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CIRCULATION.

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CONTENTS.

Editorials 353
(a) Clubs, Societies and an Editor 353
(b) Quebec Mining Law Amendments 354
(c) Progress and Procrastination 354
(d) That Timmins Sample Car 354
(e) The Hair-Trigger Critic 355
(f) Porcupine 355
(g) Nova Scotian Mining Examinations 355
(h) Editorial Notes 355
Hoisting by Electricity 355
A Suggestion in "Quartering-Down" Large Samples, by H. E. T. Haultain 356
A Note on the Sampling of the Porcupine Ore Bodies, by H. E. T. Haultain 357
Some Notes on the Philosophy of Sampling, by H. E. T. Haultain 358
The Amendment to the Criminal Code 360
The Porcupine Gold Area, by W. E. H. Carter 361
Our European Letter 366
Rescue Apparatus in Coal Mines 369
Safety Chambers in French Mines 370
Programme of the Mines Branch 371
Northern Quebec 371
Tool Steel Direct from the Ore in an Electric Furnace, by Alfred Stansfield 372
Personal and General 375
Special Correspondence 375
General Mining News 380
Mining News of the World 380
Company Notes 382
Statistics and Returns 382

CLUBS, SOCIETIES, AND AN EDITOR.

Again has our young contemporary, "The Mining Magazine," opened a vexed question. In its issue for May, Mr. F. Lynwood Garrison takes the editor, Mr. T. A. Rickard, to task for making caustic remarks about the Mining and Metallurgical Society of America, which society is a close corporation, composed exclusively of professional men. Mr. Garrison, not without heat, advances the argument that since the Society was organized to promote reforms advocated editorially by Mr. Rickard, therefore Mr. Rickard, who is a prominent member of the Society himself, is unfair and inconsistent in commenting adversely upon such an "altruistic organization." "Moreover," says Mr. Garrison, "you would not venture to do such a thing of [sic] any social club in which you are a member, and it is hard to see much difference in propriety as regards the Mining and Metallurgical Society."

To these strictures Mr. Rickard replies in an editorial. First he points out that there is a great gulf fixed between a social club and an engineering association. The Mining and Metallurgical Society he had criticized because it adopted the exclusiveness of a social club. For the one, "carefully prescribed qualifications as to occupation, experience, and skill" are the essentials. For the other it is merely necessary that the candidate be "congenial to those already in the club." Mr. Rickard further sums up his position thus: "Any society arrogating national or international scope, any society claiming to include all the properly qualified practitioners, any society assuming the function of professional classification, is in the position of . . . a public functionary bound to act in accordance with prescribed rules, not a private person free to give vent to his own idiosyncrasies."

To this well expressed dictum we subscribe. The whole discussion has arisen because of several misconceptions. The Mining and Metallurgical Society of America was created to perform a function that could not be performed by that excellent institution, the American Institute of Mining Engineers. Like our own Canadian Mining Institute, the American Institute exists to represent primarily the industry of mining. Our own choice of name has been more fortunate. But in all important respects the two bodies are analogous. Both are heterogeneous aggregations of persons directly and indirecly interested in mining. The Canadian body is probably the more effective, as it concerns itself in legislation. But each is controlled by professional men of the highest rank. Both have rejected definitely any proposals tending towards exclusiveness. The usefulness of each is believed to depend upon well regulated inclusiveness.

On the other hand, the Mining and Metallurgical Society purports to represent the profession. This it cannot do so long as admission to membership is denied to any man whose qualifications meet the Society's requirements. Like a University, it can deny its degree to no fit person.

In one direction in particular, the Mining and Metallurgical Society appears to have got on the wrong trail. Members, we believe, are not permitted to advertise the fact that they are members. This defeats the very purpose of the organization and removes the only effective means of discipline. The organizers overlooked the patent fact that, as the engineer looks to the public for his living, so his standing is dependent upon what the public thinks of him. In other words, the Society must not become a Star Chamber. It should and must strive not only to regulate the profession, but to secure the sympathy and assistance of the nation.

One word in closing. Mr. Garrison in his letter refers to the Society as being an altruistic organization. This is piffling. No professional body is altruistic . Altruism is a colourless something that can perhaps be postulated of religious retreats. The Mining and Metallurgical Society is a body organized to protect the profession of mining engineering. Its prime object, therefore, is self-preservation. Its chief danger is priggery.

QUEBEC MINING LAW AMENDMENTS.

A new spirit has been infused into the administration of mining affairs in the Province of Quebec. Close on the heels of the departure of the Chibougamau Commission comes the announcement that certain changes have been made in the mining laws. The object of these changes is to make the way easy for the prospector and the miner. The mining laws of Quebec have long needed attention. They are now being altered and amended so as to render them a help and not a hindrance to the pioneer and investor. In this respect Ontario, burdened with equivocal, cumbrous, and most involved legislation, falls far behind Quebec. Comparisons may be odious, but they have too often been made at Quebec's expense.

The amendments referred to are six in number. We shall glance at them one by one.

By the new provisions all building materials, clays, limestone, peat, ochres, sands, etc., found on private lands belong to the owner of the surface rights. Under the old regulations, the mining rights for these substances had to be acquired from the Crown. This amendment inures to the benefit of the farmer, if to anyone at all.

In future all sums paid on mining licenses (which are practically yearly leases of mining rights) shall be deducted from the price when mining claims are acquired from the Crown by purchase. This is distinctly beneficial to the mining man.

Formerly a period of four months was allowed between the staking out of a claim and the taking out of the mining license or the consummation of the purchase. By the late amendments this period is now extended to six months.

Penalties for tampering with stakes was punishable by a fine of $25, or one month imprisonment. The fine is now placed at $200, and the alternative imprisonment at six months.

Under the old regulations the deposits of iron sands in the lower St. Lawrence region were purchasable at the rate of $10 per acre. The Lieutenant-Governor-in-Council is now authorized to reduce this price to four dollars per acre should he deem it advisable.

The last point of change is one relating to municipal taxation of mines and mining plants. In the year 1900, a law was passed exempting all mines and mining plants from municipal taxation for a period of ten years. This measure expires in July of this year. It is now replaced by an amendment exempting the mine itself and the underground plant, but providing that the surface plants, mills, buildings, etc., are taxable by the municipalities.

We believe that there is little to find fault with in these amendments. But there is much to commend in the obvious intention of the Quebec authorities.

PROGRESS AND PROCRASTINATION.

On another page will be found notice of the programme of the Federal Mines Branch for the coming season. We are pleased to find that a British expert has been invited to visit Canada and consult with the Government with regard to the regulation of the manufacture and storage of explosives. No delay should occur in taking up this most necessary investigation.

Other timely investigations are to be undertaken. Amongst these are such questions as the utilization of peat, the treatment of iron pyrite, the production of spelter and zinc oxide, the magnetic concentration of iron ores, etc., etc.

These activities will bring results. It is regrettable, however, that one most urgent problem has been overlooked. In an editorial in our last issue we pointed out that the Hon. Mr. Templeman promised last session to give attention to the matter of life salvage in coal mines. On the programme just issued we see no reference to this. Again it is necessary to exhume the humiliating fact that an officer of the United States Geological Survey had to be called in to instruct the miners of Nanaimo in the use of breathing apparatus. By all means let somebody move.

