore, is sending it to Bandolierkop, about 60 miles from the mines. The ore has been treated in Europe, and up to June of last year the 7,000 tons odd which had been shipped are said to average 54 per cent. of copper contents. This, of course, is extremely rich stuff, and it can hardly be expected to continue at the same high level to any great quantities. It is estimated that the average would work out at about 12½ per cent.

Interested parties are still seizing every opportunity for bringing Northern Nigeria, and especially its tin resources, more and more before the British public. Sir Hesketh Bell, the Governor of Northern Nigeria, read a paper in London at a dinner on May 12th in which he remarked upon the successful administration of this African protectorate. On the question of transport, which so intimately affects the growing mining industry there, he said that the most important development of late consisted in the construction of the Baro-Kano Railway. This line, originally suggested by Sir Frederick Lugard and planned by Sir Percy Girouard, was practically completed only three weeks ago. It held a record for celerity of construction and economy of cost. Three years had hardly elapsed since the first sod was turned at Baro, and on the 8th of April the first train steamed into Kano, having travelled from Baro, 360 miles distant. Between Zaria and Kano no less than 6¼ miles of rails were laid in a single day. The cost would only very slightly exceed Sir Percy Girouard's original estimate of $15,000 per mile, and the line had the merit of being by far the cheapest railway ever constructed in tropical Africa. In a few weeks it would be possible to go from Lagos by way of Kano, nearly 800 miles from the coast, in little more than three days. Up to quite recently such a journey, even on horseback, could not have been done in less than a month.

Several new tin companies have been floated in London, but on the properties themselves nothing much can be done until the close of the wet season. Segar R. Bastard, a solicitor by profession, is perhaps the best known figure behind the Nigeria tin movement in London. A contemporary of the present Premier at the City of London School, he was one of the earliest financiers and promoters who interested themselves in Northern Nigeria. It was owing to his enterprise that the Champion Gold Reefs of West Africa, a gold mine which had practically floundered, sold up its remaining assets and invested the last of its money two or three years ago in the then untried Northern Nigerian tin fields to such a good extent that within the first year a hundred per cent. dividend was paid. The company, now known as the Champion Tin Mines of Northern Nigeria, is now the parent of half a dozen of the most important alluvial tin propositions out there.

An interesting revival is taking place in the English capitalized mines of Russia. Prices of the leading dozen companies have risen substantially in the last month and Lena Goldfields have received special attention. Very many of the deals here are on behalf of people in St. Petersburg, who have taken up one share after another. This Russian group, so far as London is concerned, has been in such a moribund condition since the sensational collapse of about four years ago that even now it would not be overstating to say that dealers generally are completely bewildered at this unexpected turn of events. In the meantime, a demand is proceeding on Continental account which literally takes one's breath away, having regard to the heavy lines of stock which are daily changing hands.

One of the biggest achievements and greatest gambles of the Whitaker Wright regime is recalled by the announcement of a reconstitution scheme for Lake View Consols. The scheme is explained in a circular from the directors, and it is proposed to form a new company with a capital of $875,000 in ten shilling ($2.50) shares, one of which will be given in exchange for each

five-dollar share in the existing company. Formed in 1896 under the auspices of the notorious London and Globe Finance Corporation, Lake View Consols acquired the Kalgoorlie properties known as the Lake View and Boulder East from a colonial company for $1,100,000 in fully-paid shares. The quotation of the shares was soon soaring to great heights. In October, 1897, an interim dividend of $2.50 a share was paid, and the five-dollar shares reached $63⅛. A further $2.50 was paid in April, 1898. In 1899, $12.50 per share, or 250 per cent., was paid, and the quotation reached its record mark of $144⅜. The wild fluctuations of the shares can be gathered from the fact that in the same year the price dipped to $45 15-16. In 1900, during which $6.25 a share was paid, the highest price was $76⅞. At the end of that year came the great Whitaker Wright crash, and on December 28, 1900, the shares were cut down by one fell stroke from $65 to $38¾. In the following year 50 per cent. was paid in dividends, but since then the distributions have amounted in all to no more than $1.60 a share. The quotation reached its low record of $1.50 in 1908. Now it is $3.56.

British coal masters are being driven to a rapid improvement of their methods by the fact that the days of plenty of coal are drawing to an end in this country as they must do with an annual output of 264,000,000 tons. Coal owners are being forced to open up extremely thin seams, and at the present time a seam of coal is being worked in Lanarkshire which is only 14 inches in thickness. To enable the collier to get at the coal it is "undercut" 5 inches, and so the man is favoured with a space 19 inches wide, in which he has to spend about seven hours per day. To get to his "place" he wriggles, or one may say swims, some 70 yards.

It will be realized that the cost of "getting" coal from a thin seam must be very much greater per ton than from a thick seam, and the problem which the colliery manager faces is how to reduce this cost. The result of studying this subject was, first, the coal cutter and, as a natural complement, the face conveyor. This problem of the coal cutter is largely one of compact and strong gearing, and it will be evident how far this problem is from a satisfactory solution when it is stated that a machine costing, say, $1,000, may easily take $500 per annum to keep it in repair. It must be remembered, of course, that a collier is no mechanic, and that from him machines need expect no gentle handling and very little sympathetic treatment.

THE VOLUMETRIC ESTIMATION OF SULPHUR IN IRON AND STEEL.

By T. GIFFORD ELLIOT (Sheffield).

(Paper read before the Iron and Steel Institute.)

The methods used in the analysis of iron and steel twenty years ago were largely gravimetric, whereas the majority of those in use at the present time — at least in a works laboratory — are volumetric, although in the estimation of sulphur in iron and steel no volumetric process has yet been discovered which is universally applicable, and the gravimetric process known as the "aqua regia" is still in constant use.

Whether the "aqua regia" or Bamber's method be used, the gravimetric estimation of sulphur is very tedious, and liable to error even in skilful hands. This is proved by the difficulty of obtaining results in agreement from different laboratories on the same sample, although variations in the method of working are probably responsible for some of the discrepancies.

The volumetric estimation of sulphur has received considerable attention during the last few years, and many papers have been written on the subject. Most of the work has been devoted to eliminating the loss of sulphur in the evolution method, generally thought to be due to the formation of organic sulphur compounds instead of sulphuretted hydrogen, on attacking the metal with acid.

Various suggestions have been made with a view to effecting this most necessary result. The chief are as follows :(1) The speed of solution should be as quick as possible. (2) The gases from the evolution flask should be passed through a hot tube to decompose any organic sulphur compounds, and then into an absorption flask. (3) The weighed portion of the sample should be annealed in a non-oxidizing atmosphere before treatment with acid. (4) The acid used to dissolve the metal should be concentrated hydrochloric acid of 1.19 specific gravity.

Schulte[1] and also Phillips[2] in 1895 suggested passing the gases through a red-hot tube.

In 1902 Walters and Miller[3] first suggested the annealing of the weighed portion for analysis before treatment in the evolution flask. They placed the sample in a porcelain boat and heated to bright redness in a tube in a current of hydrogen for fifteen minutes, but if the sample contained an "appreciable amount of titanium," for half an hour.

In the same year Dougherty[4] made the annealing more practicable, by suggesting the use of a covered porcelain crucible for the purpose, with a piece of filter paper placed on the drillings to provide the non-oxidizing atmosphere.

C. A. Seyler[5] described his experiences with Dougherty's method, in a paper read before the Society of Public Analysts in December, 1902. He obtained the best results by annealing at 750 deg. C., although he stated that more experiments were required to obtain the best temperature. So far as I am aware, this is the only published instance where the temperature of annealing was measured.

S. S. Knight[6] modified Dougherty's method in 1904, by mixing the sample with pure iron dust reduced by hydrogen. The mixture was placed in a porcelain crucible, covered with a little more iron dust and an ashless filter paper. The lid was put on, and the whole heated for ten minutes "at the highest heat obtainable by a blast lamp."

In 1906, J. MacFarlane and A. W. Gregory[7] suggested the use of cream of tartar to mix with the drillings for annealing. They mixed 5 grammes of the powdered sample with half a gramme of cream of tartar, wrapped the drillings in filter paper, placed in a small porcelain

crucible, covered, and annealed at a bright red heat in a muffle for fifteen minutes.

An interesting report was presented in 1908 by H. Kinder,[8] of the work of a chemical commission appointed by the German Society of Ironworkers, to inquire into the estimation of sulphur in iron and steel. The figures obtained show that the highest results were got by the use of strong hydrochloric acid, 1.19 specific gravity, and quick evolution, and that under these conditions the use of a red-hot tube is unnecessary.

In a laboratory where the ordinary routine consists in the analysis of samples varying from the best hæmatite iron to high phosphorus foundry iron, and from the purest transformer iron through the many varieties of steel used for steel castings to complex alloy steels, the applicability of a method for general use is severely tested.

I have found that many samples of iron and steel do not evolve their full sulphur contents after merely annealing in a non-oxidizing atmosphere, when treated with concentrated hydrochloric acid. MacFarlane and Gregory's method of annealing with cream of tartar, however, gave me excellent results with some brands of iron with which I had previously not succeeded; but with other brands, and particularly with nickel-chromium steels and other self-hardening material for which I was very anxious to find a quick method of determining the sulphur, the full amount was not obtained. I am not overlooking the fact that the method was only designed for irons.

My experience agrees with the finding of the German Commission as to the importance of using concentrated acid and rapid evolution. Moreover, in many experiments, I passed the gases from the absorption flask through a red-hot tube and into a second flask, but the amount of sulphide obtained in the second solution was negligible.

In order to find a more active reagent than cream of tartar, I tried various substances, and finally chose potassium ferrocyanide. The effect of heat upon this substance is to decompose it into carbide of iron, potassium cyanide, and nitrogen. The result is, that the drillings are more or less carbonized, and a strongly reducing atmosphere obtained.

Experiments made to determine the length of time required for annealing, indicated that with less than twenty minutes, low results are obtained. On the other hand, no advantage is usually to be gained by exceeding this period, whilst in the case of steel drillings, oxidation is then liable to occur.

Annealing experiments with different amounts of ferro-cyanide indicated that 0.25 gramme mixed with 5 grammes of the sample, was the most suitable amount. If more is used, cyanogen compounds may be driven into the absorption flask, especially if the condensing tube gets hot. The result is, that when the titration is made by adding iodine to the contents of the absorption flask without filtering, acidified only with acetic acid, an excess of iodine may be added beyond that required to dissolve the sulphide, without any colour being imparted to the solution. (A drop of starch solution added here gives the characteristic blue colour.) On adding dilute hydrochloric acid, the brown colour due to the excess of iodine appears, and the titration is proceeded with as usual, the result being unaffected, notwithstanding.

Experience has shown that in order to obtain correct results it is absolutely necessary to control the temperature of annealing. As will be seen from the table of results the correct temperature lies between 750 deg. C. and 850 deg. C.

If there are no means of measuring the temperature available, it is necessary to work a standard of known sulphur content with each batch of samples annealed.

An indication as to whether the sulphur is being evolved correctly is furnished by the colour of the precipitated cadmium sulphide. This should be distinctly yellow. A pale precipitate is usually associated with a low result, and suggests that the annealing has not been conducted properly.

In order to promote uniformity in the rate of solution, which is important, it is advisable that the drillings of the sample should be of the same degree of fineness as the standard, and of similar composition. Reference is made below to the use of a standard.

The method I have adopted is as follows: 5 grammes of the sample are mixed, as far as is practicable, with 0.25 gramme of pure finely powdered anhydrous potassium ferro-cyanide, and wrapped in one 9-centimetre filter paper if the sample is a graphitic iron, or two papers if it is a steel or white iron, placed in a small porcelain crucible (Royal Berlin O.A.), covered with the lid, and annealed at 750 deg. C. to 850 deg. C for twenty minutes in a closed muffle. After the annealing and subsequent slow cooling outside the muffle, the drillings should still be covered practically completely by the charred filter paper, if the temperature has not been above 850 deg. C. or they have not been in the muffle too long. I make a point of observing the appearance of the annealed drillings very closely, because low results are obtained if the paper is completely burnt away from the top of them. After cooling, the crucible is emptied into a glass mortar, and the slightly caked drillings loosened with a pestle. They are then brushed on to a small piece of stiff paper, which is rolled into cylindrical shape so that it will fit right into the neck of the evolution flask, and allow of the drillings being transferred to the flask without touching its neck or sides. The evolution flask is connected with a condensing tube 6 inches by 1 inch, containing about 2 inches of water, and standing in a conical beaker filled with cold water. A tube from this dips into a flask containing 60 cubic centimetres of the cadmium chloride solution, which again is connected with another flask containing more cadmium solution. Fifty cubic centimetres of concentrated hydrochloric acid are now added, and heat is immediately applied to the flask until the frothing of the contents indicates that the solution is well in progress. The flame of the burner used to heat the flask is lowered. As soon as the speed of the bubbles of gas passing through the cadmium solution begins to slacken, the flame of the burner is raised so that the liquid in the flask just boils. The boiling is continued so long as any appreciable amount of gas is given off from the solution. The apparatus is then disconnected, and iodine solution added in excess to the contents of the absorption flask — usually nothing is found in the safety flask; then 10 cubic centimetres or so of diluted hydrochloric acid (one part acid and two parts water) are added, and the liquid shaken to complete the solution of the sulphide. The excess of iodine is then titrated with sodium thiosulphate, starch solution being added when the iodine colour has nearly disappeared. (The air in the apparatus may be washed out by carbonic acid before the addition of the acid to commence with, and again at the end of solution of the drillings, if desired, though

the slight advantage gained thereby is hardly worth the extra trouble for works practice.)

If the filter paper used to wrap the drillings, or the ferro-cyanide itself, contains sulphates, the latter are reduced during the annealing, and their sulphur given off as sulphuretted hydrogen in the evolution flask, so that a blank determination becomes necessary. The blank can be conveniently determined upon a pure iron, by dissolving 5 grammes of the iron in concentrated hydrochloric acid, and absorbing the sulphuretted hydrogen as usual. By annealing another 5 grammes of the iron in the usual way, and determining the sulphur contents as in the direct estimation, any difference due to the above causes can be determined.

The iodine and thiosulphate solutions may be standardized by means of a steel or iron, the sulphur contents of which have been accurately determined by the "aqua regia" or Bamber's method. The value of the solutions in sulphur so obtained, should agree closely with that got by calculation after standardizing the thiosulphate against a standard solution of potassium permanganate. The latter is very easily performed, and is a very useful check on the working of the process. The solutions of iodine and thiosulphate used are of such strength, that 1 cubic centimetre equals 0.005 per cent. sulphur on 5 grammes of the example.

The cadmium chloride solution is prepared by dissolving 20 grammes of cadmium chloride in water with the aid of a few drops of hydrochloric acid. Ammonia is added until the precipitate of cadmium hydrate formed, completely dissolves. Acetic acid is then added until the solution becomes slightly acid, when a further 20 cubic centimetres are added in excess, and the solution made up to 2 litres.

I find the cadmium solution acidified with acetic acid, and containing ammonium acetate, the best absorbent to use. It does not absorb the hydrocarbons, phosphides, etc., simultaneously evolved with the sulphur compounds, to the extent that solutions of salts of zinc, lead, and copper do, or as do the alkaline solutions frequently used for this purpose. I have frequently tested the point by filtering off the cadmium sulphide before titration, and comparing the results obtained by titrating the washed sulphide, with those got by direct titration.

The three steels each contain over 1 per cent. of both nickel and chromium. No. 8620 is in the cast condition, R. 4290 in the tempered, and No. 8672 in the annealed state. The latter contained under 0.05 per cent. of hardening carbon, and practically the whole of the sulphur was obtained as cadmium sulphide by direct evolution. This is most important, and I believe that therein lies the solution of the problem of how to obtain the whole of the sulphur in a sample of iron or steel evolved as sulphuretted hydrogen by hydrochloric acid. It is, of course, absolutely necessary that the sample should be completely decomposed by the acid. In the case of irons containing titanium, as Blair[9] has shown, this is not the case, and some of the sulphur may remain in the evolution flask in the insoluble residue. I have experimented with an iron containing 0.2 per cent. of titanium. The sulphur content, obtained by a gravimetric method which included the fusion of the insoluble graphitic residue after treatment with aqua regia, was 0.080 per cent. The direct evolution gave 0.017 and 0.018 per cent. After annealing at 800 deg. C. the amount obtained was 0.066 per cent. The special treatment (referred to in the last column of results in the table) consisted in placing the crucible containing the sample in the muffle at 950 deg. C., and leaving at that temperature for five minutes. The gas was then turned off, and the muffle allowed to cool down to just below 800 deg. C. The gas was then relighted, and the temperature of the muffle kept at about 790 deg. C. for fifteen minutes. The crucible was then brought out to the front of the muffle and allowed to cool slowly. The sample containing titanium after this treatment gave 0.076 per cent., which suggests that by a proper preliminary treatment the whole of the sulphur may be obtained even from pig iron containing titanium by the evolution process.