For the information of all interested, we publish on another page a review of the action taken by other governments.

THAT TIMMINS SAMPLE CAR.

One thing that has contributed to what may be a much exaggerated rating of Porcupine is the Timmins sample incident. In a recent editorial we referred briefly to this. Since writing that editorial we have received what appears to be more authentic information. Some of this we are not at liberty to use. But we are quite free to

refer to the fact that serious doubts have been expressed by several engineers as to the representative character of the Timmins sample.

Now, whatever the actual facts may be, the Messrs. Timmins are in nowise bound to make public the history of that sample unless it is their intention to interest the public in their enterprise. In this event they have no right to expect the public to consider their statements unless those statements are backed by a full technical record of the sample.

On the other hand, if the Messrs. Timmins intend to develop their property without selling shares to the public, they have every right to suppress particulars. But, until those particulars are published, all that can be accepted is that a car-load of rich ore has been mined in Porcupine.

. . . . . .

No good object can be served by shutting our eyes to facts. Porcupine is decidedly *not* a proved district. Development has been and will be slow. The prices asked for undeveloped prospects are preposterous. Frequently the elements of a decent gamble are lacking. As against these facts, however, it must be remembered that rich ore has been found on several claims. How extensive the enrichment is in each case is known by no one. Only careful, competent engineering can determine this.

Owners of claims, anxious to sell quickly and at the top of the market, may resent plain speech. But exaggeration is precisely what has before now killed gold mining in Ontario. The CANADIAN MINING JOURNAL will rejoice exceedingly if Porcupine becomes a successful mining region. But whatever grounds we may have for *hope*, we have not yet a sufficient basis for *belief*.

THE HAIR-TRIGGER CRITIC.

Having passed through Egypt on his way to the "desired metropolis," Mr. T. Roosevelt finds himself impelled to inform the British nation that it is not doing its full duty by that country of historic trouble. As a critic, Mr. Roosevelt falls into the hair-trigger class. Sub-conscious cerebration provided him with his criticisms long before he saw Egypt. Egypt furnished local colour. The fact is that it is Great Britain's misfortune not to have conformed to Mr. Roosevelt's own methods.

Mining centres ever and anon are touched up by the same species of critic. The hair-trigger critic is often desperately in earnest and unquestionably honest. But either he is incapable of seeing beneath the surface, or else he is temperamentally incapable of taking sufficient pains to inform himself on both sides of his subject. The worst of him is that he may frequently become the innocent mouthpiece of extreme partisans.

PORCUPINE.

Porcupine is so much discussed at present that we feel no compunction in assigning it a large amount of space. We would request our readers to ponder carefully the articles contributed by Mr. Haultain. They are characteristically vigorous and timely. Dwellers in Porcupine will do well to take them to heart.

The general article by Mr. W. E. H. Carter is intended as a provisional estimate of the camp. Mr. Carter's judgment is worthy of respect. In addition to his professional experience he occupied for some years the position of Inspector of Mines for Ontario. Consequently, he has an intimate knowledge of gold mining in this province.

NOVA SCOTIAN MINING EXAMINATIONS.

We have been credibly informed that grave abuses exist in the system of examining candidates for coal miners' certificates in Nova Scotia. It is needless to give particulars. We hope that no time will be lost in clearing up what appears to be a distressing condition.

EDITORIAL NOTES.

Our readers will find matter of extraordinary interest in our current London letter. The notes concerning the Maikop oil field, and the discussion of coal dust explosions are outstanding features.

In Canada, gold coins are legal tender for a payment of any amount; silver coins for an amount not more than ten dollars; and bronze coins for an amount not exceeding 25 cents. British gold coins are legal tender, as are, also, subject to certain restrictions, United States gold coins.

The initial number of "Canadian Finance," an independent investment, trade, banking, and insurance journal, has just reached us. "Canadian Finance" is published in Winnipeg under the editorship of Mr. S. R. Tarr. Its object is to serve western interests no less than those of the east. Hence it should be of especial service to thousands of eastern investors. We wish it all success.

Nova Scotian coal operators, as the "Maritime Mining Record" points out, must face the problem of finding a market for slack coal. To our mind the best solution is that of utilizing the slack for generating power at the mine. There are growing markets for power within easy distance of most of the larger mining centres.

The method of measuring ore reserves in terms of the square fathom instead of in tons has been adopted by the Wernher-Beit mines. The change is looked upon favourably by other operators. Why the "fathom" should be chosen instead of the "yard" or, better, the "metre," it is hard to conceive.

HOISTING BY ELECTRICITY.

Where sufficient electrical supply exists and where there is provision to prevent entire stoppage in case of the failure of the power supply, hoisting by electricity is worthy of the consideration of mine managers. At a German mine, where electrical hoisting exists, over 3,000 tons of coal are raised in 16 hours' winding, with an average of 40 hoists per hour.

A SUGGESTION ON "QUARTERING-DOWN" LARGE SAMPLES.

BY H. E. T. HAULTAIN.*

I.

(Editor's Note.—These articles were written at the request of the CANADIAN MINING JOURNAL. Mr. Haultain has just returned from a visit to Porcupine. In the articles he outlines his personal opinions in the hope that they will prove suggestive to workers in Porcupine.)

The term "quartering-down" doubtless comes from the ancient and time-honoured method of "coning and quartering," where the ore was carefully shovelled into a cone-shaped heap, carefully flattened out into a pie shape, and as a pie, quartered by two cuts at right angles. Two opposite quarters being discarded, the other two were again carefully coned, flattened and quartered, and this was repeated until a sufficiently small sample remained. This is an elaborate process for mixing and halving and if carried out with care, gives a small sample ready for the assay office, which will truly represent a car-load.

Fig. 1.

The assayer on receiving the sample, which may weigh perhaps 10 pounds, proceeds to crush it to a sand and mixing it thoroughly does the "quartering-down" by means of a riffle-sampler, which divides the sample into eighths or twelfths, preserving alternate eighths and discarding others, and by repeating this he finally retains a sample weighing only a few ounces, but which so accurately represents the original carload as to be the regular basis of sale between miner and smelter. In each case the "quartering-down" is really a halving.

A necessary element of both the coning method and the riffle method is the preliminary mixing, and this is more important where the sample is cut only into quarters than with the riffle sampler where it is cut into a larger number of fractional parts. Brunton, in his presidential address to the A. I. M. E., hsowed that even with the elaborate ritual of the coning method it was easily possible to get false results due to improper mixing. But even where we accept the method as being entirely reliable we are justified in seeking a method less cumbersome; we want something quicker and simpler.

A continuous acting set of riffles, such as the well-known "Jones" sampler, where the sample can be passed through in a continuous stream, or in intermittent shovelfuls, does away with the elaborate mixing, is simple and really fool-proof. Figures 1 and 1A show a very simple form of the riffles adapted for use with the shovel. The discarded material remains in the wheel-barrow and is wheeled away to the dump. In the photo the individual riffles are one inch wide and two inches deep. I have used riffles in this form up to four inches wide, but have of late preferred for large samples a still simpler form of apparatus. Fig. 2 shows a diagrammatical model.

Fig. 1A.

It is simply a plate supported on edge, which splits the thrown shovelful roughly into halves and keeps them separate. The scientific philosophy of this is sound, as is also the horse-sense. What is lacking is the psychological effect of the ritual of the coning and quartering. This method requires no elaborate mixing for instead of dividing into only four parts and accepting two of them, we divide our sample into a hundred or a thousand parts (shovelfuls) and then split each of these parts into halves while they are freely falling in the air. Where there is much work to be done I prefer the form shown in Fig. 3, which is from a photo of a diagrammatical model. The edge is covered with an inverted trough or roof which serves to place the sample away

from the separating plate to make it easier for shovelling, or sends it straight into a wheel-barrow or car. Two splitting edges are used and the sample is shovelled from one to the other and back again, and so on until it is cut down to the required size. Unless the ore has been previously crushed the larger pieces of the sample

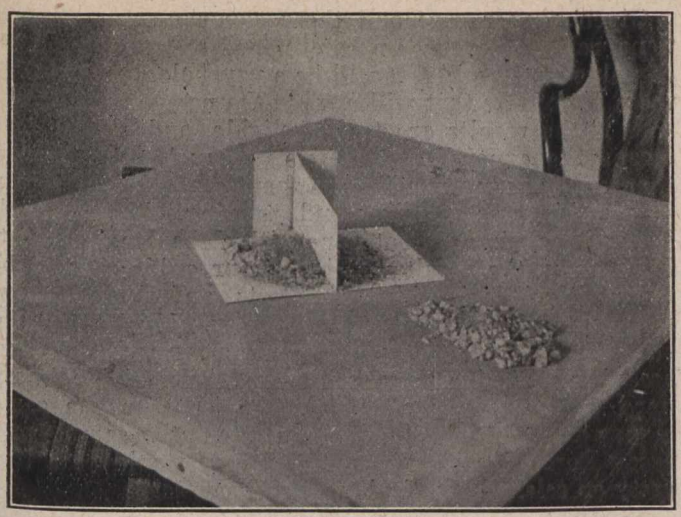

Fig 2.

should, of course, be broken up between each halving. When the sample is down to 25 pounds no piece should be larger than one-quarter inch in diameter. For gold ores showing visible gold freely, the ore should be still finer; a 25-pound sample should be able to pass an 8-mesh screen, and should go to the assay office preferably without a further cut.

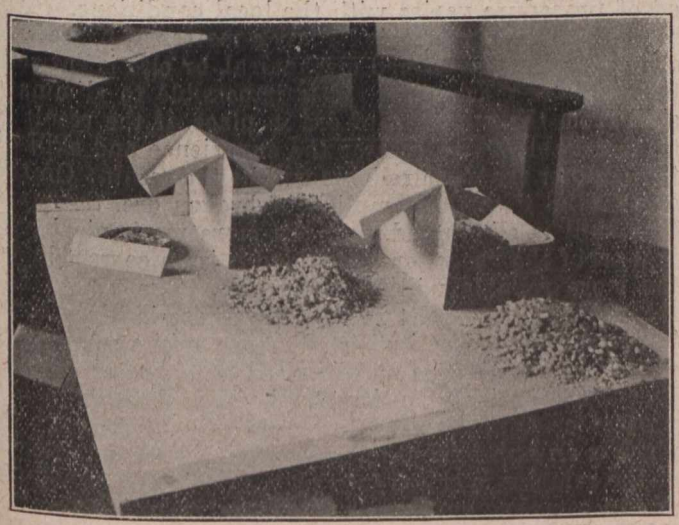

Fig. 3.

The "roof" may be a piece of sheet steel, 3 feet by 6 feet, bent to shape, and should be high enough to admit a wheel-barrow or car under one side. The other side should drop its ore onto a piece of sheet steel, 4 feet by 8 feet, and if the samples are large, a frame or pen of boards 3 feet by 7 feet may be placed upon this to prevent the ore scattering.

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A NOTE ON THE SAMPLING OF THE PORCUPINE ORE BODIES.

By H. E. T. Haultain.

II.

Porcupine is the most important new district in Ontario to-day. We all want to know what the various bodies of quartz and schist will average when it comes to milling them. It is plainly evident that there is plenty of gold-bearing quartz up there, but it is not yet evident how much of it contains pay values, though we do know that some of it is bonanza ore. Upon the determination of the probable value of the quartz depends the making of some very heavy payments in the near future, and for the purpose of making reliable estimates much work is being done at large expense. Most of the work is systematic and elaborate, the very reverse of that which characterized the early years of Larder Lake. Not only is the surface being exposed by extended stripping and trenching, but shafts and drifts and cross-cuts to explore the bodies at depth are being systematically planned and executed. It is quite true that in some cases shafts have been commenced before sufficient surface work had been done, but it is equally true that some of the surface showings fully justified the expense of underground work without further delay. All this expense is for what purpose? To boom stock? I am glad to say that I do not think so, and to my mind, this is the best symptom in mining in Ontario to-day. This work is true exploration; it is for the purpose of examining the ore bodies and the first thing and the main thing in the examination of an ore body is the sampling, and Porcupine is going to give some trouble with its sampling. So much so is this going to be the case that some people will not be satisfied till they have elaborate "mill-runs" or perhaps "smelter-tests." As a firm believer in the possibilities of sampling and also in the common "horse sense" of sampling, I submit a note or two in regard to the evident troubles. In the first place the quartz is going to be remarkably "spotty," not only spotty inch by inch, but spotty round by round. There are going to be hand specimens and "tie-pins" frequently associated with barren quartz as their immediate neighbour, and there are going to be fairly large blocks of barren or nearly barren quartz followed by equally large blocks of bonanza ore. The gold itself is all the way from fine flour gold to coarse and very coarse, though I saw very little of what might be termed "nuggetty" gold. Incidentally it is worth noting that the gold is certainly "where you find it" up there. It is in the quartz and in the schist, in the seams and in the solid, with the sulphides and in the white, so-called "bull quartz." It is with the fine sulphides and with the coarse cube pyrites. It is with galena and with zinc blende. And also it can equally well be absent from each and all of these associations.

But to come back to the sampling. Can these ore bodies with their very erratic values be sampled? They certainly can be sampled in such a way that the results will be very far from a true guide no matter whether the samples are taken with a prospect pick or run through a mill, but I think they can also be sampled very satisfactorily by adapting general sampling methods to the special conditions, and I have no doubt that sooner or later transfers will be made on the basis of sampling and that careful managers will control their output and report their reserves based on sampling just as is done in all other respectable gold camps.

The values vary greatly from inch to inch across the veins—this calls for increased care in the taking of the

individual samples, and despite this care it will result in greater variations from the probable mean value and consequently calls for more frequent samplings. The values vary greatly foot by foot along the vein. This calls for more frequent samplings. We must never forget that not only do we want to know the general average value, but we also need to study the vagaries of the ore body, wherever visible, that we may better interpret and estimate the unseen. That is the main difference called for—more frequent samplings, added to greater care in the sampling; greater care to more successfully eliminate partiality of motive and partiality of method, and more frequent samplings to permit of the greater chances of error "evening up." There is another aid to accuracy and that is to take larger samples. I don't mean to change our methods altogether and substitute the blasting down of samples of several tons weight for the sample carefully taken by hammer and moil. I mean that the sample should be increased in pounds, not tons, that where we took a 10-pound sample in copper ores we should take a 50-pound sample in Porcupine. But the taking of the larger sample should never for one moment permit us to relax our care in the taking. It is hard to persuade the ordinary man that the erratic results of individual samples do not make all care seem foolishness. They say, If with all your care your results are each very different from the true average why are you so careful? Samples taken at haphazard will not vary to any greater extent. The answer is that other things being equal chances will even up; with great care exercised in each sample to get the right proportions, etc., the errors will balance when many samples are taken. This is true philosophy, it is also horse-sense and everyday experience.