Iron No. 471 was found to give off the whole of its sulphur as sulphuretted hydrogen by direct evolution (i.e., without any preliminary treatment).

As it is my custom to have all iron samples annealed before treatment in the evolution flask, I experimented with this sample in order to test the effect of the annealing on the amount of sulphur obtained. The results are given in the table.

I wish to express my thanks to Messrs. G. B. Willey, A.R.S.M., and E. G. Barnes (the latter of whom has been responsible for the control of the annealing), to whom I am indebted for the carrying out of a large amount of the experimental work involved in the preparation of this paper.

1 Chemical News, vol. lxxv., p. 47.
2 Journal of the Society of Chemical Industry, 1896, p. 218.
3 Journal of the Iron and Steel Institute, 1902, No. 1, p. 851.
4 Iron Age, May 8, 1902, p. 14.
5 Analyst, April 1903.
6 Chemical News, vol. xc., p. 326.
7 Ibid., vol. xciii., p. 201.
8 Stahl und Eisen, 1908, No. 8, p. 249.
9 Transactions of the American Institute of Mining Engineers, vol. xxxi., p. 748.

TABLE OF RESULTS

Description of Sample	Gravimetric Method Silicon per Cent.	Evolution Method — Annealed (Temperatures) — Un-annealed	700° C.	750° C.	800° C.	850° C.	900° C.	950° C.	Special Treatments	Remarks
Steel, No. 8620	0.061	0.025 0.026	0.046 0.045	0.058 0.058	0.061 0.060	0.059 0.059	0.053 0.054	0.046*a* 0.051*b*	.....	(a) Paper burnt off: drilling slightly oxidised. (b) Drillings quite bright after annealing instead of grey, as in the case when annealed at a lower temperature.
Steel, R. 4290	0.051	0.030 0.031	0.045 0.048	0.049 0.050	0.051 0.051	0.050 0.047	0.048 0.046	..	0.050	The Duplicate results were obtained by different workers using different apparatus.
Steel, No. 8627	0.054	0.053	.....	.....	0.053 0.054	....	0.048	.....	0.054 0.055	
Iron, No. 471	0.085	0.085 0.086	0.083 0.087	.....	0.084 0.085	0.080 0.081	0.066 0.071	.....	0.084	Do.
Iron, No. 726	0.053	0.028	.....	0.052	0.051	0.048	.....	.....	0.051	Do.

Canadian Mining Institute—Western Branch.

The tenth general meeting of the Western Branch of the Canadian Mining Institute was held at Trail, British Columbia, on May 18. Mr. Wm. Fleet Robertson, provincial mineralogist, chairman of the branch, presided, and there was an attendance of members and visitors from various parts of the Kootenay and Boundary districts, the neighbouring State of Washington, and the coast cities, Victoria and Vancouver. There were two sessions—afternoon and evening.

The visitors were welcomed by the president of the Trail Board of Trade, after which several papers were read and discussed. These were: "The Burns Anthracite Coal Property, Alberta," by Mr. Alexander Sharp, M.E., Orient, Washington; "Costs of Operation at the Blue Bell Mine, Kootenay Lake, B.C.," by Mr. S. S. Fowler, M.E., Riondell, B.C.; "Notes on Property of the Le Roi No. 2, Limited, at Rossland, B.C.," by Mr. Ernest Levy, M.E.; "The Standard Mine, Silverton, B.C.," by Mr. John Valance; and (by title only) "Notes on the Lucky Jim Zinc Mine, Slocan, B.C.," by Mr. A. J. Becker; "The British Columbia Copper Company's Smeltery, Greenwood, B.C."; "The Van-Roi Mining Company's Concentrating Mill, Four-mile Creek, Slocan," and a description of the copper smelting side of the Consolidated Mining and Smelting Company's smeltery at Trail.

Mr. H. Mortimer-Lamb, secretary of the Institute, who had journeyed from Montreal, Quebec, to British Columbia to attend the meeting, read a letter of greeting from Dr. F. D. Adams, president of the Institute, and explained the proposal of the council of the Institute to hold a semi-annual meeting in British Columbia in the autumn of each year, this to be as far as practicable similar to the general meeting of members held annually in one of the cities of Quebec or Ontario. It was recommended that the first of these proposed semi-annual meetings shall be held next autumn. The matter was referred to the incoming branch council with a recommendation that it further the efforts of the general council to make such semi-annual meeting a success.

An invitation to hold the next general meeting of the branch (in September) at New Denver, Slocan Lake, in the vicinity of which town several important silver-lead mines and concentrating mills are being operated, was favourably received and referred to the branch council for its decision thereon.

A proposal that the Provincial Government be urged to either add to the staff of the Provincial Bureau of Mines, or employ mining engineers not on the staff, to do exploratory work in new districts in the province giving promise of becoming mining fields, was not adopted, it being considered that the meeting was not in possession of sufficient information to show that there exists a public demand for such action, or other reasons that would warrant its making such a recommendation to the Government.

The result of the ballot for chairman and members of the branch council for the ensuing year was that Mr. Robert R. Hedley, of Vancouver, B.C., was unanimously elected chairman, while all but one of the twelve elective members of the branch council were re-elected, the only new member being M. E. Purcell, superintendent of the Centre Star group of mines, Rossland, B.C. The Branch officers and council for the ensuing year are as follows: Chairman, Robert R. Hedley, Vancouver, B.C.; Secretary, E. Jacobs, Victoria, B.C.; Council—W. H. Armstrong, Vancouver, B.C.; *S. G. Blaylock, Moyie, B.C.; S. S. Fowler, Riondel, B.C.; Norman Fraser, Michel, B.C.; Chas. Graham, Middlesboro, B.C.; Thos. Graham, Nanaimo, B.C.; J. Cleveland Haas, Spokane, Wash.; John Hopp, Barkerville, B.C.; W. H. Trewartha-James, Victoria, B.C.; *Frederic Keffer, Greenwood, B.C.; *Thos. Kiddie, Vancouver, B.C.; F. C. Merry, Ferguson, B.C.; M. E. Purcell, Rossland, B.C.; *W. F. Robertson, Victoria, B.C.; Lewis Stockett, Hosmer, B.C.; *O. E. S. Whiteside, Coleman, Alberta; W. E. Zwicky, Kaslo, B.C. Mr. Hedley presided during the latter part of the evening session.

On Friday morning, May 19, some of the visitors were shown through the Consolidated Mining and Smelting Company's copper and lead smelting works and electrolytic lead refinery at Trail, and in the afternoon spent several hours in the company's Centre Star mines, at Rossland.

The Burns Anthracite Coal Property, Alberta.

Mr. Sharp showed that this property consists of 15,360 acres of Crown-granted land, beside an area leased from the Dominion Government. The nearest railway towns are Calgary and Okotoks, each distant about 45 miles from the property. The coal measures belong to the Lower Cretaceous period (Kootenay series). The formation comprises about 4,000 feet of sandstone, dark shale, conglomerates, and—near the base—some clay and ironstone. At intervals in the strata occur the coal seams and coaly shales, the whole resting on carboniferous lime. The area is 11 miles long and from one mile to three miles broad. The measures lie in a long, narrow, synclinal trough; strike N. 42 deg. W., and dipping to westward at an angle varying from 52 to 80 degrees. The southeastern outcrops are at elevations from 300 to 2,000 feet above the valley of Sheep Creek, but towards the north, at Burns Creek, the coal comes down to the level of the valley and has every indication of going deeper. Ten or twelve seams of coal have been exposed and traced, by drifts and open-cuts, about five miles. These exposures show fully 100 feet of coal in the measures. Fifteen samples, taken from seams ranging from 4 feet 6 inches to 20 feet in thickness, gave analyses varying between the following percentages: Moisture, 1 at 2.10 per cent.; fixed carbon, 70.05 at 82.25 per cent.; ash, 3.5 at 17 per cent.; sulphur, 0 at 1 per cent.; volatile, 9.6 at 13.43 per cent.; B.t.u. (one sample), 14.877. Complete analyses of two samples from a 7-foot seam on Rickert Creek were as under:

Water, 0.98, 1.02; carbon, 84.77, 87.24; ash, 5.42, 5.92; sulphur, 0.18, 0.18; hydrogen, 3.63, 2.92; oxygen and nitrogen, 4.48, 3.24, coke, 90.64, 92.81.

The topography of the country is favourable to economical mining. Some of the seams come down to the level of the valley, so can easily be reached by tunnels at the valley floor. Any of the seams can be drifted on from either side of the several creeks that cut the formation. Thus a chain of collieries can be operated along the valley. Power can be generated from water power of the creeks. The seams are being prospected at different horizons so that the nature of the roof and floor texture may be ascertained before any permanent opening shall be made. The difference in elevation between the coal property and Okotoks is about 2,150 feet, or approximately 48 feet to the mile.

*Members of Council ex-officio.

Costs at the Blue Bell Mine, Kootenay Lake, B.C.

Mr. Fowler, who will later prepare his paper in fuller detail, made an appeal for voluntary publication of costs of operation of mines or dressing plants, stated in connection with all the conditions which control those costs. The object of obtaining these would be to afford means whereby those to whom the figuring should become accessible might more accurately forecast the results of new undertakings. In order to set an example Mr. Fowler presented figures of costs pertaining to the operation of the Blue Bell mine and ore-dressing plant, including all overhead charges except interest and sinking fund. A summary of the figures presented shows that in the treatment of 43,069 tons of ore (containing lead, iron, and zinc) during nine months prior to March 31, 1910, the cost of ore extraction was 98.4 cents; concentration, including weighing of ore and loading of product, 50.2 cents; and management and all general expenses, 37,6 cents; total, $1.862 per ton. These costs were attainable only through the means of extraordinarily favourable physical conditions, but the result was also much assisted by the loyal co-operation of staff and mine and mill crew.

Property of Le Roi No. 2, Ltd., Rossland, B. C.

This property comprises more than 150 acres, situated in the vicinity of the mining groups of the Consolidated Mining and Smelting Company of Canada, Ltd., and the Le Roi Mining Company, Ltd., Rossland, B.C. It has been investigated by two mines—Josie and No. 1—and by numerous surface workings. Several veins have been worked. The country is much broken and displaced by numerous dikes, and the solution of the problem as to what is the result of these disturbances is still unfolded. The most important dike is that known as the Josie, which has an average width of 100 feet, striking approximately north and south and dipping 84 degrees to the west. Corresponding figures for the Tramway dike are: Width, 50 feet; strike, N. 20 deg. E., and dip 70 deg. E. Both are accountable for surface depressions, due to their adaptability to more rapid erosion. The minor dikes strike roughly parallel with the Josie, with dips, as a rule, not far from vertical. The main rock disclosed by the workings is the augite porphyrite which varies considerably in texture, hardness, and breaking qualities in different parts of the mines. The orebodies are erratic, both as to position and variability in size, as well as disposition of value; additional difficulty is experienced owing to the visible characteristics of the ore seldom indicating its value at all, and this involves constant recourse to assaying. The orebodies vary in width from a knife-edge to 30 feet, so that there have been called for both the square-set and "shrinkage" stoping methods of ore extraction. The latter system is exercised to as great an extent as practicable on account of its smaller cost. By far the larger proportion of past production has been derived from between the 300 and 700-foot levels of the Josie mine.

The Josie main shaft inclines at 74 deg., has three compartments, and extends to the 1,300-foot level. It is 14 feet 6 inches by 5 feet inside the timbers, and is equipped with a 150- h.p. double conical-drum hoist. In the shaft building are grizzlies, 4 inch and 1 inch spaces, on which hand-sorting of ore takes place. The ore is separated into first-class, second-class, and mill ore. First-class fines is shipped to the smeltery, and the remainder sorted into shipping and mill ore, and waste; second-class fines is sent to the mill, and the remainder distributed as in the case of first-class. Mill ore is trammed direct to the concentrator. No. 1 mine shaft is 3-compartment, 800 feet deep, and is equipped, similarly to the Josie, with hoisting engine and sorting floors.

Figures covering the operations of the last financial year will serve to give an idea of what is accomplished by hand-sorting. They are:

	Tons extracted.	
First-class ore	42,770	
Second-class ore	5,790	
Mill ore	4,480	
		=53,040 tons.

which by sorting was resolved into:—

	Tons.	
Shipping ore	29,776	
Mill ore	17,553	
Waste	5,711	
		=53,040 tons.

Stoping costs were:—

Ore production: labour	$0.76	
Explosives	0.32	
Illuminants	0.03	
Sundries	0.04	
		$1.15
Ore sorting labour		0.21
General expense		0.35
Power plant: labour	0.07	
Supplies	0.36	
		0.43
Mine general: Labour	0.33	
Supplies	0.07	
		0.40
		$2.54

Average assay value of ore shipped was: Gold, 0.8882 ounces; silver, 0.8086 ounces; copper, 1.6305 per cent.

During the last financial year there was done: Driving and cross-cutting, 4,202 feet; raising and winzing, 160 feet; total, 4,362 feet. Cost per foot, $17.72. Cost was exceptionally high, however, due to greater depth of working (chiefly on 1,300-foot level), bad powder, and several other unusual conditions. The following comparative table will show corresponding costs of several consecutive years:

Year to Sept. 30.	Drifting and cross-cutting. Feet.	Raising and winzing. Feet.	Total Footage. Feet.	Total cost per foot.
1910	4,202	160	4,362	$17.72
1909	3,220	338	3,558	14.35
1908	4,302	270	4,572	14.17
1907	2,538	255	2,793	14.58
1906	3,392	187	3,579	12.91

In addition to the work done in 1910, as shown above, the main shaft was deepened 193 feet, at a cost of $1.73 per foot, and 11,508 feet of diamond drilling was done at $1.73 per foot. The average depth of drilled hole was 371 feet.

The concentrator is capable of milling and treating 60 tons of ore per diem. The machinery is electrically driven by motors aggregating 100 h.p.; it comprises one 9 by 16-inch and two 8 by 12-inch Blake crushers, two 6-foot Chilean mills, and four Wilfley tables.

During the last financial year the grade of ore treated, and results, were: Mill feed, 17,235 tons; assay value, gold 0.122 ounces and silver 0.255 ounces per ton, and copper 0.554 per cent. Concentrate produced totalled 1,368 tons, assaying gold 1.297 ounces and sil-

ver 0.748 ounces per ton, and copper 1.144 per cent. Cost per ton crushed was $0.99.

As a result of the company's mining and milling operations in Rossland during the financial year ended September 30, 1910, the net profit was $249,255.81.

Standard Mine, Silverton, B.C.

Mr. Vallance gave a comprehensive description of this property, which has attracted much notice of late owing to the opening in it of large shoots of ore containing much galena of good grade.

The group includes 13 mineral claims. The mine is at an altitude of 3,354 feet above sea level and 1,594 feet above Silverton, on the eastern shore of Slocan Lake, and distant from the mine one mile and a half. Development work on a systematic plan has been in practically continuous progress since 1904. The "big ore shoot" was cut by the lower levels in 1909-10, and the present remarkable showings of ore exposed.

The enclosing country consists of old and very siliceous sedimentary rocks, cut in places by masses and dikes of an eruptive rock generally classed as granodiorite. A large "boss" of this rock occurs along the east side of the Standard claim and is, apparently, the centre from which the local dikes radiate. The sedimentary strata is mainly hard, blocky argillites, siliceous shales, and impure quartzites. The Standard vein is a strong fissure cutting the Bedding planes of the enclosing sedimentary rocks; a dike of quartz-diorite-porphyry is intruded into the fissure and lies along the footwall side. This dike rock is much altered and appears to in some manner be closely connected with the principal orebodies found in the veins; probably the clayey-talcose matter of the altered dike has influenced the course of the mineral-bearing solutions and caused the ore to be deposited on or near the dike, where it is most frequently found. Much evidence of large and repeated movements is found in the vein, especially toward the hanging wall side, and, at some points movements have occurred after the formation of the orebodies—masses of galena being found deeply striated by movement of adjoining hard gangue material.

The principal minerals are argentiferous galena and zinc-blende, with some pyrite, chalcopyrite, and grey copper (Freibergite) as associated minerals. The Freibergite occurs as specks and bunches mixed with the galena, mostly, but occasionally with the blende, and it is evidently highly argentiferous for specimens have assayed as high as 2,000 ounces silver per ton. The vein gangue is quartz, lime spar, and spathic iron, with enclosed fragments of shale and occasional masses of altered dike rock.

In the workings above the fourth level, the orebodies were found lenticular in form and following a zone pitching about 30 degrees. From No. 4 down to No. 5 level the big shoot of galena has a pitch nearly 28 deg. Where the big shoot is cut by No. 5 level the vein gradually widens from 4 to 30 feet. Here the clean galena has its maximum width of 15 feet, the remaining 15 feet being high-grade milling ore with included masses of clean galena. From here to the present face of No. 5, which is approximately 1,200 feet from the portal of the adit, the vein widens and the orebody gradually changes its character, the shoot of clean ore giving place to a great mass of milling ore enclosing irregular bodies of solid galena. The ore shoot has been opened a length of 250 feet; a cross-cut at the present face shows ore, chiefly milling grade, about 85 feet in width.

The mine workings consist of six levels. with connecting raises from No. 5 upward, and a number of cross-cuts from the levels, where the vein is wide. Not including stopes and cross-cuts, the mine openings have, together, a length of 8,500 feet. The depth on the vein, from No. 1 to No. 6 level, is 740 feet. After connection shall be made with No. 5 raise, No. 6 will become the main adit for the mine, and the upper terminal of the aerial tramway will be placed at its portal.

Ore from stopes above No. 4 level was taken out by ordinary overhand method, and the ground timbered with a two-piece set, or by stulls, as required. In the lower levels, where the vein is wider, the large orebody will be extracted by overhand stopes, with square-set timbering. Ore extracted has been roughly graded in the workings; the cleaner ore has been sent to the sorting houses, while the cobbings from this, and all second-grade ore from the mine, have been placed on the milling ore dumps. Shipments to the smeltery to date aggregate 4,418 tons; average metal contents were: Silver, 78.46 ounces per ton; lead, 62.5 per cent.; zinc, 5.88 per cent. Some shipments returned more than 100 ounces silver per ton, and others 73 per cent. lead. In addition to large orebodies blocked out in the mine, there is much ore in the sorting houses ready for shipment when the aerial tramway shall be completed, while the quantity on the milling dumps is estimated at 8,000 tons, which will concentrate 3½ or 4 tons into one ton of shipping product.

Preparatory to mining on a larger scale than in the past, and commencing milling operations, a 10-drill compressor plant and a concentrating mill with a grinding capacity of 200 tons and dressing facilities for 100 tons per diem, are being put in. Water power will be utilized, with a head of 160 feet at the compressor and 275 feet at the mill. The Leschen aerial tramway will be 7,900 feet in length, with a grade of 16 per cent., and a carrying capacity of 20 tons per hour. The tramway and compressor should be in operation in July and the mill in October next.

Efforts are being made to organize a mining school in Nelson, B.C. A provincial grant is asked for, and the school will be in affiliation with the local high school.

One of the most enterprising mine owners of Slocan district, British Columbia, is Mr. Alex Smith, formerly of Toronto. For years he and a partner have been engaged in developing the Surprise mine, situated on the mountain divide between Cody Creek and McGuigan Basin, Slocan. After having sunk to a depth of 300 feet and taken out a considerable quantity of ore, the work of driving a long deep-level adit was undertaken. Several years' work resulted in the face of this tunnel reaching a point under the old workings of the mine, from which a raise was commenced. The distance to be raised was nearly 800 feet, and of this about 600 feet has been accomplished. The work with only hand drills and the ventilation not being good, progress has been slow, but there is now only 170 feet required to be raised to make the intended connection.

COAL-DUST EXPLOSIONS

(Abstract of Miners' Circular No. 3, U. S. Bureau of Mines.)

By George S. Rice.

(Continued from last issue.)

Moistening the Air Current.

The simplest method of keeping a mine damp is to put moisture into the ventilating current; then the air going through the mine does not dry the dust but carries moisture to it. There are two ways of putting moisture into mine air. One is by using fixed sprays of water placed at intervals through the mine; the other is by moistening the intake air at the mouth of the mine.

Water Sprays.

Water sprinklers should give a fine spray, as much like fog as possible, so that the water will be carried along by the air until it is absorbed as invisible vapor. The chief care needed in using sprays is to keep the nozzles from clogging and to prevent men and boys who do not understand the necessity for spraying, from damaging the sprays or turning them off to avoid getting wet in passing by.

Clean water should be used for spraying. The nozzles should be of the form least liable to clog and most easily and quickly cleaned after clogging. All nozzles should be inspected at frequent intervals.

There can be no question of the value of water sprays for laying dust. However, to get the best results from their use some mine official must be made responsible for the condition of the sprays at all times. He must also be required to see that there are sprays enough running to keep the relative humidity of the air currents at, or above, 90 per cent. In zero weather the incoming air may traverse 2,000 to 3,000 feet of entry before its temperature rises above the freezing point. Therefore at mines in districts where the winters are cold, provision must be made for draining pipes and nozzles throughout the intake part liable to freeze; and in cold weather the area must be wet down by hose or by water cars, so that it does not become dry. A recent dust explosion started in the haulage road, which was also the intake, at a point only 600 feet from the mouth of the mine.

Heating the Air and Using Water Sprays.

At certain mines the experiment is being made of heating the ventilating current at the intake to mine temperature and then moistening it by water sprays. This requires a somewhat costly heating plant, for in zero weather the warming of 100,000 cubic feet, more or less, of air per minute takes much heat. This method will moisten the mine air, but it is more expensive and complicated than the following method.

Steam Jets.

Under some conditions the easiest way of moistening the air current entering the mine is to use exhaust steam. The heat of the steam warms the intake air a little, and the moisture is supplied as vapor and in finely divided form, like fog. Generally the exhaust steam from the fan engine will suffice to dampen the air except in the coldest weather. After a mine has been thoroughly moistened, a slight shortage of water in the intake air for a week will not prove serious, and in most of the coal fields of this country cold waves do not last long. However, if a mine shows a tendency to get dry, some live steam will be needed to supplement the exhaust steam.

Many mining men have thought that the use of exhaust steam would mean the presence in the intake air course of a vapor so hot that the roof would slack and fall, as it does in some entries where a steam main is laid. Such is not found to be the case in practice. The steam expands as it leaves the nozzles, and rapidly cools, so that 15 or 20 feet away the air current feels merely warm even in medium weather, and 50 feet away there is no perceptible warmth from the presence of the vapor.

If the part of the entry close to the jets is protected by lining or lagging, the roof will not be perceptibly affected by the heat. Although moisture may have a bad effect on some roofs, generally it has been alternate wetting and drying that has caused roofs to weaken.

The steam-jet method, if systematically used, will make the ventilating current evenly humid. Many mines that have introduced the method have experienced no bad results. The cost of maintenance is virtually nothing if steam is employed around the mine and the exhaust steam is not otherwise used.

If the ventilating fan is driven by a slide-valve engine, as is usually the case, the exhaust steam therefrom is sufficient for moistening the air in all but the coldest periods; then some steam from other sources may be needed. The efficiency of the method, when systematically followed up, has been shown beyond question by its trial and adoption in a considerable number of important mines.

Steam jets can not be used on a haulage road where locomotive tenders, mule drivers, or trip riders are employed, since the jets fog the air for a long distance and make the haulage difficult or dangerous. Therefore, their application is generally limited to mines that have pressure or blowing fans and do not use the intake airways for haulage.

Steam Jets and Water Sprays Combined.

With the generally approved system of ventilation employed in mines that make an appreciable quantity of methane, haulage and travel are not allowed in entries carrying the return currents, but only in the intake entries. Where this system is used and no haulage is done except on the day shift, a combination of water sprays and steam jets has given good results. When trips are being hauled over the road the water sprays are used. In cold weather these sprays must be situated so far inside the mine that the incoming air will not freeze them. During the night, or when there is no haulage to the outside, the exhaust steam sprays are turned on at the mouth of the intake and the main entries thoroughly dampened. In this way a small number of water sprays help to keep the mines moist during the day shift.

Use of Calcium Chloride.

Another method of keeping down coal dust is by using a deliquescent salt, one which slowly dissolves by absorbing moisture from the air. Calcium chloride is such a salt. It has been used for a couple of years at coal mines near Welch, West Virginia; also at several mines in different parts of this country.

Dry crude calcium chloride, as sold by dealers, contains 60 per cent. or more of calcium chloride; the other 40 per cent. or less is chiefly common salt (sodium chloride). The latter, if pure, does not absorb moisture from the air and is of no value for laying dust. Pure calcium chloride can absorb three or four times its weight of water.

In the larger cities of the eastern part of the United States calcium chloride costs, in carload lots, from $14 to $18 per ton. It may be bought in three forms: Dissolved, solid, or granulated. The solid form, which comes in large drums, contains a high percentage of water and has to be broken for use. This form is not as convenient for mine purposes as the others. The granulated form is easy to scatter along an entry, and if it is packed in air-tight cases, so that it can not absorb moisture during shipment and storage, it is the best form to buy.

There are two ways of using calcium chloride. One way is to dissolve 5 or 6 pounds of it in 100 pounds of water and sprinkle the solution along the roadways by water cars or by hand pumps. The salt must be used in this way in order to moisten the ribs, roof, and timbers.

The other way to use calcium chloride is to sow the granulated form broadcast. This method is especially suited for dampening gobs or the floors of entries; on roads where coal dust is thick it gives much more lasting results than does sprinkling. The little granules of the salt lie on the surface, and by the moisture they absorb from the air they make the dust particles stick together. After the surface of the dust in a road is thus moistened any new dust that falls upon it will stick and get moist in turn.

Any person who intends to try the calcium chloride treatment for coal dust should remember that the crude calcium chloride is not pure, and some that has been sold contains so much common salt that it has little value for laying dust. In one instance brought to the attention of the Bureau of Mines the substance sold as calcium chloride contained no calcium chloride at all, but was chiefly common salt.

Conclusions.

The mining engineers of the Bureau of Mines, from the experiments they have made and from the facts they have gathered in examining hundreds of coal mines, believe that explosions of coal dust can be prevented by proper care. Furthermore, they believe that although the use of any one of the methods described in this circular may be difficult and expensive under some conditions, there will be little danger of a widespread dust explosion at a mine where any one of the methods is properly carried out.

The engineers of this bureau believe that, although many mine operators have taken great pains to protect miners from most of the dangers of mining, the precautions regarding dry coal dust are not always complete. Some operators who keep the main roads free from dry coal dust do not make sure that in all parts of the mines the dust is in a harmless condition. Hence it sometimes happens that a blow-out shot or a small explosion of gas sets fire to the dust in a dry room or a dry heading, and the resulting explosion crosses an area that was kept so damp that a dust explosion could not have originated within it.

It must be remembered that after a dust explosion has developed the shock and the flame are so strong that slightly dampened coal dust may be caught up and ignited to spread the explosion. It must also be remembered that a dry area usually contains more dust than can be completely burned by the oxygen that is at hand. So if an explosion gets a good start in such an area, it may have strength enough to carry burning and unburned dust into and perhaps across a dampened area. The latter, though it may furnish no coal dust, can supply the oxygen needed to burn the dust carried over from the dry area.

In a recent mine disaster in this country the explosion travelled 1,500 feet along a slope that had been washed down with hose just before the explosion and even had a wet floor after the explosion. The explosion burst forth from the slope mouth in a great flame and deposited much coked dust on the timbers of the trestle. The flame and the thick crusts of coked dust showed how great was the quantity of unburned dust and gases that had been carried for 1,500 feet along a slope that was so damp it might have been considered

Precautions.

In a mine working a coal that makes inflammable dust, the risk of a dust explosion can be greatly lessened by following these precautions:

Use permissible explosives where the coal can not be wedged down, and use them in the ways suggested by the Bureau of Mines in Miners' Circular 2.

Don't use black powder, dynamite, or any long-flame explosive.

Don't blast the coal "off the solid." Undercut it or shear it, and wedge it down if possible.

Don't drill the holes beyond the undercutting or shearing.

Don't fire two shots at once, except by electricity from outside the mine. Allow enough time between shots for the dust to settle.

When shots throughout a mine are fired after the shift by shot-firers, they should be fired on the last of the air first, then successively toward the intake, so that the dust and gases from the earlier shots will not be carried towards and possibly ignited by the later shots.

Don't tamp shots with coal dust, bug dust, or small coal, whether wet or dry. Use clay or other material that will not flame.

Lead out all coal dust or bug dust from the working places and do not let it collect along the roads. It is dangerous in the mine; it has value as fuel outside.

Use tight cars and keep the coal below the sides of the cars.

Flush the tops of the loads with sprays.

Remember that a dry mine is a dangerous mine.

Wash the coal dust from the roof, ribs, and timbers; or, if this is not done, keep the dust damp by making the mine "sweat" all winter as it does in summer; or else keep the coal dust covered with rock dust, clay, or similar material.

Don't be satisfied with having some parts of the mine wet.

Keep all the mine wet, so wet that the roof and sides are beaded with moisture and the dust packs down on the floor and looks wet.

Although in the year only 150 tons of tungsten ore were marketed, the present annual consumption is well over 4,000 tons of concentrated ore carrying from 60 per cent. to 70 per cent. tungstic oxide.

The Tilt Cove Copper Company, Limited, operating at Tilt Cove, Newfoundland, earned a gross profit during the calendar year 1911, of £12,152 8s. 2d. The company is a subsidiary of the Cape Copper Company, Ltd., a London concern that was organized in 1863. The Tilt Cove mine is held under a 99-year lease, expiring 1989.

On the Organic Origin of the Sedimentary Ores of Iron and of their Metamorphosed Forms: The Phosphoric Magnetites.

Read before the Iron and Steel Institute by W. H. Herdsman, Glasgow.

There is, I am aware, nothing new in attributing the formation of the phosphoric ores of iron to organic agency. The subject, however, has not yet, in my opinion, received the attention which it merits.

I bring it before you, therefore, for consideration and discussion, as these ores are of increasing importance to the steel industry on account of the growing scarcity of non-phosphoric ores, while the sedimentary ores appear to exist in practically inexhaustible quantities, and must form the basis of our calculated supplies in the not very distant future.

The oolitic or pisolitic structure of so many of the sedimentary ores of iron, and the phosphoric character of all, have long led me to see in those features evidences of an organic origin, a view our advancing knowledge of the numerous micro-organisms at work in nature tends to support, bringing, as it does, to our notice many forms apparently adapted to play the part of builders-up of iron ore deposits.

Perhaps the strongest evidence bearing on the subject is afforded by the deposits of bog iron ore which are to be seen in many countries in process of formation, and have been shown to be due to the activity of organisms, generally identified as bacteria, in the ferruginous waters.

There is no doubt that several genera of bacteria have been definitely recognized as habitually precipitating iron from its solutions; they bear names in inverse ratio to their own length (with a list of which I need not trouble you), and are generally known as "the Iron Bacteria." The Russian bacteriologist, Winogradsky, has claimed that the deposition of iron by these bacteria is not a mechanical process, but is due to the physiological activity of the organisms, which liberates energy by oxidizing ferrous oxide in its protoplasm, ferric hydrate being formed, which accumulates in the sheath and gradually passes into the more insoluble ferric oxide. Dr. Hans Mollisch, of Vienna, however, contests this physiological action, and Dr. David Ellis, of the Technical College, Glasgow, the leading British authority on the iron bacteria, is, pending further investigation, in agreement with Dr. Mollisch.

Putting aside, however, the character of the action by which the precipitation is effected, it has been proved that many of the bog ores are almost entirely composed of the ferruginous walls of the thread bacteria B. Gallionella and Leptothrix.

Dr. Mollisch, in a recent work, shows photomicrographs of a Siberian bog ore consisting of the "rust-red" walls of Gallionella Ferruginea and Leptothrix Ochracea; he also shows a similar ore from Plass in Bohemia, which consists largely of the remains of the Chlamydothrix Ochracea. Dr. Mollisch was one of the first to point out that Leptothrix have also the power to store up manganese oxides in their walls, and so form ore masses of this metal. He also noted that the same bacteria can alternately precipitate iron or manganese according to the character of the solutions available.