I think it might be very good policy occasionally to satisfy oneself by taking a large sample by blasting down several tons, breaking it up small with hammers and carefully quartering it down, remembering always to break the larger pieces before each quartering, so that we would wind up with, say, 25 pounds of material that would pass a 4-mesh, or, better still, an 8-mesh screen, and sending this 25 pounds to the assay office to be assayed.

Particularly in taking surface samples where the ore has not been shattered by blasting it would be well to jar up the surface by a row of holes 18 inches to 2 feet deep, followed by the taking of a fairly large sample, say one hundred pounds for each five feet of sampling, but let there be no relaxing in the painstaking care of the sampling because of that 100 pounds instead of 10 pounds.

Frequent samples taken in this way will give a very reliable idea of the true values. A few samples, no matter how they are taken or of what size, cannot represent truly the erratic ore bodies in Porcupine.

Personally, I should have very much the greater preference for a system of sampling that "quartered down" every round of muck as it was brought to surface. The extra cost of doing this, that is, the cost above added to the cost of the underground workings, would be small in comparison and the results would be something to swear by. The bucket could discharge over a splitting board, one-half could go direct in a car to the dump, the other half could be broken up with hammers and cut down on sheet steel plates.

Porcupine ores will be new for many assayers. Their final sample should be much larger than usual, they must be keenly alert for metallics, they should crush their final sample through 150-mesh, certainly through 120. They should not work with less than one assay ton and should make their assays in duplicate and triplicate. They should also take duplicate samples of the sample brought to them to check their own methods of quartering and care of metallics. The bucking board must be a good one, free from holes, and the man who bucks the samples will need especial training and overseeing. There are more errors made in breaking down samples than in assaying.

Given proper care and these common-sense precautions, reliable results can be obtained and the only added value of the mill test will be a psychological ore. But there is nothing that will obviate the necessity of skilful care if the results are to be reliable, and skilful care means the expenditure of money, much more money than one is accustomed to see spent on such apparently simple things as sampling and assaying. If the sampling and assaying are not done with elaborate care, costing money, the result will be a poor guide; it will be worse, it will misguide. Mill-tests and long-distance shipments of big samples cost money. My idea of the situation is that money spent on proper sampling and assaying will give very much more information in regard to the values of the ore bodies than the same money spent on mill-tests, but to attempt to sample and assay Porcupine ores in a casual way would be a travesty on scientific methods and on horse-sense.

SOME NOTES ON THE PHILOSOPHY OF SAMPLING.

By H. E. T. Haultain.

III.

A sample is a part to show the quality of the whole. Sampling is the obtaining of that part. In mining work we have the sampling of ore in place, and the sampling of broken ore. The sampling of an ore body, i. e., ore in place, is an art requiring knowledge, experience, skill, and the exercise of relentless care; the best method of procedure varies with the local conditions. The sampling of broken ore is largely a matter of procedure so simple as to be termed mechanical, or else is entirely the work of machinery. It is impossible to eliminate skill from the sampling of ore in place, if the result is to be reliable. The greater the experience and skill of the sampler the more reliable will be the result. On the other hand with the sampling of broken ore, the more that skill is eliminated, and the more mechanical and fool-proof the procedure, provided it is on correct lines, the more reliable will be the result. The reason for this is that the sampling of a body of ore in place is an imperfect method at its best, because only a small part of the ore can be seen and handled, whereas with broken ore the entire quantity can be passed through the process or apparatus. The result of sampling ore in place is an approximation and the skill and experience of the sampler is called into play, first in the obtaining of the samples, and, secondly, in interpreting the results. The sampling of a body of ore in place results in a series of samples, probably of very different value, no one of which may represent the average value of the ore, but which when taken together and properly interpreted will result in a reliable estimate. The sampling of a quantity of broken ore may result in one small sample which is so close and sure an approximation that it will represent the total quantity as accurately as our modern sensitive scales will weigh it. But this small sample will consist of a very large number of pieces or particles of ore, no one of which may represent the average value of the lot, some of which may be many thousands of times as rich as others, but when

taken together (without further interpretation) will accurately represent the original quantity. (The series of samples which represent the body of ore in place may be considered as having a similarity to the particles of ore which go to make up the final sample of a quantity of broken ore.)

The Sampling of Broken Ore.

What is the first essential feature required in the result of the sampling of a quantity of broken ore? Surely the answer is accuracy, and the second feature, fully as important as the first, is that we should know that the result is accurate. There is little use in the result being accurate if we have our doubts about it.

To assure accuracy we must have impartiality of motive in the man and impartiality of method in the procedure. Many think that it is only necessary to have impartiality of motive and will consider a grab sample taken with eyes shut a fair sample. They will say that if you tear a sheet of paper into a score of scraps and throw these into the air over the pile of broken ore then pieces of ore taken where each scrap of paper fell will constitute a fair sample. This eliminates the partiality of motive, but the method is still partial in that it takes samples only from the surface, or perhaps from only a small area of the surface, of the pile. Others will tell you that a large sample is a fair sample and the only fair sample, that there is some special virtue in a two-ton sample sent through a "mill-test." With the value of the "mill-test" I have dealt in a previous article.* The value of the large sample depends on the way it is taken, just as does the small sample. There may be a partiality of method which will completely upset the accuracy of the large sample, and it is generally much easier to protect the small sample from salting than the large sample.

But impartiality of motive and impartiality of method alone are not sufficient to insure an accurate sample; one thing more is necessary. The sample must contain a sufficiently large number of separate particles. If we had 900 one-ounce pieces of quartz and 100 one-ounce pieces of galena mixed together we should have a mixture containing 10 per cent. galena. If the pieces were uniform in weight, then nine pieces of quartz and one piece of galena would be a representative sample of the lot. Fewer than ten one-ounce pieces could not possibly be a representative sample. Nor would there be much chance of getting one and only one piece of galena in a sample of ten pieces by any method of cutting down, no matter how impartial our motives and our methods might be. This extreme care emphasizes the fact that chance or probability plays a large part in sampling, but other things being equal chance evens up in the long run. We must not only have at least ten pieces in our final sample to permit of the mathematical possibility of its representing the 10 per cent. mixture, but we must have a very much larger number to even up the chances no matter how impartial our methods. How many pieces should constitute a minimum sample is not easy to define even by higher mathematics, but it is not difficult to err on the right side if we take the precaution to crush the samples before cutting. One pound of ore crushed to pass a 30-mesh screen will contain many millions of separate particles, and with all ordinary ores, if this is halved by any reasonably impartial method the chances will even up so completely that the most careful assay cannot detect a difference in the value of the two halves. But should the ore contain particles of gold so large that they will barely pass the 30-mesh we have an extreme case calling for special treatment. The assayer recognizes this and where metallics are present screens them out and treats them separately. In a $20-ore one particle of gold in the sample will call for an equivalent of 30,000 particles of barren quartz, each weighing as much as the gold particle, or of more than 200,000 particles of similar size. For this reason the assayer should use a finer screen for gold ores than for other kinds and should watch most carefully for metallics.