D. D. Jackson, an American authority, has further described a new species of Crenothrix which he named C. Manganifera, the remains of which in one case he found to consist of 34 per cent. of manganese oxide and 14 per cent. of iron oxide, while in other cases the manganese oxide varied from 30 to 66 per cent., with varying smaller amounts of iron oxide.

We have Dr. Mollisch's authority for the statement that apart from the iron bacteria there are other organisms which have the power to convert soluble salts of iron and manganese into insoluble forms as oxides. He especially mentions certain confervoid algæ, to which class the diatoms also belong, and a marine organism, Cocconeis, which surrounds itself with a brown covering of manganese oxide.

A quite accidental confirmation of the statement that other organisms have the power to deal with iron oxides was afforded me recently, when a sample of iron ore, which, with a number of other mineral samples, was lying on a wooden shelf in a somewhat damp situation in my coach-house, was attacked by a fungus, which Dr. Ellis has been good enough to indentify for me as that of ordinary "dry rot." The whole mass of fungus growing between the shelf and the wall gradually assumed a reddish hue and threw off spores of oxide of iron which covered the shelf below with a red powder, giving, on assay, the same iron contents as the ore attacked.

It is notable that of about ten pieces of different minerals in the same parcel only the iron ore was attacked, and on the iron ore being removed, the fungus gradually resumed its normal colour, and the shower of mineral dust falling from it ceased.

This illustration of the fact that apparently many forms of organisms will act as precipitants of iron oxides may help us to understand the varied forms under which the sedimentary iron ores are found. The differences of the several beds of the Cleveland, Lincolnshire, and other ores may evidently be due to varying climatic and other conditions favouring first one and then another type of organism agent of ore deposition, during the period of their formation. The greater differences which are found between the sedimentary iron ores of the different geological periods may be similarly explained.

During the earlier geological times bacteria, and probably diatomaceæ, may be assumed to have been the principal agents at work, giving us the peroxide and generally siliceous ores of the Cambro-Silurian age; while, with the gradual development of organic life, we have the protozoa and calcareous elements brought into play, the former acting through their organisms, or, as calcareous nuclei, acting chemically, together with numerous molluscs similarly acting, would contribute to the ores of the later periods their more highly calcareous and variable phosphorus contents.

To some it may appear difficult to understand how organisms so minute as bacteria, of which some 500 millions are required to cover a square inch of surface, should be capable of forming ore deposits which often amount to thousands of millions of tons, yet when we learn of the rapidity with which they multiply by fission under conditions favourable to their growth and development, we see that, given those favourable conditions, the dimensions of the deposits can only be

limited by the supply of material—that is, ferruginous and phosphoric solutions available.

As regards the phosphoric contents of the sedimentary ores of iron and its relationship to their organic origin, the association of phosphorus with living matter is of ancient date, and it is well known that phosphorus in a soluble form must be supplied to all land, growing crops. Tests recently carried out by me show the presence of 5.28 per cent. of phosphorus in the ash of the "dry rot" fungus already mentioned, while in the ash of ordinary mushrooms I found as much as 6.85 per cent. In a sample of seaweed I found 1.86 per cent. phosphorus in the ash, equal to 0.104 per cent. in the plant itself. The highly phosphoric contents of bog iron ores which are shown to be composed of bacteria remains, confirms the phosphoric character of those organisms also.

The very considerable variations of the phosphorus contents in the different sedimentary ores may be assumed to be due to the different organisms concerned in their deposition, and possibly also to the varying degree in which the matter of the organisms itself may have become incorporated in the ore deposits.

Though the phosphorus present in iron ores is invariably of organic origin, it does not always indicate an organic origin of the ore itself. Some fifteen or twenty years ago some shipments of Elba iron ore sent to this country were found on analysis to be higher in phosphorus than usual, parts showing as much as 1.5 per cent. phosphorus. As the Elba ore had hitherto been one of the purest of our ore supplies, this caused some consternation to the parties interested, and I was sent out to the island to investigate the matter. I was able to trace the phosphoric ore to the summit of a hill not far from the coast, and came to the conclusion that the excessive phosphorus contents of that part were due to it having at some remote period been the haunt of sea fowl, the guano deposit of which had in the course of time become incorporated with the surface layers of the iron ore masses at that point.

My explanation, I remember, was ridiculed at the time by one of our leading luminaries, but has since been amply confirmed by similar experiences in insular positions elsewhere.

On the connection of the oolitic structure with the organic origin I do not dwell, as at present I have no evidence to offer.

I propose now to deal with the phosphoric magnetites, especially those of Swedish Lapland, my remarks being suggested by a recent purusal of the Carnegie Research Report, by Dr. O. Stutzer, on the "Geology and Origin of the Lapland Iron Ores," published in No. II. of the Journal of the Institute for 1907. Dr. Stutzer appears to have made a very careful examination of these ore fields, and reviews impartially the various theories regarding their origin, and the evidence by which they are supported, his own conclusion, however, invariably being that they are magmatic segregations in depth, which, with their enclosing crystalline rocks, have been injected to their present position.

I find myself entirely at variance with Dr. Stutzer in his conclusions, which, in my opinion, are also contrary to the mass of evidence he adduces to support them, and as the problem of the Lapland ores has, since my own brief visit, appeared to me a simple one, I propose to submit my views for criticism and comparison with those of Dr. Stutzer and others, set out in the paper referred to.

My opinion is that the Kiruna and other phosphoric magnetites of Sweden are sedimentary ores of organic origin of Cambro-Silurian age, similar to and probably contemporary in deposition with the Wabana ore beds of Newfoundland. These Swedish deposits, together with their containing rocks, have been metamorphosed by heat of dynamic origin, due to compression caused by the shrinkage of the earth's crust, to which force all volcanic activity is probably due. The evidence of this action is the tilted position of the ore bodies; the ore was brought to a state of fusion, or an equivalent physical condition at the great depth at which this action took place, and the peroxide particles have been converted into magnetite, which appears to be the ultimate product of thermal metamorphism. The particles of this magnetite have segregated into the dense form in which it now exists —the silica, alumina, and lime of the sedimentary ore passing into the composition of the containing clays, shales, etc., which now, by semi or complete fusion, are transformed into the gneisses, porphyries, and syenites associated with the present ore masses.

In the Kiruna district the ore and rocks have been subjected to a higher temperature than at Gellivara, where the granular structure of much of the ore probably represents the remains of its original oolitic structure, and the gneisses the incomplete fusion of the shales which contained the original ore beds.

That the width of the ore body at Kiruna is greatly in excess of any known sedimentary iron ore bed is explained by presuming the segregation of several ore beds into one body, their partings naturally uniting by fusion with the adjacent rocks, while some further thickening would probably occur by the action of gravity on the tilted ore mass; it is notable that the greatest thickening occurs at Kiruna, where there is also evidence that the highest temperature and consequent greatest approach to fluidity prevailed.

From Dr. Stutzer's paper I find that a sedimentary origin for the Lapland deposits is advocated by Sjogren, Hamberg, and De Launay, though none of these authorities appears to offer any definite explanation of the subsequent metamorphosis.

That the ore beds form part of a regular sedimentary series is shown by the section given on p. 117 of Dr. Stutzer's report, and is confirmed by all the evidence he has collected.

When the series became heated by the pressure which brought about the metamorphosis of the ore into magnetite, the highly alkaline fucoid clays enclosing the ore beds would naturally be the first to soften and fuse, while the more acid members would be metamorphosed without fusion, or the loss of their sedimentary identity to the schists and quartzites as they now exist. The specular ore deposits of the quartzites frequently referred to by Dr. Stutzer are of quite different origin, being non-phosphoric impregnations of the original sandstones, which have been segregated and metamorphosed during the period of high temperature into their present specular condition. They are of the same class and type as those found throughout the northern parts of the Scandinavian Peninsula constituting the ores of Dunderland and Sydvaranger. The ore is frequently mixed specular hæmatite and magnetite, showing an incomplete stage of metamorphism due to thermo-physical causes respecting which we are at present imperfectly informed. The complete transformation of peroxide ores into magnetite is apparently only brought about when actual fusion results.

To Dr. Stutzer and other advocates of a magmatic origin for these and similar deposits I would point out that the magnetite which is contained in the accompanying crystalline rocks is invariably titaniferous, as Dr. Stutzer himself records in so many of his observations, and as the iron sands resulting from the disintegration of such rocks are always found to be. The analysis of the Kiruna syenite given in Dr. Stutzer's paper on p. 113 shows that the magnetite yielded by segregation from such rock would contain 20 per cent. of titanic acid, while the Kiruna ore contains but traces of this substance. As Dr. Stutzer admits or claims a contemporary origin for the syenites and the ore bodies they enclose, I shall be interested to learn how he reconciles these facts with a magmatic origin for the ore. Had Dr. Stutzer checked his observations more frequently by chemical analysis, he would, I think, have avoided many pitfalls and arrived at a different conclusion.

In supporting the theory of a sedimentary origin for these Lapland ores, I would draw attention to the fact that similar iron ore deposition is now going on in the same district, and probably under very similar conditions to those prevailing when these great deposits were laid down.

Dr. Stutzer notices the occurrence on pp. 108 and 111 of his paper without apparently appreciating the relevance of the matter to the subject he was studying. He says: "In the numerous peat-bogs the iron of the more ferriferous rocks has been largely changed by reduction to an organic ferrous salt, which, when removed in solution in running water, is re-oxidized to ferric hydrate, furnishing material for lake and bog ore deposits." And again he says: "The innumerable peat-bogs of Lapland have a powerful solvent effect on the more ferriferous rocks, the dark red porphyries being soon bleached white; the iron-laden bog waters collecting and stagnating (?) in ponds deposit their contents as a dark brown ferric hydrate."

Here Dr. Stutzer has accurately noticed and recorded natural processes of iron ore deposition going on, which we have every reason to believe have gone on through all the cycles of the geological ages. These processes, which modern science enables us to trace to organic agency, furnish, I submit, a simple and natural explanation of the origin of these deposits more probable and more convincing than those requiring us to accept them as deep-seated magmatic segregations, subsequently injected to their present positions, or as of "pneumatolytic hydatogene" origin, "derived from gases in solution in the magma or contact deposits." That they are of sedimentary origin, however, is, I think, rapidly becoming the accepted belief, and in claiming, as I do, that their metamorphosis has been caused by heat generated in the constant shrinkage of the earth's crust, always steadily going on, with the consequent folding and compression which is every where apparent where igneous and eruptive manifestations are found, I am again looking to a simple and natural agency to explain their present condition.

In support of my views I would point out that—

(1) The general alignment of the magnetite outcrops, and the continuity of the deposits in length and in depth where worked or tested, correspond in every way with the extensive areas generally covered by sedimentary iron ore deposits.

(2) The average phosphorus contents of these deposits (the magnetites) is everywhere from 1 to 2 per cent., agreeing in this important respect with sedimentary deposits of similar geological age.

(3) In the Annapolis-Torbrook district of Nova Scotia the metamorphosis of a sedimentary hæmatite into a phosphoric magnetite can be definitely traced.

(4) Mr. L. Cayeux has shown that the magnetite ore of Dielette, France, is a metamorphosed sedimentary ore, as it still preserves a typical oolitic structure.

In conclusion, I may note that a consideration of the organic origin of certain ores of iron has incidentally brought to notice the fact that manganese ores may be similarly formed.

It throws more light on the close and constant association of the ores of the two metals in nature, and suggests that organic agency may have been responsible, at least in part, for the great sedimentary ore beds of the Caucasus and South Russia which frequently show an oolitic structure, and other manganese deposits elsewhere whose sedimentary origin has been lost or obscured by subsequent metamorphism. With respect to the connection which I have endeavoured to show between the phosphoric magnetites and the sedimentary ores of iron, it is evident that the acceptance of my views would recognize, in the metamorphic action, a natural refining process which has thrown out the earthy constituents of the sedimentary ores and raised the metallic contents of the metamorphosed product to a high degree of concentration.

If this be so, then the same refining and enriching process may be expected to be met with elsewhere wherever sedimentary ore beds have been subject to disturbance by earth movements from their original horizontal position, the degree of enrichment being proportionate to the dynamic force developed and the thermal equivalent resulting therefrom.

In preparing this paper, I have to thank Dr. David Ellis, of the Technical College, Glasgow, for much valuable information respecting the iron bacteria, of which, as is well known, he has made a special study.

Methods of Removing Slag at Granby Company's Smeltery, B. C.

The Granby Consolidated Mining, Smelting, and Power Company, Limited, is preparing to dispose of the slag from the blast furnaces at its copper smeltery at Grand Forks, Boundary district of British Columbia, by a different system to that in use there, which latter has been for years the hauling from the furnaces to the dump, of the slag while hot in cars by steam locomotives.

The extent of the smelting operations of this company, the smeltery of which is stated to be the largest copper reduction works in the British Empire, and among the biggest in the world (second only to the great Washee works at Anaconda, Montana) is indicated in the following brief outline of the smeltery plant and equipment in use at Grand Forks. At this smeltery there are eight rectangular, water-jacketed, blast furnaces—six 44 by 266 inch, and two 48 by 260 inch, at tuyeres, depth 15 feet 8 inches—having a total capacity of 4,000 to 4,500 tons of ore per diem; 12 Connersville blowers, with a total air capacity of 239,000 cubic feet; specially designed mechanical furnace-charging system; hot slag haulage, by 14-ton steam locomotives in 44-cubic ft. slag cars; three converter stands, 84 by 126 inches, operated by electricity, and

one stand, 72 by 100 inches for which hydraulic power is used, converter capacity being 50,000,000 pounds of copper per annum; three blowing engines, total capacity 19,700 cubic feet of air per minute, and much accessory plant and machinery.

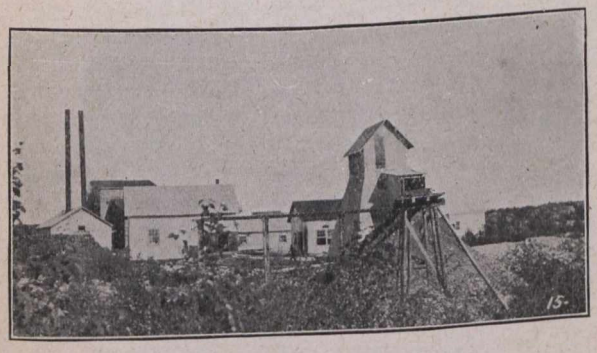
During the earlier years of the company's smelting operations the slag was granulated by water and run to the dump by gravity, in the ordinary way. Then, as the dump filled to an extent making it difficult to maintain the grade requisite for the continuance of this method of disposal of the slag, it became necessary to substitute for it the hot slag haulage system now about to be dispensed with in favour of a return to granulation by water and disposition of slag by a method described as follows:

Four large receiving bins will be erected below the present level of the slag dump and at a distance of about 150 feet from the blast furnace settlers. The slag will be granulated by water immediately after its discharge from the settlers, in the ordinary way, and be conveyed thence to the receiving bins in launders. From the bins it will be distributed over the dump by a series of conveyor belts, at first up a gradual incline to a maximum height of about 100 feet, and then by a cross conveyor to the place for dumping. These belts will be ordinary 30-inch conveyors. The incline will at first be over a series of trestles, but afterwards the grade of the dumped slag will be so regulated as to give the requisite incline up to whatever height it shall be found economically practicable to carry it. The conveying belts will be operated by two electric motors. Arrangements are being made for the supply of lumber for construction of the receiving bins, trestles, launders, etc., and the excavation of trenches for the launders from the settlers to the receiving bins is already in progress.

Two main reasons have caused the management of the company to make this change in the method of disposal of slag. One is, the excessive cost of the present hot slag haulage system, owing to the slag having to be hauled about three-quarters of a mile to the dump, together with the high cost of maintenance in good working condition of locomotives and slag cars; and a second, the increasing difficulty of disposal as the dumping room below the present level becomes more and more curtailed. The substitution of the new method of slag disposition for that long in use is expected to involve an outlay of between $30,000 and $40,000, but important compensating results will be lower cost of disposal of the slag, and provision of dumping room for fully 10,000,000 tons of slag. To long continue the present hot-dumping system would mean the changing of the course of the north fork of Kettle River, with resultant cost of land that would be destroyed thereby, so the change determined upon will avoid a large expenditure in that direction and at the same time bring about a substantial reduction in operating costs. It will probably be about four months—near the end of September—before it will be practicable to make the change now being prepared for; meanwhile the slag will be dumped while molten, as during several years last past.