In finely crushed gold ores the value of individual particles will vary from nothing up to $600,000 per ton. In coarse particles the values will not run so high, consequently it is not necessary to have so many particles in the large sample of coarsely-crushed ore as in the small sample of finely-crushed ore.

To sum up: Experience based on the work connected with the sale of many millions of tons of gold-bearing ores shows that a car load of ore may be truly represented by a small sample. Where no metallics are present three ounces of 120-mesh material may truly represent the carload of 50 tons.

To get this result impartiality of motive, impartiality of method and sufficiently fine crushing is all that is necessary. The process is generally a series of halvings of the ore, one-half being rejected and the other half again halved and so on. As the sample is reduced in quantity the individual particles are reduced in size by repeated crushings. In regard to the fineness of crushing Richards gives this table:

Size, Inches Cube or Mesh.	Weight of Sample, Pounds.
2 inch	10,000
1 inch	2,000
½ inch	400
¼ inch	200
⅛ inch	75
10 mesh	25
50 mesh	1

Where metallics are present the limiting size of the sample depends upon the coarseness of the metallic particles. In the extreme case of some of the Cobalt ores the metallics are removed before the first cut in the car load is made, and this may be necessary in some phenomenal nuggetty gold ores.

But with the majority of gold ores it is not necessary to attempt to separate the metallics until the sample is reduced to one pound in weight. The criterion is not mathematical deduction, but practical experiment.

If our methods have been correct and yet duplicate samples fail to check sufficiently closely the remedy lies in larger final samples, but it would be a phenomenal gold ore, indeed, of which a car load could not be represented by a few pounds.

Sampling Ore in Place.

In sampling a body of ore blocked out in a mine at best we have only access to certain "faces," the "sides" (more truly edges) of a block of ore exposed by shafts, tunnels, etc. We may be able to see four sides or edges of the block and our ordinary sampling methods with moil and hammer may then perhaps reach as much as 2 per cent. of the ore and the value of the 98 per cent. unseen must be based on the results obtained by sampling the 2 per cent. No rules will govern here. The peculiarities of the ore body must be interpreted by the judgment and experience of the man. In regard to the sampling of the exposed faces, however, the underlying philosophy is similar to that of sampling broken ore.

*CANADIAN MINING JOURNAL, Jan. 1st, 1909.

Theoretically the surest way would be to take a slice of uniform thickness from all the exposed face and pass it through the procedure for sampling broken ore. This would give us an entirely true result as far as the average value of the whole face was concerned, but if the face were of varying width and varying value it would still leave us ignorant concerning these variations of value and it is largely on the proper interpretation of these variations that we base our estimate of the unseen ore. If we cut up our slice along the exposed face into sections and sample each section separately, we get information concerning the variations and the shorter the length of each section, within reasonable limits, the more complete our information. Sometimes this can be done, for example, by sampling each round of muck as it comes from shaft or tunnel, otherwise it very seldom is practicable. As a substitute the next best course is to take out small short sections at intervals, and in practice this comes down to cutting a "channel" with hammer and moil. In this we get very far away from the simple, fool-proof procedure of sampling broken ore. The dangers resulting from partiality of motive and partiality of method are seriously magnified. There can be and often is wholly unconscious partiality of motive. A mine foreman knowing his ore intimately and deeply interested in his mine can rarely take impartial samples. Impartiality of method is assailed by the varying degrees of hardness or brittleness of the ore, and less consciously but perhaps more dangerously by sudden variations in apparent value. This sampling of ore faces by hammer and anvil (which is certainly the best method as well as the standard method) calls for experience, sound judgment, skill, care, patience, persistence, more than any other operation that falls to the lot of the engineer. Given all these, given complete impartiality of motive and of method, our final result must be gauged by the weight of the chance. Just as a few particles cannot safely make a representative sample of a lot of broken ore, so a very few sections of an ore face cannot safely represent the whole ore face. I think we can sanely say that one sample taken across a small section of an ore face by itself means nothing. It is only in association with others that it has its value. One sample may be very far from the average value, each sample is probably more or less so, but in many samples the "chances even up" and our average will be more surely correct the more frequent the sampling. This, then, is the mechanical side of the question, as it was with sampling broken ore. There must be many samples of a face, as there must be many particles in the sample of broken ore. But in sampling broken ore we erred easily on the safe side by sufficient crushing. In sampling ore in place we can never get too many samplings. On the same line of reasoning our individual samplings should not be too small. With very evenly valued, disseminated ore small samples may be all right, but the more the ore is spotty the larger should be the sample and also the more frequent.

Increasing the size of the sample is only to be used as an added guard. Many seem to think that the large sample in itself carries the evidence of impartiality.

It is probably the reverse. The large sample may suffer from partiality of method through an excess of the more easily broken part of the ore, or from partiality of motive from being taken by blasting from a richer (or poorer) part of the ore body. There may easily be specimen car loads as well as hand specimens. *Frequency of sampling is of much greater importance than increase in the size of the sample.*

In conclusion, there is no royal road to the sampling of ore in place, as there is no mechanical road. Impartiality of motive and of method are the first essentials, but to these must be added all the human attributes included in experience, skill and care, and to all this must be added frequency of sampling to appease the Goddess of Chance. The one exception to this, the only approach to the mechanical and the fool-proof, is to sample by suitable halving methods all the muck as it comes from each round blasted in shaft or tunnel or cross-cut.

THE AMENDMENT TO THE CRIMINAL CODE.

Following is the text of recent amendment to the Criminal Code. It relates to ore-stealing:—

AN ACT TO AMEND THE CRIMINAL CODE.

(Assented to 4th May, 1910.)

His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. The Criminal Code, chapter 146 of the Revised Statutes, 1906, is amended by inserting the following section immediately after section 424:—

"424a. Everyone is guilty of an indictable offence and liable to two years' imprisonment who, having in his possession, or upon his premises, with his knowledge, any rock, ore, mineral, stone, or quartz of a value of not less than twenty-five cents per pound, or in the case of mica of a value not less than seven cents per pound, or any partly melted, partly treated or partly manufactured gold or silver which there is reasonable ground to suspect has been dealt with contrary to the provisions of paragraph (b) or (c) of section 424, is unable or refuses to account satisfactorily for or prove his right to the possession of the same.

"2. If in any proceeding under this section any question arises as to the value of any rock, ore, mineral, stone or quartz, the judge, magistrate, justice or other officer before whom the proceeding is pending may order such assay or assays, test or tests, to be made as may be deemed requisite for determining such value.

"3. No action or prosecution for a violation of this section shall be commenced or undertaken in any part of Canada unless or until an order has been passed by the Governor in Council declaring this section to be in force in such part of Canada. Any such order may be amended, revoked or renewed from time to time in whole or in part by any subsequent order in council.