THE ST. ANTHONY GOLD MINE.

EDITOR'S NOTE.—The following article was written at the request of the Journal. It is based upon a private report compiled by Mr. J. C. Houston. The object of appending the lengthy assay sheet is to adduce evidence of the possibilities of the region. The present owners of the St. Anthony are floating no company. Whilst we cannot, of course, assume responsibility for the accuracy of the samples and assays, we are satisfied that they have been done honestly and carefully.



General View of the Buildings

Office, Storehouse and General View of Harbour

(Written for the CANADIAN MINING JOURNAL.)

The building of the new transcontinental railroad through Northern Ontario and particularly through that section of Ontario north and west of Port Arthur known as Sturgeon Lake district, has made readily accessible and brought into some prominence the gold bearing areas in that locality. On account of the inaccessibility of this district little development work has been done in the past on the numerous prospects staked along the shores of Sturgeon Lake, although specimens of visible gold-bearing quartz of almost incredible richness have been brought into Fort William and Port Arthur, which were reached in the old days by one hundred miles of lake and river navigation and then by the Canadian Pacific Railway from Ignace.

To those who are not familiar with the location of this gold field, it may be well to explain that the route from the east is, first to Fort William via the C.P.R., this city being eleven hundred miles west from Montreal, eight hundred miles west of Toronto, and about four hundred miles east of Winnipeg. From Fort William a branch of the Grand Trunk Pacific is now open for traffic as far west as Superior Junction, one hundred and eighty miles distant. The new line of the Transcontinental Railroad is now being built east from that point, and it is inside the angle formed by the junction of the two roads that the Sturgeon Lake gold district lies. The lake itself, lying northeast and

Open Cut running north from the shore of Coture Lake.

southwest, practically forms the third side of a triangle, for its northeast end reaches within three and one-half miles of the main line of the G.T.P., while the south end, or the foot of the lake, is within six miles of the Port Arthur branch of the G.T.P.

As much of the supplies for the building of this section of the Transcontinental Railroad east of Superior Junction were brought in over the lake, the contractors found it advantageous to connect the foot of the lake with the railroad by a six-mile spur. They then established a boat service on the lake, so that there is now a continuous water and rail connection with the outside world. In the old days freight was taken in by canoe from Ignace with great hardship, often at a cost of $200 a ton; but now it may be billed through from any point and at most reasonable rates. The contractors announce that they are going to operate their spur line and boats to the advantage of mining people in the district. Once the main line of the Transcontinental is in operation facilities for getting in freight will be even better and the rates lower. Since nearly all the properties now being developed in the Sturgeon Lake district are either on islands in the lake itself, or on the shore, and since steamers are now landing passengers and freight on the docks of all of these, it will eliminate much of the hardship and expense of other days, and rapid development of the more valuable properties is sure to follow.

Sturgeon Lake itself is a beautiful body of water about 36 miles long and of varying width, sometimes up to two miles. There are numerous islands and a great many bays in the lake, the shore line of which is clothed with spruce, balsam, jack pine, poplar, etc. The country generally is rolling and is the haunt of many of our large game species. The lakes are well stocked with fish, the large grey trout predominating.

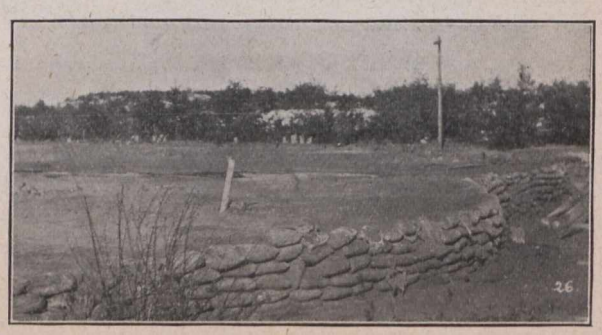
A visit to the various claims now being developed in this district shows that the summer is to be a busy one. At the Rainbow property, which is situated on an island about midway in the lake, there is a showing of blue quartz in a vein some 30 inches wide which carries values on the surface, and in the shallow pits, which were sunk on the vein. The values also extend into the wall rock for about two feet, thus giving a probable total width of about four feet of milling ore. This property is owned by English capitalists and work is being pushed vigorously under the supervision of a mining engineer of wide experience in Australia and the West African gold fields.

Besides the Rainbow property there are many other locations upon which a good deal of work has been done, such as the Douglas, the Dawson, the Whalen, the Faucett, and the Covenay. None of these, however, has reached the producing stage. The only property on the lake that has been developed that far is the St. Anthony, which is situated at the head of the lake and which has recently been acquired by Toronto investors. The property is in charge of Mr. J. C. Houston, formerly manager of the Right of Way mine, Cobalt. Mr. Houston, "Joe" to his familiars, is thoroughly acquainted with the Rainy River and Lake of the Woods mining camps.

The following facts are taken from Mr. Houston's report. The samples were taken by him and assayed under his supervision:

Geological.

The main vein has a north and south course, while the contact between the schist and granite runs in a northeast and southwest direction with a varying dip towards the southeast. Thus the values are partly in schist and partly in granite. The character of the enclosing rock does not seem to have much influence on the ore as the samples show just as favourably in the north end which is altogether in the granite, as in the south end which is wholly in the schist. The veins in the schist appear to have more regularity than in the granite. All of the ore so far mined on the property has been taken out of an open cut at the south end, as indicated on the plan and longitudinal sketch shown herewith.



Old Tailings Dump

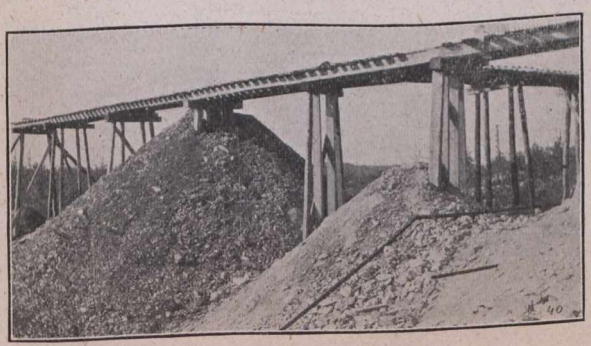
Longitudinal Section.

This open-cut begins about four feet above the water level of Coture Lake, and continues for about 145 feet. It then dips down about 40 feet to the tunnel which formed the 100-foot level. It extends along this level for about 100 feet and then angles up to the surface at about 60 degrees. This section has been stoped out from 10 to 25 feet wide and while some waste was included the greater portion of it was ore.

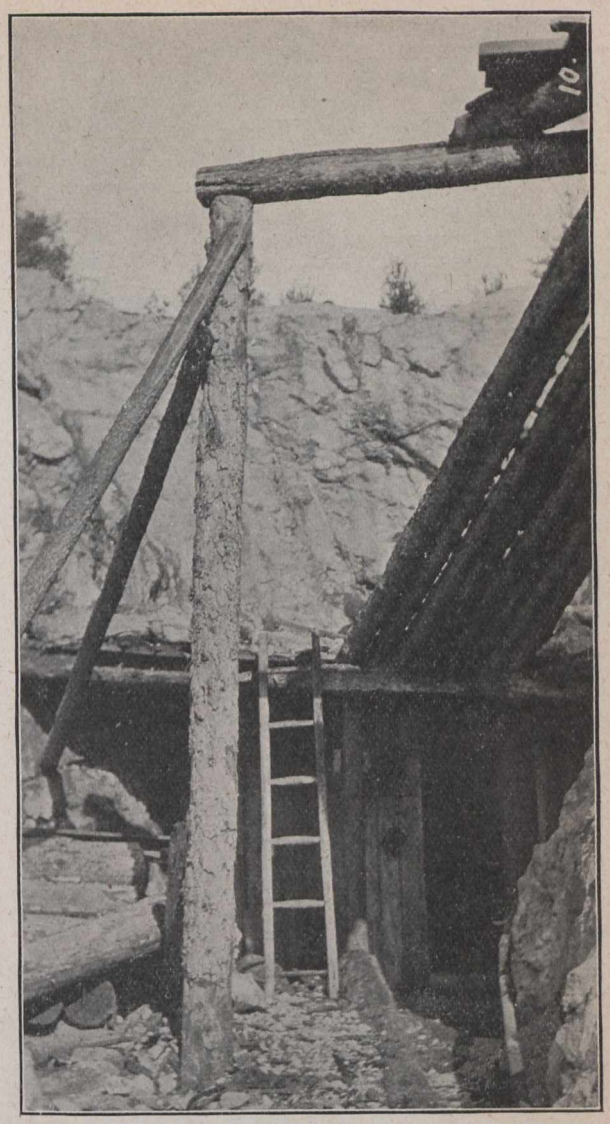
A drift was run south on the 100-foot level from the bottom of this open-cut for a distance of about 45 feet and a winze sunk there, to a depth of over 50 feet. Good ore was opened up in this drift, the whole length of it showing $25 to $40 per ton. In the winze the vein dips to the west and consequently passed out of the shaft which was sunk vertically at a depth of 40 feet. This also showed good ore, as it gave an average from about 20 samples of $19.20. The open-cut immediately over the winze gave assays of $39 and $42 over widths of 14 and 12 feet respectively. At the north end of the open-cut the vein split into two portions, the easterly portion of which was drifted on at the 100-foot level, as indicated by Stations 15, 14, 13, 12. Good ore shows all the way along at that level. At Station 12 it shows four feet of $20 ore. At this station a cross-cut was run to the west for a distance of about 70 feet; it then curves to the north past Station 4, where it encounters the west section of the large vein. Here no values of any particular moment were shown up for nearly 100 feet; but close to Station 3 values begin to come in and for a distance of 120 feet along the drift and up the raise to the surface there is pay ore. On an average of about 45 assays this ore ran $23.60 to the ton. On the surface this section of the vein shows from 12 to 25 feet wide, and where the raise holes through to the surface there is over 30 feet of ore that will run from $7 to $8 to the ton.

Continuing north from the bottom of the raise, considerable dead work has been done. There is a drift north from Station 8 about 150 feet in length which is in absolutely barren ground. At Station 10 this drift turned sharply to the west, and as soon as the vein was picked up, the work in that direction ceased. At Station 2 a cross-cut has been run over to the east to connect with the main shaft and continued eastward for about 130 feet. About 50 feet to the east from the main shaft this cross-cut intersects the vein that was driven on from Station 12, and at the intersection the assay return was $35 over a face of four feet.

Number two vein, which shows on the surface, for about 200 feet in length and has a varying width of from 8 to 12 feet, gives assays of from $2.40 to over $4. On the surface No. 1 vein can be traced northward from where the raise holes through to the surface for a distance of about 300 feet, and shows a varying width of from 6 to 12 feet. On the north end of this surface showing two pits have been sunk, and three assays taken from these pits give the following results: $7.60, $24.80, and $8 respectively. No. 1 vein does not end where these pits are sunk, but apparently outcrops across a swamp 1,000 feet further on. It was surprising to find that here in this section about which little is known, there was to be found a property with over 1,000 feet of drifting at the 100-foot level, with a main working shaft sunk for a distance of about 120 feet, and at a distance of about 400 feet from the main shaft was a winze sunk to an additional depth of 52 feet, with good ore showing in it down past the 40-foot mark.



Ore Dump



Surroundings where the 100 ft. level holes through to the surface.

Assay Sheet.

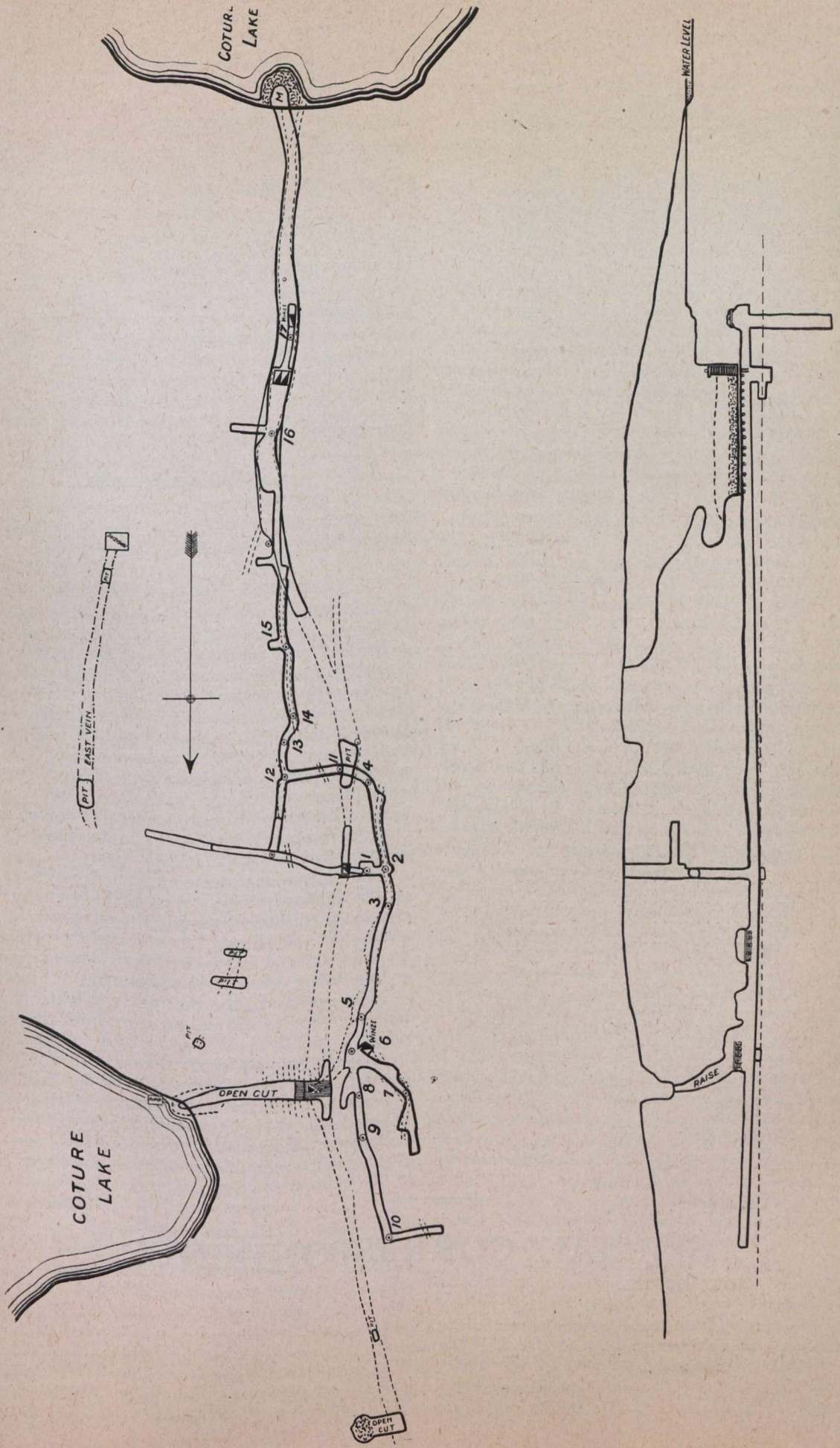
South end of drift, 100-foot level.

No. 1	$112.00
2	74.40
3	11.20
4	67.60
5	110.80
6	58.80
7	16.40
8	19.20
9	7.20

10	8.80
11	5.60
12	6.00
13	10.40
14	6.00
15	2.80
16	22.40
17	6.80
18	4.80
19	12.40
20	2.40
21	2.00
22	1.20
23	Trace
Samples from Winze—	
24	22.40
25	55.20
26	11.60
27	127.60
28	7.20
29	7.20
30	2.00
31	2.80
32	13.20
33	2.00
34	6.00
35	12.80
36	10.40
37	5.60
38	23.60
39	7.20
40	7.60
41	9.20
42	8.80

Surroundings where the 100 ft. level holes through to the surface.