"4. No prosecution shall be had under this section unless it had been initiated on the information or complaint of a manager or director of a mining company or on the information or complaint of some one thereunto authorized by a mining company or a manager or director thereof, or by or with the authority of the attorney-general of the province in which the offence is alleged to have been committed, or by the owner or part owner of a mine who deposes under oath that he believes that rock, ore, or other substance similar to some of those mentioned in this section has been stolen or wrongfully taken from the mine."

The use of steel square timber sets is estimated to reduce the timber cost per ton of coal mined in certain anthracite regions from 7.7 cents to 5.7 cents per ton.

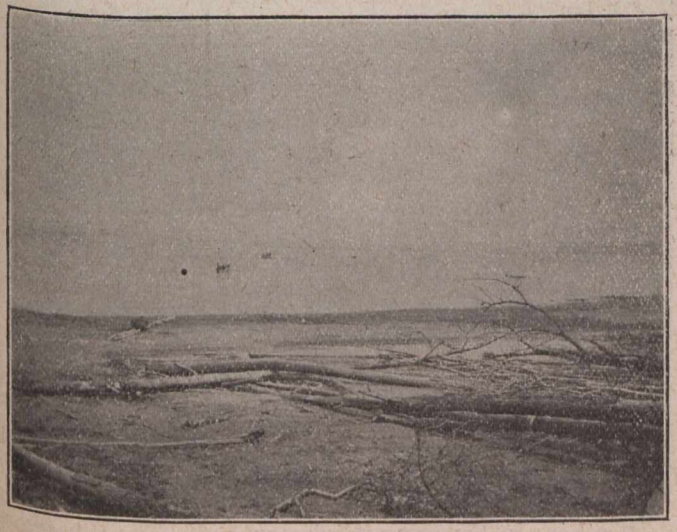
THE PORCUPINE GOLD AREA.

By W. E. H. Carter.

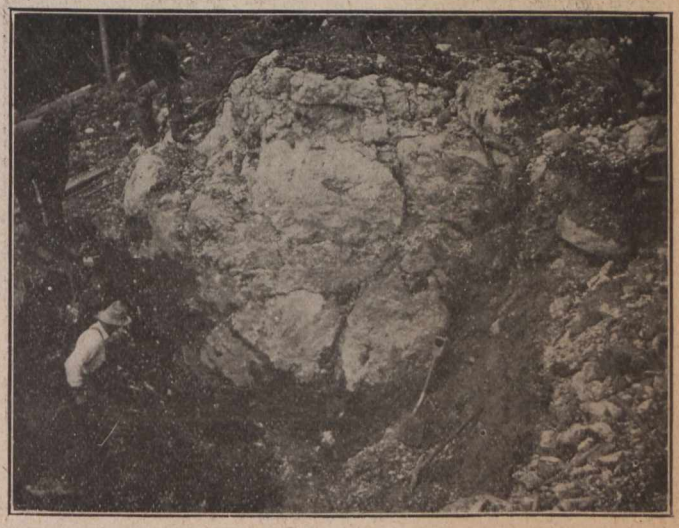
Having heard many favourable reports of this recently-opened-up district the writer determined to see for himself what the new discoveries of gold amounted to. The trip was made about the middle of May and nearly two weeks were spent in looking over the properties on which the most important finds to date had been made. I am glad to be able to say that the showings of gold-bearing quartz on some of these properties justify the earlier information given out, and promise to develop into important paying mines.

Crossing Bar at Mouth of Frederickhouse River.

Shuniah Hotel, Pottsville.



Crossing Frederickhouse Lake.



Vein on Dome.

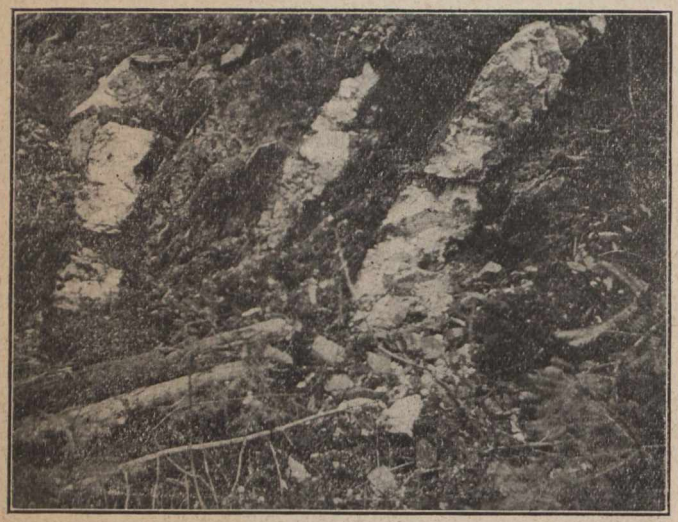
Several articles have already appeared in the Canadian Mining Journal on this new mining camp, which give some information of the geology of the area and the veins, the topography and general character of the surface, and also of the routes by which access is gained, so that there is little left to note in these connections.

With regard to the geology it is of interest to know that Dr. W. G. Miller, Provincial Geologist, is now on the spot with three parties, all of them actively engaged gathering data for a geological map of the townships of Whitney and Tisdale, in which the most important finds of gold have been made, and of probably a portion of the country adjacent round about these. It is hoped to have this information ready for distribution before the first of August, and it will be of value in clearing up much of surmise as to character and relation of the rocks and veins of the area.

In hilly, rocky countries the casual traveller or prospector might easily form some correct conclusions for himself, but not so here where the surface of the land is flat and for the most part covered with clay and sand with a top dressing of wet swamp and dense spruce forest. The rock exposures throughout are widely scattered and then usually only low ridges of quite limited area well covered with moss and timber.

When the first general survey of this country was made by the writer for the Provincial Bureau of Mines in 1898, exploration was confined to the rivers and lakes and the country for a mile or so back therefrom

on either side, from the height of land at Night Hawk Lake and Porcupine Lake to tide-water at James Bay and, although all these creeks and lakes that are now the scene of mining activity were then surveyed and mapped, so few rocks were observed (all apparently of Huronian Age) that the whole area from this point north for a good many miles, was considered as belonging to that geological period. With the present more detailed examination by prospecting, it appears that while there are large areas of Huronian in the shape of dark greywacke schist, the Keewatin green schists are



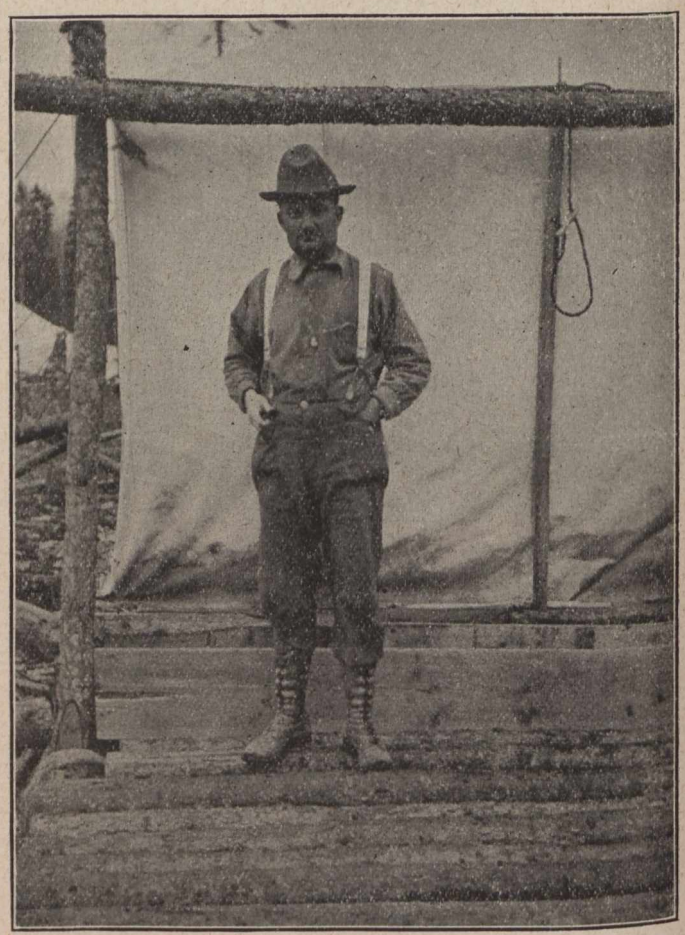
Vein on one of the Dome Claims.