200 feet of 100-foot level north from open cut—	
43	3.60
44	2.80
45	3.20
46	3.20
47	3.60
48	44.00
49	7.60
50	8.40
51	4.80
52	4.00
53	42.00
54	6.40
55	9.60
56	4.80
57	11.20
58	6.00
59	40.40
60	34.00
61	29.60
62	18.00
63	8.80
64	20.40
65	2.00
66	4.40
67	24.40
68	10.80
69	4.80
From Station 12 north for 40 feet—	
70	5.20
71	25.20
72	22.00
73	84.40
74	19.60
75	13.20
76	10.80
77	22.00
78	22.00
79	62.00
80	123.20
81	2.40
82	5.20
83	Trace
84	Trace
85	Nothing
86	2.00
87	Trace
From Station 4 to Station 3—	
88	Trace
89	Trace
90	4.40
91	3.20
92	Blank
93	Blank
94	Trace
95	Trace
96	Trace
97	Trace
98	Trace
99	Trace
100	Trace
101	Trace
102	2.00
Station 3 to Station 7 and up the raise—	
103	1.20
104	3.20
105	6.40
106	5.20
107	16.40
108	6.80
109	3.20
110	25.60
111	3.20
112	25.60
113	23.20
114	19.20
115	18.80
116	38.40
117	11.20
118	5.20
119	8.80
120	68.40
121	38.40
122	46.80
123	21.20
124	40.00
125	24.00
126	50.80
127	20.40


COTUR. LAKE
COTURE LAKE
EAST VEIN
PIT
OPEN CUT
MINZE
RAISE
WATER LEVEL
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

128	14.20
129	99.60
130	23.60
131	60.00
132	13.60
133	10.00
134	58.40
135	19.60
136	20.40
137	34.80
138	54.40
139	32.80
140	26.00
141	8.80
142	6.00
143	19.60
144	1.20
145	1.20
146	.80
Sample A	6.20
Sample B	5.60
Sample C	18.00
Sample D	10.80
Sample E	14.00
Sample F	30.60
Dump Lake	20.80
New Vein	2.00
X Cut South Side	4.80
X Cut North Side	10.40
From First 50 feet of Main Shaft—	
147	7.60
148	4.80
149	8.40
150	19.60
From open cut directly above winze across 9 foot and 12 foot—	
151	42.00
152	39.60
153	12.40
154	21.60
155	14.40
Across 50 feet at head of raise on surface—	
156	.80
157	....
158	.80
159	....
160	.80
161	....
162	4.00
163	....
164	4.40
165	....
166	3.60
167	....
168	4.00
169	....
170	1.20
171	26.80
172	26.00
173	24.00
174	2.40
175	4.00
From north end of open cut—	
176	39.60
177	35.20
Pit at north end of main vein—	
178	7.60
179	21.40
180	18.20
Pit near north end of main vein—	
G	24.80
H	8.00
I	51.00
J	38.40
K	4.80
L	10.40
M	20.80
Ore dumped into lake—	

Tailings Samples.

1	27.60
2	30.00
3	6.40
4	3.60
5	8.40
6	3.20
7	29.60

The old mill equipment used by the former owners is being partly discarded and largely supplemented by the present owners, who expect that by July 15th they will have installed and in operation a complete 10-stamp mill, with a six-foot pebble mill for re-grinding purposes. There is equipment of two 80-horse-power boilers, a 40-horse-power Corless engine, and a cross-compound compressor, 4-drill capacity, a Rand hoist with three hundred feet of cable, a complete outfit of water pumps, water tanks, etc. The machine shop is provided with a large lathe, a drill press shaper, and other necessary equipment. The assay office is also in good shape. As will be seen by the photographs furnished herewith the property is well supplied with buildings, there being a sleeping camp, a cook-house, and other buildings large enough to accommodate a force of 40 or 50 men.

At the present time the fuel supply for the property is being obtained from the forest of the surrounding country, but there is every reason to expect that within a comparatively short time it will not be necessary to depend on the timber growth for fuel, as there is a large water fall on the Sturgeon River about eight miles from the St. Anthony which will furnish power sufficient to supply all the needs of the Sturgeon Lake Gold Fields even if developed on a very large scale.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Dominion Coal Output.

The output obtained from the mines of the Dominion Coal Company in May was as under:—

No. 1	50,770
No. 2	69,070
No. 3	18,710
No. 4	39,670
No. 5	32,140
No. 6	23,240
No. 7	14,580
No. 8	14,580
No. 9	34,490
No. 10	16,770

No. 12	22,010
No. 14	11,300
No. 15	2,300
No. 16	1,150
Tons	350,770

This is the largest production ever obtained by the Coal Company in May. The nearest record was in May, 1908, in which month the output was 335,829 tons.

The production for the five months ending May, during the present and recent years, is as follows:—

1908	1,585,364
1909	1,273,676
1910	1,196,917
1911	1,523,190

While the output is some 326,000 tons ahead of last year at the end of May, yet it is 62,000 tons behind the corresponding period of 1908. The first seven months of 1908 produced 2,300,000 tons, and it is not likely that this output can be reached by the end of July this year. The last half of 1908, however, was a very poor one, as shipping was hindered by forest fires and fogs in the St. Lawrence, and a marked trade depression was making itself felt. It is hoped during the coming summer to maintain the present rate of output, and it is reasonably probable that the output for 1911 will reach over 3,800,000 tons, and get away from the 3½ million mark around which Dominion Coal outputs have so persistently hovered for six years.

Dominion Steel Corporation Employees' Debentures.

As intimated by the president of the Dominion Steel Corporation at the annual meeting in Montreal, this corporation has taken the commendable step of issuing 6 per cent. debentures to their employees in such low denominations as $50 and $100, and on an easy instalment-purchase plan. These debentures are issued only to employees or the trustee or benefit societies connected with the corporation or its subsidiary companies. The scheme, therefore, embraces employees at the Sydney Steel Works, the Marble Mountain, and other limestone quarries of the Steel Company, the ore mines at Wabana, at the mines and works of the Dominion Coal Company, and at the Springhill mines. The debentures may be paid for in one sum, or in 24 or 36 monthly instalments, which will be deducted from wages. Once the instalments are all paid the debenture is transferable, being made out to bearer, but it is not transferable in course of purchase, except to another employee of the corporation. If a purchaser desires to surrender his rights and discontinue the instalments he may do so, and will be allowed ordinary bank interest on the accumulated instalments. Provision is made for temporary suspension of payments when circumstances render this necessary or desirable. A most attractive feature of the issue is that if a purchaser should die before his instalments are paid up, the corporation will itself pay up all instalments due after his death, and treat the debenture as fully paid up, and his representatives may at once receive the debenture, or its face value in cash, The debentures run for six years, and the holder, if he is still an employee at the end of this term, may receive the cash value or a renewal debenture on which interest will be paid at not less than 5 per cent. per annum.

It is probable that this debenture issue will be largely taken up, as it affords a real necessity among an industrial population earning fair wages, namely, an absolutely safe investment returning twice the interest rate allowed by savings banks. The usual bond issue in denominations of $500 and $1,000 is altogether out of the reach of the thrifty workingman, but there must be a great number of men with a few hundred dollars who will welcome this issue, particularly with the added insurance provision. There are also large numbers of young men, earning good wages, who can easily find the small instalments of from $1.30 to $4 monthly required to purchase a $50 or a $100 debenture, who will find this form of investment an excellent way to accumulate the nest egg necessary for marriage, or old age.

The following interesting paragraph appeared in the "Colliery Guardian" of the 12th May:—

"At the Mansfield colliery, belonging to the Bolsover Colliery Company, as the result of one week's working of 5½ days, ending Tuesday, May 2nd, a record for a week's turning was made, the total quantity of coal brought to the surface being 25,068 tons. This gives an average turning of over 4,557 tons each day, or 620 tons per hour. It is worthy of mention that during the year 1910 not a single fatal accident occurred at the pit."

This is a record to be proud of so far as production goes, but to mine over a million tons of coal without a single fatal accident is a far greater reason for congratulation. The Bolsover Colliery Company's mines are in the northern portion of the Derbyshire and Nottinghamshire coalfields in the English Midlands, and this company has always been known for its solicitude for the safety and comfort of the workmen. The colliery village of Bolsover is a model of what a colliery village should be. It was laid out with this intention and has justified the expenditure and thought that was devoted to this end.

The Springhill Strike.

The Springhill strike was called off on the 28th May by a unanimous vote of the men, having lasted from early in August, 1909. The date recalls the fact that just one year and one month from this date the Glace Bay strike was declared off, the vote to return to work having been taken in this case on the 28th April, 1910. Springhill is a place that has an unenviable notoriety for strikes, but it is to be hoped that the strike which has just closed will have satisfied even the most inveterate advocate of strikes for a long time to come.

The strike followed upon the refusal of the men to accept the findings of a Conciliation Board. The demands of the men were for recognition of the U.M.W.A., for an increase in wages, and the adoption of a fixed wage schedule, and payment for the coal produced by the ton and not by the box, with a modification of the system of docking for stone. The Board refused to recommend any of the demands of the men, but suggested an arrangement in connection with docking for stone, which the men rejected.

Shortly after the commencement of the strike the Cumberland Coal & Railway Company announced that the strikers would not be taken back to work except under a reduction of 15 per cent. in the wages of coal cutters.

Towards the end of 1910 the Dominion Steel Corporation purchased the stock of the Cumberland Coal & Railway Company, and attached the Springhill mines to the properties operated by the Dominion Coal Company.

The militia were called out in July, 1910, to repress disorder. Owing, however, to the restrictions placed upon the military when acting in aid of the civil power, and the indifferent attitude of the town police of Springhill, the strikers for a long time had practical control of the town, and by a system of pickets were able to prevent any men returning to work. In March, 1911, the militia were withdrawn and the town was placed under the jurisdiction of a Provincial Commissioner of Police, who, with the assistance of 30 provincial constables, was able for the first time to put an effectual stop to the picketing and molesting of the men at work. Almost immediately following the arrival of the Police Commissioner, several of the most prominent strikers returned to work, and it was evident that many others were tired of the useless struggle and had only been deterred from seeking work by fear of bodily injury at the hands of the strikers.

At the beginning of the year the Provincial Workmen's Association revived the old Pioneer Lodge at Springhill. Nego-

tiations were entered into between the officers of the P.W.A. and the management of the Dominion Coal Company for a lessening of the 15 per cent. reduction announced after the strike was called, and endorsed by the Coal Company when it assumed the management at Springhill, for a modification of the docking arrangement and for consideration for abnormal working places.

The strike leaders began to realize that the situation was daily getting more hopeless for them, and the Police Commissioner approached the Premier with a committee of strikers seeking through his intervention to obtain terms from the Coal Company which would enable them to return to work. After negotiations extending over several weeks, the Coal Company agreed to take back the men who had been on strike as fast as places could be found for them, the company stating it believed it possible to do this within 45 days. The finding of the Longley Board is to govern the method of docking for stone. The wages of coal producers will be reduced 10 per cent. below those existing prior to the strike, but fair consideration will be allowed in abnormal places. No other reductions are to be made in day wages, the schedule which was announced by the Coal Company in January remaining in force, with the exception of the concession to the coal-cutters.

The net result of the strike is that the U.M.W.A. has not gained recognition, that the award of the Longley Board with reference to the docking system which the men refused is to become effective, and that instead of increased wages, the coal cutters will suffer a 10 per cent. reduction.

The United Mine Workers of America have spent a lot of money in Nova Scotia to little purpose. It is estimated that in the strikes at Springhill, Glace Bay, Morien, and Inverness at least $1,800,000 has been expended, and in each case the strikes were either abortive from the first or eventually unsuccessful. The chief reason for the failure of the U. M. W. to obtain recognition in Nova Scotia is that this organization is unnecessary. Taking advantage of an insignificant "insurgent" movement in the P. W. A., the U. M. W. attempted to usurp the jurisdiction of the Nova Scotian union, and posed as the heralds of unionism to a benighted mining population, ignoring the fact that Nova Scotia mines had been unionized long before the U. M. W. came into existence, and that the conditions under which Nova Scotian miners live and work are immeasurably superior to the conditions in the proper habitat of the U. M. W. of America.

Others reasons for the failure of the U. M. W. were the introduction of American strike methods, altogether foreign to Nova Scotian ideals, brutal and organized intimidation, the lavish use of union funds to corrupt those who could aid the strike cause or give the leaders information; the open advocacy of the extremest tenets of international socialism, and above all, the utter rottenness and insincerity of the whole U. M. W. campaign with its specious appeal to the foreign portion of the mining population and the newly arrived and credulous miner from the British Isles. The chief officials of the U. M. W. must have found it very difficult to explain, and more difficult to defend, the huge expenditure of union funds in Nova Scotia, where the status of the miner is higher than in any United States coalfield, where the fatality rate is lower and the conditions of living are better; where the true aims of unionism are better understood and practised than in any labour union affiliated with that reactionary and tyrannous body known as the A. F. of L.

Many of the miners of Nova Scotia were carried away by the midsummer madness of the U. M. W. agitation, and the unlimited promises of this union's paid organizers, accepting all too credulously the vapourings of migratory orators whose sole mission was that of destructive agitation. To-day the disgust of these men is all the deeper because of their first unsophisticated enthusiasm. Looking back over the past two years is to review the most disastrous period in the history of Nova Scotian coal-mining, all the more to be deplored because of the entire needlessness of all the strikes which were called at the mandate of the United Mine Workers of America. There was not a grievance, real or fancied, in all the complaints of the U. M. W. which could not have been settled on better terms without the intervention of this alien organization, and without all the loss of money, reputation, and trade which has been entailed upon the miners and the coal owners.

ONTARIO.

Cobalt and Gowganda.

The power situation is now all that could be desired and the production from the camp is back at its former level in tons, but owing to increased concentration is lower in tonnage. All the silver prospects with money in the treasury to resume development have commenced to search for the white metal again and there are probably as many men now employed at Cobalt as during the past year and before the power shortage. But the speculative element has entirely disappeared, and unless a property can actually show silver in a fairly continuous ore body it is hard to raise money for development.

In the annual report soon to be published, the Buffalo mines will show a production of a million and a half ounces or approximately the same as last year. 1,250,000 ounces were produced at the mill from 41,000 tons of ore, or an average of about 30 ounces per ton milled. The ore reserves will be approximately the same, about 41 million ounces, the old reserves of last year scarcely being touched. Much of the ore this year has come from development on the new level at the 300-foot, and some old stopes on No. 10 vein.

The problem of the treatment of the low grade ore at the Crown Reserve and the Kerr Lake has been solved. It was at first proposed to erect a customs concentrator at Kerr Lake, but there was a hitch at the eleventh hour and the scheme fell through. Now an arrangement has been made whereby the Nova Scotia mill treats both the Crown Reserve and the Kerr Lake ore at a certain fixed price per ton for five years. The total amount contracted for is 175 tons from both mines, and the time fixed is five years. The Nova Scotia has to bear the expense of adding another 20-stamp to its equipment, to build the 6,000-foot aerial tramway, and give a guaranteed extraction. The bullion will be delivered back to the two companies for them to market themselves. The mill should be able to handle ore by the first of August.

Fire destroyed the power house at the Nancy Helen in the first week of June. The plant, which consisted of a gas producer plant, a hundred horse-power engine, and the first half of a 12-drill compressor, was probably worth about $15,000. No work has been in progress for some time, and it is believed that fire must have originated from crossed wires. Negotiations were in progress whereby the control of the company was to be turned over to Port Arthur capitalists.

Mr. C. A. O'Connell has taken charge of the Trethewey mine, in place of Mr. George MacNaughton, who succeeded Mr. Frank Loring as manager. Mr. McNaughton is going to Porcupine after a visit to Nova Scotia.

A strike has been made at the 140-foot level of the Kerr Lake north of the shaft, showing a lead about two inches wide, but of very rich ore indeed. Very few shipments are being made from this property at the present time, the low grade being conserved until it can be treated at the Nova Scotia mill.

In a bush fire at the Beaver Lake station, South Lorrain, of the British Canadian Company, the power house was burned down and the transformers so damaged that they will have to be replaced. This will affect three mines working with electric power, namely, the Wettlaufer, the King George, and the Alice Lorrain. The accident will not affect the service to Cobalt and Kerr Lake at all.

The Kerry mine has now finished pumping out its shaft and is commencing to sink the shaft below the 350-foot level. The Gould Consolidated, another lease on Peterson Lake, has commenced operations on Cart Lake. Brydge lease, St. Anthony, Union Pacific, and Little Nipissing are all working again.

The Meteor Mining Company, a wealthy Pittsburg syndicate, is now sinking a shaft on the west side of its claim near the Savage, in an attempt to catch the Savage veins. A considerable amount of work has previously been done by tunnelling into the hill but without result.