Typical Outcrop on low wet Ground.

also well represented. These two appear the most frequently and contain the present important veins. Other reported rocks consist of quartzites, some basic eruptives and conglomerate.

The veins are lenticular in character and irregular in width. In one case the quartz covers an area of approximately 100 feet by 100 feet, with some country rock intermixed, but this is exceptionally large. Most of them range from 5 to 10 feet, with occasional still greater expansions. The few that have been stripped for any length maintain, generally, a uniform strike for that distance, over 500 feet in one case and 300 feet in many others. There does not appear to be any one favoured direction nor do they necessarily run with the formation.

The veins are of solid white and, in a few cases, blue quartz and are ideally free milling. The quartz itself contains only a very small proportion of metallic sulphides, probably under 1 per cent. and that mainly iron pyrites, but also specks of galena, blende and chalcopyrite. It is tough to drill, but crushes readily. The walls close to the vein and also the inclusions of the same country rock in the quartz between the walls are on the other hand very highly mineralized with iron pyrites in crystal form, and as much of this will have to be milled with the quartz, the percentage of sulphides will be thereby somewhat increased. No weathering and oxidation has taken place beyond a few inches to a foot below the surface in the veins.

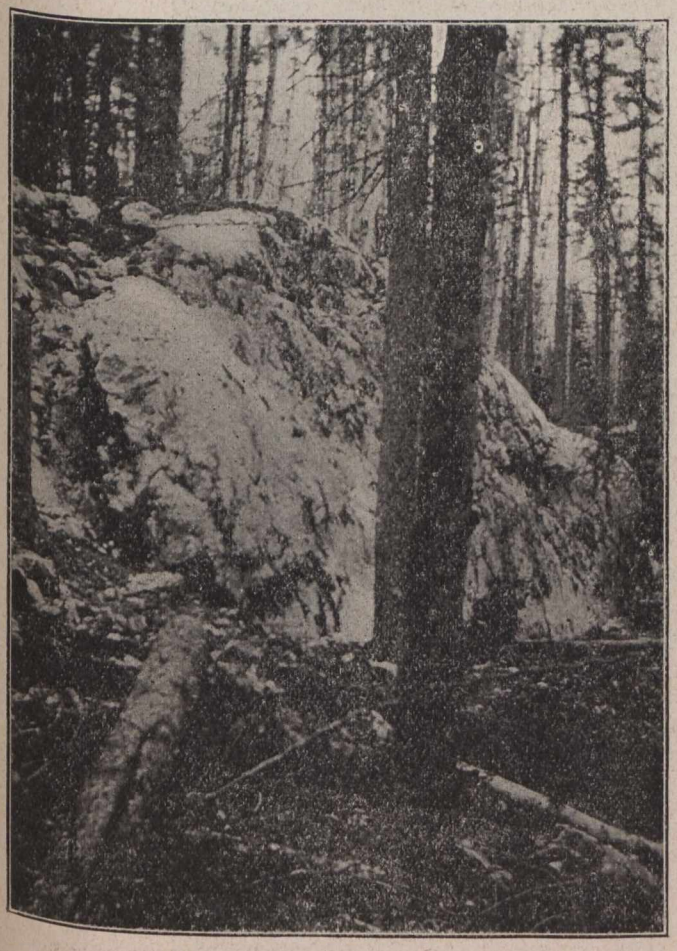


Wilson, Discoverer of the Dome.

The first important discovery of gold is said to have been made in the southern portion of the township of Tisdale on the Wilson-Edwards claims, or, as they are now called, the Dome Mines. This was quickly followed by others in the same neighbourhood. The time was about the middle of last summer, and the rush of prospectors which followed has resulted since in the complete staking of the country for a number of miles in every direction. These same pioneers are now migrating still farther west beyond the Mattagami River, which lies a short distance to the west of Tisdale Township. Naturally, considering the distance from source of supplies and the long winter, but little development work has been as yet accomplished on any of the claims, and not until the end of the summer or later, with active stripping and other mining operations, will it be possible to form an idea of the extent of the pay ore

area in the countless claims outlying the best finds of to-day.

The most striking feature of the field is the great number of quartz veins being found. Almost every day during the spring months new ones were uncovered, not only on hitherto untouched claims, but on those under active development, where already many had been laid bare. One wonders where it will end. Ordinarily such a condition of affairs causes fear that the gold will be found too widely distributed in small quantities and, consequently, insufficiently concentrated in any one vein or group of veins to produce pay ore. Such has been the history of more than one gold-bearing field in Ontario.



Another View of Outcrop on Timmins' Claims.

Trenching in Swampy Country. (Foley-O'Brien lease.)

However, this time there appears little doubt that the exception has been found. There is a group of claims near the southwest corner of Tisdale township which probably hold the record in the camp for number of veins at short distances apart, and in every one of them gold can readily be seen in many places. Knowing the gold areas of Ontario so well, where it has been typical to find large scattered nuggets of gold, and then through the remainder of the vein practically nothing, it was of particular interest to be unable to find, here or anywhere in the camp, such specimens. On the contrary the gold is finely disseminated, even in the richest samples. This is the most encouraging feature of the veins, for it indicates the likelihood of a better distribution of values throughout the quartz in those places where none can be seen.

Doubtless there will be pay shoots and barren portions in the best of the veins. This remains to be determined in the course of development by systematic sampling and assaying, little of which had as yet been undertaken.

On this particular group of claims a shaft was being sunk, then 60 feet deep, across the whole width of about 15 feet of the vein. Judging from the dump rock therefrom the quartz is remarkably rich, possibly $200 per ton for the whole dump. Say, however, that it only averages $100 per ton, the three hundred tons or so now in the pile represent $30,000. If this can be repeated for even a short distance of vein at the same depth the values mount up into extraordinary figures. Adding to this the fact that there are, with almost no exploratory work done, a dozen or more quartz outcroppings on various other parts of the property, some of which have equally good surface showings, one may arrive at some conception of the possibilities. The veins were never less than 2 or 3 feet wide, and from that up to 15 and 20 feet, roughly averaging, as then uncovered, probably 6 to 8 feet wide.

Without as yet actually knowing the gold content of these several veins it is not likely that as mined they will average any such figure as that of the ore from the above mentioned shaft. But with such apparent quantity a much less average value per ton will suffice to make of them a most profitable mine.