The sale of the Cobalt Central has again been postponed and the further date for the offering up of this company is now placed at June 17. All the local debts of the Standard Cobalt, which is controlled by the Cobalt Central, have been paid, so that there is some probability that the property will never come to the hammer, but will be worked again by the company under the new management.

Those who are agitating for a Gowganda-Elk Lake railroad are now confident that they will get their desire in spite of the cold reception the Government gave the project a little while ago. It is stated that some New York capitalists are ready and willing to build an electric road if they are given exclusive rights in the territory. Mr. Englehart is going up to Elk Lake to look over the situation early in July.

Excellent results are being obtained at the Miller Lake O'Brien property this year. The ore bodies at the 200-foot and 250-foot level are far better than above, and during the first part of this year the ore reserves have been greatly increased.

NORTHERN ONTARIO AND QUEBEC.

Porcupine, Swastika, Keekeek, and Matachewan.

The fire at the Hollinger was the one event in the history of the new goldfields most likely to delay the inevitable boom. The Hollinger is the company that has so far represented Porcupine abroad, and now that its plant has been burned and its mill operations delayed for six or eight months, there is nothing yet in the camp to take its place.

The compressor at the Hollinger was not damaged and one boiler is available, so that it will be possible to keep work going on a small scale until machinery can be taken in over the railroad to South Porcupine and beyond. The reports from Porcupine are to the effect that the road from South Porcupine to the Hollinger is in such a condition that it is not possible to take heavy machinery over it, and that such transportation will have to be made when the railroad gets in. The T. and N. O. has now promised that there shall be no delay in extending the line from South Porcupine to South Tisdale, and this decision will undoubtedly have important consequences. The best natural townsite in the whole camp is on the sandy plain between the Mattagami and the Hollinger, and here the Hollinger Gold Mines propose to lay out a townsite. No doubt a considerable settlement will grow up here.

Steel on the Porcupine railroad has already been laid to Golden City, Porcupine, and it will be extended to South Porcupine by the middle of June. On July 1st, when the first passenger train will run over the line, it should be well on the way to the Hollinger.

Prospectors coming out of the Keekeek country in Northern Quebec report that while there appears to be no visible gold, the country is excellent for prospecting, and a considerable number of veteran prospectors will be in there this summer.

The route in at present is from Ville Marie to Quinze, 22 miles on a stage, from foot of Quinze Lake to Sturgeon Rapids, 32 miles in a gasoline launch, from Sturgeon Rapids to Gonderau Portage out of the Kenojovis River 22 miles, one mile and a quarter and one-quarter of a mile portage into Simonard River, paddle two miles and a half to portage into Wobiskus Lake, and thence into Keekeek.

Prospectors have taken full advantage of the easy terms upon which staking can be undertaken in Quebec and lines have been run round probably 100,000 acres to date. Sam LeRoy, the original staker in this country, has a big vein of quartz in the schist on the edge of a bluff near the lake, and J. B. Roy, about two miles and a half back in the bush, has just torn the moss off what appears to be a pegmatite dike about 15 feet wide. Some few men are now going in to do work, and the country looks so promising that good discoveries are quite likely to be made between Keekeek Lake and the Transcontinental before the summer is over.

There is also a rush into the Fort Matachewan country north of Elk Lake, near the Montreal River. No authentic reports have been received from this field yet.

Bewick Moreing & Company, who now control the Rea Mines, have issued a statement that a reef has been struck at the 200-foot level about 15 feet from the shaft. It is 23 inches wide and shows a considerable amount of free gold. At a depth of 240 feet the sections from the shot drill show $19.20 to the ton after free gold had been picked out.

It is stated on excellent authority that the Drummond interests of Montreal have taken over the control of the Jupiter properties in South Porcupine. This will insure efficient development for another Porcupine property. On the next claim to the Jupiter, the vein has been traced on to the Armstrong Booth for a distance of 350 feet. The lead is in places four feet wide and runs on grab assay from the pay streak $42. At 83 feet a diamond drill core contained $20 and $40 assays from the same vein. Mr. E. P. Earle, of the Nipissing, and Mr. Frank Armstrong are interested in this property.

There has been a change in the management of the Swastika mine, an increase of capitalization, and a determination to put the mine on a working basis forthwith. The capital of the company has been increased from $1,000,000 to $2,000,000, and twenty stamps are to be added to the mill, with adequate compressor capacity also. Mr. R. B. Lamb stays as consulting engineer, but Mr. Summerhayes, formerly of the Porcupine Central, takes the place of Mr. Vandergrift as superintendent. Owing to the other good finds made round the Swastika, there is now a considerable amount of speculative interest in this area and a small settlement is rapidly growing up.

The National Porcupine Mines, the first to start operations in the Township of Ogden, have abandoned their option on the Weston properties.

BRITISH COLUMBIA.

A late spring has in some measure retarded progress in the metal mining districts of British Columbia, first cold weather and then much rain having been experienced in many camps. By the end of May, though, weather conditions were generally favourable, with the season's placer gold mining operations fairly entered upon, and wagon roads in lode mining districts, wherever transportation is by horse teams, again hard enough for heavy hauling to be undertaken.

The effects of the general cessation of work in the coal mining districts of eastern British Columbia and western Alberta are not being felt to so great an extent in British Columbia lode mining camps, as it was feared they would be. The prompt action of the British Columbia Copper Company in obtaining a supply of coke for metallurgical purposes from Pennsylvania, followed by the Consolidated Mining and Smelting Company and, at the end of May, by the Granby Company, has resulted in there being no interruption in smelting operations at the respective works of the B. C. Copper and Consolidated companies, and only three weeks' suspension at those of the Granby Company, which last was in some measure influenced as well by the necessity for general overhaul and repair of blast furnaces and accessory plant.

Little or no progress seemed to have been made by the end of May by the Board of Conciliation and Investigation in the

direction of bringing about an agreement between the Western Coal Operators' Association and District No. 18, United Mine Workers of America. For some unexplained reason the board took a recess of three weeks after having visited a number of collieries and taken evidence. Whether or not operators and miners will be any nearer to a settlement when the board shall resume its sittings is not known to the public at the time this is being written. Meanwhile the various collieries are idle and the U. M. W. A. local organization is giving its members a little assistance in the shape of provisions. Opinion outside of those immediately concerned seems to be that there is no present prospect of an agreement being arrived at without further delay.

Cariboo and Cassiar.—Little news is obtainable thus early in the season from the placer mining camps of these districts. Hydraulicking has been fairly started and, there having been an abundant fall of snow through the winter, water is plentiful for gravel sluicing. If the backward spring be not followed by an early hot summer, the season will probably be long and results correspondingly profitable. On the whole there should be a larger total recovery of gold from hydraulic mining operations this year than for several recent years, for some of the larger mines are better equipped and their water supply facilities are larger than in the past.

East Kootenay.—The Sullivan group is now the largest producer of ore in this district, the output of the St. Eugene mine, also operated by the Consolidated M. and S. Company, having fallen off considerably. A comparatively small production is expected from the Society Girl mine, and possibly the Aurora will also send out some ore. There is not likely to be any important change in conditions in the northern part of Fort Steele mining division until after the construction of the Kootenay Central Railway shall have provided railway transportation facilities. Similarly, lode mining in Windermere division will remain at a standstill, so far as production is concerned, although it may be some mine owners will be encouraged to resume development work now that the construction of the railway has been definitely promised and is being proceeded with. Placer mining will be on a small scale on Wild Horse and several other creeks, while on Perry Creek a decided improvement is looked for in connection with the enterprise of some Vancouver men who last year put in a steam shovel to admit of the gravel being handled in larger quantity. Coal mining and coke making in East Kootenay have been stopped for the time being. It was reported about the end of May that an underground fire had necessitated the sealing up of one of the Michel mines of the Crow's Nest Pass Coal Company, but fortunately there had not been any loss of life in connection therewith. The Corbin coal mine, which had an agreement with its men continuing to a later period than that of the larger mines, is now, like the others, not producing coal. Idle miners and coke makers, while not permitted to work themselves, daily see coke from Pennsylvania being hauled over the railway through the Crow's Nest Pass district, on its way to smelting works in Kootenay and Boundary districts.

West Kootenay.—In Ainsworth division, endeavours are being made to extend lode mining operations in the vicinity of the town of Ainsworth, where several properties are being developed. Across the lake, the Blue Bell is still idle. Up the north fork of Kaslo Creek work is being done at three or four mines which from time to time ship ore. The Utica, on Paddy's Peak Mountain, and the Whitewater group, situated nearer the divide between Ainsworth and Slocan divisions, are both being developed with a prospect of again shipping ore if proposed arrangements for a resumption of traffic on the Kaslo & Slocan Railway shall be carried out.

The outlook is favourable for Slocan mining division, especially as regards McGuigan Basin and Four-mile Creek camps. The early construction of a spur from the C. P. R. line from Sandon to Slocan Lake is looked for, a route for this having been surveyed and preparations made for provisioning the men who will be engaged in construction work. The completion of this spur will provide railway transportation for zinc ore from the Lucky Jim mine, near Bear Lake, on the Ainsworth-Slocan divide. It will also make practicable the shipment of much silver-lead ore from the Rambler-Cariboo, in McGuigan Basin, in which mine developments continue to be most promising, for ore has lately been found on the 1,200-foot level, which will give another face for ore extraction to add to those already opened on the 1,050-foot and other levels up to the 700. About Cody, conditions seem to be improving, for the finding of another shoot of ore in the Reco has been reported, while development on the Noble Five group, Sunset, and Surprise, indicates that all three may be expected to be on the ore-shipping list again before the close of the ensuing summer. Near Sandon, the Ruth-Hope, Richmond-Eureka, and Slocan Star groups are all being worked, and further production is expected from them. In the vicinity of Three Forks, the McAllister has changed hands and the Idaho-Alamo is again under lease. Near New Denver, the Mollie Hughes is being taken over by a Spokane company, which is expected to work this mine on a larger scale than in the past, while the Sweetgrass is being developed with promise of its making a profitable output of ore. Several of the smaller mines in the mountains near New Denver are also having attention this season.

Four-mile Creek camp, or Silverton camp as it is also called, is now the most active in Slocan division, with three important mines and two concentrating mills in operation. At the Standard mine, development on Nos. 5 and 6 levels has been continued. The face of No. 5 is now in milling ore of good grade; cross-cutting both ways from the adit has shown the width of ore here to be about 85 feet. No. 6 has not yet been driven far enough to reach the downward extension of the big shoot of galena ore occurring in No. 5, and which is believed to continue to the lower level. Construction of the aerial tramway to the mill site near the lake shore, about 8,000 feet away, is in progress, as is also that of the ditch and flume to bring water from Four-mile Creek to the place where the new compressor plant is to be erected, and thence to the mill site. Cribbing and excavations for foundations of mill building and plant have been completed, and machinery and plant for tramway, compressor, and mill equipment are being received. The machinery of the new mill the Van-Roi Mining Company started operating on March 15 is running smoothly and results are satisfactory. During the month of April the tonnage of ore put through the mill was 3,273 dry tons, the shipping products obtained from which were, approximately, 190 tons of silver-lead and 230 tons of silver-zinc concentrates. The former is being shipped to the Consolidated Company's smeltery at Trail, B.C., and the latter to Bartlesville, Oklahoma, U.S.A. The Van-Roi mine is looking well, with a large tonnage of ore blocked out ready for extraction, so that prospects are favourable for a long and continuous mill run under conditions that indicate profitable results to the company. The Silverton Mines, Limited, operating the Hewitt-Lorna Doone group, is also expecting to have an uninterrupted season of production. For several years the development of its mine has been steadily proceeded with, until now there is much ore ready for shipment. The higher grade ore, in which freely occur ruby silver and grey copper, the latter also containing much silver, is sorted out by hand and shipped crude to the smeltery. The second-class ore is sent to the Wakefield mill, on Four-mile Creek, for concentration by ordinary water process. One unit of the Elmore Vacuum Process plant is being put in at this mill, to treat the zinc middlings and make a shipping product to contain 45 per cent. or more of zinc and 100 ounces of silver per ton.

In Slocan City division, the Enterprise and Eastmont, on Ten-mile Creek; and the Arlington, Ottawa, Meteor, Black Prince, and Hampton, all on or near Springer Creek, are being

worked. The Enterprise is under lease to Mr. S. S. Fowler, of Nelson; two shifts of men were employed throughout the winter, with the result that shoots of ore were opened from which shipments will be made now that the wagon road to the lake is again hard enough for use by the freight teams. The Eastmont is owned by the Ellis Silver Mining Company, of Toronto; during the winter 15 to 20 men were employed on the property, and a lower adit was driven. Several shoots of ore were passed through and the main orebody opened in the higher levels was afterwards entered. It is expected that more ore will now be shipped than during the corresponding period of last year. Of recent developments on the several other Slocan City properties above mentioned, the most important was that on the Meteor, where a shoot of ore was found, 14 to 20 inches in width, and of high grade; from this several cars of ore are expected to be obtained.

General.—Late developments in Rossland mines are more than ordinarily promising. Mines in Nelson division, especially some of those in Sheep Creek camp, are also looking well. Similarly encouraging reports come from some of the mines of the Granby and B. C. Copper companies, in Boundary district. In the Similkameen, the Nickle Plate group is still making excellent returns, and bids fair to long continue to do so. On the Coast favourable reports come regarding the Britannia mines, near Vancouver; the Marble Bay and Cornell mines, Texada Island; and the Hidden Creek copper mine, on Observatory Inlet, under bond to the Granby Company. Space restrictions, however, prevent further notice of these at this time.

GENERAL MINING NEWS.

NOVA SCOTIA.

Sydney, N.S., June 1.—A new steel ingot record was made in May. The output was bettered by about 400 tons. The former record of 28,142 tons was made in June, 1909.

Work has started on the foundation of the new nail mill.

ONTARIO.

Toronto, June 3.—In his report on the Hollinger mine made by General Manager Robbins, the details of which the directors are making public, Mr. Robbins says the stoppage of mining operations from the fire is not serious, as they have a sufficient amount of ore developed to keep the mill going for several years. The principal loss is in the delay which will now occur before the mill can be built and put into operation, but even this is not a serious matter.

"The company will now be able to build the complete mill and cyanide plant together and start operations upon a larger scale than we had previously planned," he says. "All plans are being prepared with a view to ultimately treating a large tonnage. The new shaft will have four compartments and the head gear will be designed to accommodate self-dumping skips. The underground work will be so arranged that by means of an east and west main cross-cut all of the workings will be connected to the main shaft. The ore will be dumped directly into the crusher station, and after being put through the coarse crushers it will be elevated to the sampling mill. The reject from the sampling mill will be delivered by conveyor to the stamp bins. The probable treatment will consist of coarse stamping, fine grinding in tube mills, concentration of sulphides and metallics which will be treated separately, and cyaniding of the entire pulp.

"There is little doubt that within a year or so the company will have to increase this milling plant to a capacity sufficient to treat from 400 to 500 tons per day. There is in the mine in the neighbourhood of 200,000 tons of ore sufficiently developed to enable the company to begin mining upon an extensive scale as soon as the mill is running.

"During the past two months a large part of the underground work has been confined to cross-cutting east and west of the main vein and a total of approximately 650 feet of cross-cut has been driven. The result of the work has been highly satisfactory as it has proven that the various veins which parallel the main vein upon the surface persist below the surface and carry high values to and below the 100-foot level.

"West of the main vein two parallel veins have been proven upon the 100-foot level. These veins with the mineralized wall rock form bodies of payable ore from four to eight feet in width. Samples taken at random have shown values from $2 to $84 per ton.

"East of the main vein a cross-cut has been driven approximately 100 feet to intercept a dome of quartz which outcrops upon the surface. The surface outcropping has been traced for over 300 feet. The cross-cut driven through this vein at the 100-foot level has disclosed the width of the ore body to be 22 feet, carrying values from $9 per ton on the foot wall to $34 per ton on the hanging wall and giving an average of approximately $18 per ton over the entire width of the vein.

"The deepest workings are those on the 200-foot level of the main vein where something over 200 feet of drifting has been accomplished. The vein is from four to 20 feet in width, and the assays are most erratic, varying from $1.60 to $437 per ton. A sample of 16 tons taken from the 200-foot level, about 25 feet north of the winze, was found upon treatment to carry approximately $84 per ton."

Mr. Robbins says the figures are quoted merely as an illustration of the fact that the high values encountered upon the 100-foot level are duplicated upon the 200-foot level.

The report concludes by saying that no disappointments have resulted from either cross-cutting or sinking and the indications are that during the next year work in the unproven ground to the west and to the north of the present workings will add greatly to the intrinsic worth of the mine.

Toronto, June 9.—The by-law to double the capital stock from $1,000,000 to $2,000,000 was unanimously adopted by the shareholders of the Swastika Mining Company at their meeting yesterday. The president stated that his reports from the mine were highly satisfactory. Arrangements have already been made for the underwriting of a large block of the new stock.

The Swastika Company was reported as still in funds, and has $150,000 of the old stock in the treasury.

Toronto, June 2.—Two decisions in cases in which E. J. Townsend, a mining promoter of Sudbury, was defendant, were given yesterday by Chief Justice Falconbridge. A. H. Beath sued Townsend for 10,000 shares of stock in the Golden Rose Mining Company, in which Townsend had a controlling interest, which is in the Temagami district, and asked Beath to assist him in promoting it, promising Beath ten thousand shares. Townsend tried to back out of the agreement, and asked Beath to resign. In giving judgment, His Lordship said that the preponderance of evidence was in Beath's favour and that Townsend's witness was a mere creature. "The defendant was endeavouring to make signals to him in the witness box," said the judge, who gave Beath judgment for 9,000 shares.

The other suit was brought by John F. Black, of Sudbury, respecting the same claim. Black had a small interest in the claim and signed an agreement with Townsend that they would form a company to be known as the "Queen of Sheba Mining Company."

Black claims to have advanced over $3,000 in personal loans to Townsend and for various purposes, such as the purchase of equipment and the selling of stock. He sued for this and $20,000 damages, or 150,000 shares in the Golden Rose Company. Judgment was given for Black with a reference to the Master-in-Ordinary to ascertain the amount due Black.

Cobalt.—The surveys for the 6,000 feet aerial tramway between the Nova Scotia mill and the Crown Reserve, at Cobalt, are now completed, and construction will commence at once. A contract will be let immediately for the installation of 20 additional stamps at the Nova Scotia mill to take care of the 100 tons per day from the Crown Reserve and the 200 tons per day which it is most probable will be trammed to it from another Kerr Lake mine, with which a contract is now being made. This will give the mill 40 stamps and raise the capacity to more than double its present crushing power.

Porcupine, June 1.—The Porcupine branch of the Temiskaming and Northern Ontario Railway will be extended on past the Dome as far as the Pearl Lake district and presumably as far west as the Mattagami. This follows directly in line with the action of the big interests in the Hollinger who have to a greater or less extent been instrumental in securing the decision to carry the road through past their mine.

ALBERTA.

Coleman, Alta., June 6.—Dr. Gordon and Colin Macleod, members of the conciliation board which was to re-convene here to-day to resume the inquiry being made into the dispute between the mine workers and operators in District No. 18, United Mine Workers of America, failed to reach town, and Secretary Carter, the other member of the board, who went to Indianapolis a week ago and who arrived on the west-bound flyer, after waiting until the arrival of the local train from the east, went to Fernie to-night. The executive board of the district held a meeting this afternoon, but nothing was given out as to what action was taken. Vice-President Hayes, of Indianapolis, wired Mr. Carter this afternoon that he was starting for Coleman to-day. M. F. Purcell and William Diamond, of the international board, are here, and Charles Garner will arrive to-morrow. None of the operators have yet arrived, but Manager Wilson and President Stockett are expected this evening.

BRITISH COLUMBIA.

Stewart, June 3.—One of the parties of the Dominion Government Survey Department, who, under Dr. King, the chief astronomer of Canada, are engaged in delineating the Alaskan boundary, arrived here on Sunday, May 21, by the G. T. P. Company's steamer Prince Albert and registered at the Empress Hotel. This party, which consists of the following, Mr. J. H. Mackie, in charge, Messrs. R. G. Evans, J. M. Bates, C. W. Hayward, F. M. Badham, W. Bond, H. McLelland, and B. Dodds, moved out into the field on Tuesday last, and are now encamped at Portland City, two miles from here. Their work will be to carry a series of triangles from the original base extension down to the mouth of the Inlet. Beacons will be established on all points both of the main and secondary triangulations, and a very accurate topographical survey will be made for two miles on either side of the canal. It is estimated that the field work of this portion of the international boundary will occupy three seasons.

The work of delineating the international boundary throughout its length is carried out by alternating parties of Canadian and United States surveyors, and each party is accompanied by a representative from the other nation. The American representative with Mr. Mackie's party has not yet arrived.

The work of the Geological Survey in the Portland Canal district will be continued this year by the Dominion Government. Mr. Connell, who was here last year, is expected in a fortnight with a party of assistants.

UNITED STATES.

Miami, Ariz.—The Miami plant is running in fine fashion. Underground work is being carried forward at the rate of about 2,000 feet monthly. It is wholly confined to ore-bearing ground. Considerable ore is being taken from the stock piles on the surface, but the bulk of the ore comes from the development.

Cripple Creek, Colo., June 3.—From the El Paso mine on Beacon Hill, company and lessees sent out 131 cars in May, to which the company, mining in the levels just recovered since the recession of water, contributed 62 cars, or two cars a day.

The grade of the ore is about $25 a ton. Several big stopes are being mined not only by the company, but by lessees. This is the banner production from this property to be made in a number of years, even before the El Paso was flooded. The greater portion was mined in the old levels which were declared worked out a number of years ago and which have still been producing regularly.

Boston, Mass.—The directors of the Calumet & Hecla have declared a quarterly dividend of $6 per share. Three months ago $6 was declared, a year ago $7. With the payment of the dividend just declared the stockholders will have received $115,450,000 in dividends since the formation of the company.

Fairbanks, Alaska, June 5.—A gold strike is reported to have been made at Indian Creek, a tributary of the Koyokuk River, 300 miles up stream. Pay earth has been struck in two places. Miners are stampeding from here. Gold has also been struck on Long Creek, on the north side of the Yukon, opposite Melosi. The earth yielded five to fifteen cents to the pan.

MEXICO.

Guadalajara, Mex., June 2.—Milling operations are well under way at the new reduction works of the El Favor Mining Company in the Hostotipaquillo district of Jalisco. The new 100-ton plant is running constantly and giving not the slightest trouble. At first the launders and tables required adjustment in order to produce the proper flow of the heavy "pulp," but that has been accomplished, and as soon as the two additional tube mills which are on the ground have been placed in commission, the stamp duty will be increased from four tons a stamp a day, the present load, to seven tons a stamp daily, and perhaps even higher ultimately. At present the product from the batteries is first being put through 20-mesh screens, but these will be displaced with 8-mesh screens, which will give a much coarser product for concentration over the Wilfley tables and Frue vanners. The overflow from the tables will be reground in the tube mills and again pass over the tables to the cyanide treatment department.

According to the week's tests, 34½ per cent of the assay value of the ore of the El Favor is being saved in the concentrates, and slightly better than 50 per cent. of the total assay value is being saved in the zinc boxes, making a total recovery of 84½ per cent. It is confidently expected that a much higher percentage of saving will be effected as the mill is trimmed up by steady operation.

The concentrates now are running six kilograms of silver to the ton and will furnish in returns at the present capacity of the mill a weekly saving of something better than $6,000. The saving in the zinc boxes will amount to about $10,000 weekly. The management of El Favor says it is too early yet to predict with safety the ultimate results, as the present tonnage is scarcely more than half what it is expected it will be within the next few weeks.

STATISTICS AND RETURNS

TRETHEWEY FOR MAY.

The following is the mill report for the month of May from the Trethewey mine:—

Pounds of concentrates shipped to Thorold, 75,315; No. 1 ore and jig concentrates shipped to Carnegie, 72,360; ore treated (tons), 3,577; jig concentrates (pounds), 37,641; table concentrates (pounds), 75,438; totals—75,485 ounces. First-class ore from mine, 35,418 ounces. Total in ounces—109,903. Bullion shipments for month, 1,459 pounds.

COBALT ORE SHIPMENTS.

Following are the shipments from the Cobalt camp for the week ending June 9, and those from Jan. 1, 1911, to date:

	June 9. Ore in lbs.	Since Jan. 1. Ore in lbs.
Badger	.....	55,200
Bailey	.....	40,000
Barber	.....	6,000
Beaver	.....	716,708
Buffalo	56,590	1,288,010
Chambers Ferland	63,200	575,000
City of Cobalt	.....	493,780
Cobalt Lake	55,980	1,805,250
Cobalt Townsite	.....	480,700
Colonial	.....	42,000
Coniagas	.....	1,873,520
Crown Reserve	49,670	1,208,220
Hargraves	60,000	101,100
Hudson Bay	63,600	438,450
Kerr Lake	.....	1,262,030
King Edward	.....	40,000
La Rose	.....	2,764,870
McKinley-Darragh Savage	64,060	2,685,290
Nipissing	64,920	2,714,910
O'Brien	.....	607,790
Peterson Lake (Little Nip)	.....	58,430
Provincial	.....	40,510
Right of Way	67,680	519,460
Silver Cliff	.....	106,680
Standard	.....	102,813
Temiskaming	.....	775,302
Trethewey	71,400	672,302
Wettlaufer	.....	117,232

The shipments for the week were 617,100 pounds, or 308 tons.

The shipments from Jan. 1 to June 9 were 21,693,635 pounds, or 10,846 tons.

B. C. ORE SHIPMENTS.

Both the Granby mine and the Granby smelter are absent from the ore returns this week, but both are expected to resume operation in a fortnight's time.

The following are the returns of the ore production and movement for the week ended June 3, and for the year to date:

Boundary Shipments.

Mother Lode	6,636	144,685
Rawhide	5,220	84,123
Jack Pot	473	14,220
Athelstan	225	1,942
Napoleon	662	2,637
Insurgent	162	328
Lone Star	397	2,043
Other mines	.....	488,989
Total	13,775	738,967

Rossland Shipments.

Centre Star	3,032	84,841
Le Roi No. 2	580	11,707
Le Roi No. 2, milled	300	6,600
Le Roi	227	5,326
I. X. L.	7	43
Other mines	.....	378
Total	4,146	108,895

Slocan-Kootenay Shipments.

Sullivan	672	14,514
Richmond-Eureka	29	1,089
Rambler-Cariboo	29	770
Hewitt	21	215
Maestro	19	113
Eastmont	31	121
Knob Hill	206	1,386
Twighlight	11	11
St. Eugene, milled	420	13,896
Queen, milled	420	9,030
Granite-Poorman, milled	250	5,500
Nugget, milled	110	2,420
Wilcox, milled	75	1,650
Van Roi, milled	800	8,249
Other mines	.....	4,907
Total	3,093	63,871

The total shipments for the week, including the estimated milling, were 21,014 tons, and for the year to date, 911,723 tons.

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	6,636	144,685
Rawhide	5,220	84,123
Jack Pot	473	14,220
Athelstan	225	1,942
Napoleon	662	2,637
Insurgent	162	328
Lone Star	397	2,043
Other mines	.....	240
Total	13,775	250,218

Granby Smelter Receipts.

Granby	.....	458,982

Consolidated Co.'s Receipts.

Trail, B. C.

Centre Star	3,032	84,841
Sullivan	672	14,514
Le Roi No. 2	580	11,707
Le Roi	227	5,326
Richmond-Eureka	29	1,089
St. Eugene	62	2,938
Rambler-Cariboo	29	770
Hewitt	21	215
Maestro	19	113
Eastmont	31	121
I. X. L.	7	43
Knob Hill	206	1,386
Van Roi	65	297
Twighlight	11	11
Other mines	.....	36,658
Total	4,991	160,029

The total receipts at the smelters for the week, including concentrates, were 18,766 tons, and for the year to date, 869,229 tons.

TORONTO MARKETS.

June 12 (Quotations from Canada Metal Co., Toronto).
Spelter, 5.50 cents per pound.
Lead, 3.65 cents per pound.
Antimony, 8 to 9 cents per pound.
Tin, 48 cents per pound.
Copper, casting, 12¾ cents per pound.
Electrolytic, 12¾ cents per pound.
Ingot brass, 8 to 12 cents per pound.

GENERAL MARKETS.

June 8.—Connellsville Coke (f.o.b. ovens).
Furnace Coke, prompt, $1.40 to $1.50 per ton.
Foundry Coke, prompt, $1.90 to $2 per ton.
June 9.—Tin, Straits, 48.50 cents.
Copper, Prime Lake, 12.50 cents.
Electrolytic copper, 12.40 to 12.50 cents.
Copper wire, 13.75 cents.
Lead, 4.47½ cents.
Spelter, 5.50 cents.
Sheet zinc (f.o.b. smelter), 7.25 cents.
Antimony, Cookson's, 9.00 cents.
Aluminium, 19.75 to 20.25 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $42.50 per ounce.
Platinum, hard, $44.50 per ounce.
Bismuth, $1.80 to $2 per pound.
Quicksilver, $43 per 75-pound flask.

Silver Prices.

	New York. cents.	London. pence.
May 25	53¼	24 9/16
" 26	53¼	24 9/16
" 27	53¼	24 9/16
" 29	53⅛	24½
" 30	Holiday	24½
" 31	53¼	24 9/16
June 1	53¼	24 9/16
" 2	53⅜	24⅝
" 3	53⅜	24⅝
" 5	53⅜	Holiday
" 6	53⅛	24½
" 7	53¼	24 9/16
" 8	53¼	24 9/16
" 9	53	24½

SHARE MARKET.

(Courtesy of Warren, Gzowski & Co.)

Miscellaneous.

	June 12,	1911.
Dominion Steel Corporation	59	60
Nova Scotia Steel	..	99
Crow's Nest Pass	..	68
Granby	37½	38
Consolidated Mining & Smelting	35	40
Amalgamated Asbestos	..	..
Black Lake Asbestos	..	15

Porcupine Stocks.

Foley	.97	1.04
Det. New Ontario	.50	.51
Porc. Northern	.63	.66
Rea	6.10	6.15
Apex	.14	.15
Canada	1.13	1.20
Porc. Central	.80	.81
Dobie	2.90	3.15
Dome Ext.	.65	.66
Hollinger	14.76	14.85
Monita	.15	.23
Preston	.32¼	.33
Gold Reef	.21	.25
Pearl Lake	.58½	.62
Imperial	.15	.19
Tisdale	.10	.11
Swastika	.58	.59
United	.05	.06½
Porc. Gold	.60	.60½
Standard	.18	.25
West Dome	1.25	2.00
Coronation	.26	.32
Crown Chartered	.49½	.51

Cobalt Stocks.

Amalgamated	..	...
Bailey	.04½	.04¾
Beaver Consolidated	.50	.51
Buffalo	1.75	2.00
Chambers-Ferland	.12	.14
City of Cobalt	.16	.18
Cobalt Central	.01	.04
Cobalt Lake	.20¾	.21½
Coniagas	6.60	7.20
Crown Reserve	3.15	3.30
Foster	.04½	.06
Gifford	.02	.04
Great Northern	.17¼	.18½
Green Meehan	.03⅝	.03⅞
Hargraves	.17½	.18
Hudson Bay	98.00	102.00
John Black	...	...
Kerr Lake	5.50	6.00
La Rose	4.20	4.40
Little Nipissing	.04	.04¼
McKinley	1.70	1.72
Nancy Helen	.01	.04
Nipissing	10.40	10.50
Nova Scotia	.10	.15
Ophir	.10	.14
Otisse	.01¼	.02
Peterson Lake	.09½	.10¾
Right of Way	.09	.10
Rochester	.07	.08¼
Silver Leaf	.03¾	.04
Silver Bar	...	...
Silver Queen	.05	.08
Temiskaming	.65	.66
Trethewey	1.05	1.06
Watts	...	...
Wettlaufer	1.19	1.20

New York Curb.

Brit. Col. Copper	5⅜	5⅝
Butte Coalition	19⅝	19⅞
Chino Copper	..	..
Davis-Daly Copper	1¼	1⅜
Ely Consolidated	7/16	½
Giroux Mining	7	7⅛
Goldfield Consolidated	6	6⅛
Greene-Canadian	7⅛	7⅜
Harcuvar Copper	..	..
Inspiration Copper	8⅞	9
Miami Copper	..	..
New Baltic Copper	6½	7
Nevada Con. Copper	19⅞	20
Ohio Copper	1½	1 9/16
Rawhide Coalition	..	..
Ray Central	1 9/16	1⅝
Ray Consolidated	17½	18
Union Mines	⅜	1
Yukon Gold	3 15/16	4