There are several other properties, usually in each case a group of claims on which it has not been so easy to strip the surface and, therefore, less is known about them as yet. Much the same conditions prevail on all

of these, however, as regards number of veins, but as to the quantity of gold they contain not so much is as yet known.

From what was seen it is not too much to expect that the area will produce several paying gold properties, one of which, at least, will be remarkable for the amount of gold taken out.

These better properties have not been acquired by the present owners, or optionees, for a song. Far from it. Prices paid were abnormally high. In almost any other field they would be considered not only prohibitive, but absurd. Most of the claims with showings of auriferous quartz not yet sold are held at such high prices (considering that practically nothing in the way of prospecting and development has been done on them) that investors have held back and will no doubt continue to do so until they can see a chance for their money.

Vein on Porcupine Gold Mining Company's Property. (Flynn's Option.)

The best showings to date are confined to the southern half of the township of Tisdale with an extension into the northeast quarter. There were reports of finds of gold in the outlying areas, but no work of account had been done on them.

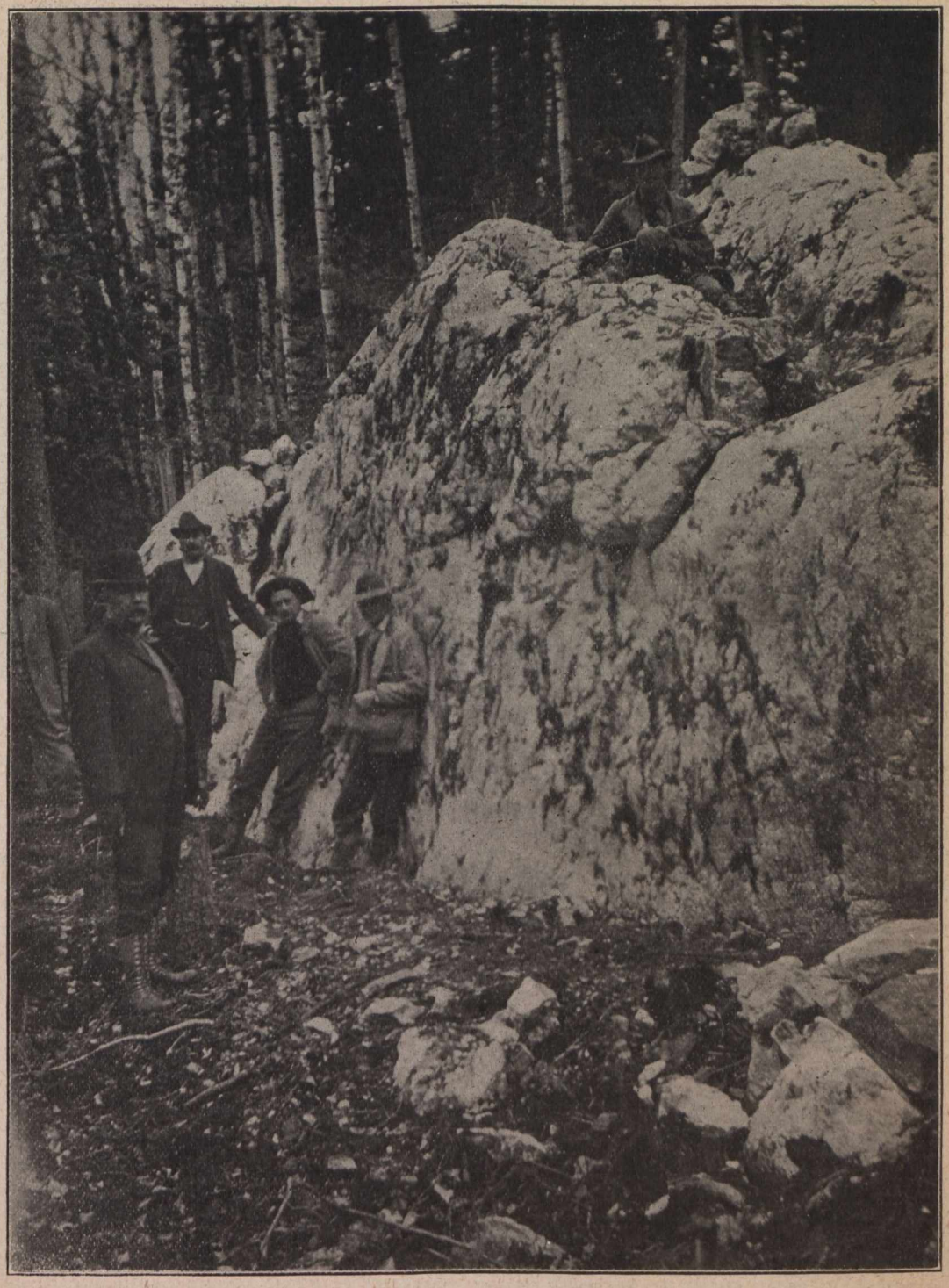
In justification of the high price the prospector or other owner asks a comparatively small sum down with

time to work, but the latter is generally insufficient. It is difficult to get in supplies and men and requires more time and money for this rush development than in more accessible regions.

The high prices paid in the silver camps to the south have without doubt upset all idea of reasonable values and terms. As a result the public have stood away to a serious extent. This fact the claim owners have not as yet realized. They may too late. It is better to make sure of a reasonable sum, particularly when the buyer is expected to make all the discoveries and assume all the chances, than to hold out for a fortune and lose all.

The difficulty of access to it has kept many possible investors from visiting the camp, and for the same reason the public has not yet realized its importance. On the whole this is not a bad condition. The trip to-day is very hard for one not accustomed to the bush, as he must walk more than twenty miles, half of which is through swampy country on a winter road. If the rumoured line of transportation in from Bisco on the C. P. R. via the Mattagami River materializes as outlined, one will be able to reach the camp by steamers and over portages by automobile. It would be well worth the trip to enjoy the scenery along this route.

The present route is from Kelso on the T. & N. O. Railway, past Frederickhouse Lake and Night Hawk



An Outcrop on Timmins' Claims.

Lake, about twenty miles of walking and fifteen by gasoline launch. The trip is made in a day, with arrangements for the passenger already well organized. Not so, however, for freight, which it is very difficult to get in at all, and then at a cost of $6.00 per hundred from steel to Porcupine. Some improvement in this may, however, be expected as the summer progresses.

camps to the south. Miners receive $2.75 to $3.00 per day, with 25 cents per day added for shaft work; helpers about 25 cents less, and surface men $2.50, all clear. The demand was greater than the supply at the time of my visit, particularly for foreign labour which is the most suitable for trenching operations.

A kind of telephone line has been strung on trees

Timmins' Shaft. Outcrop on extreme left looks like Dump.

Towards the end of May there were about 500 men at work for the larger outfits. In addition probably half that number were scattered throughout the area doing assessment work. Prospectors were arriving in considerable numbers every day, the majority travelling to newer fields in the neighbourhood of the Mattagami River and west.

Higher wages are paid here than in the more settled

from Matheson in to Porcupine and continues to a few of the mines. Occasionally it gets out of order, but messages may be sent right through with a fair certainty of their arriving without much delay.

A bi-weekly mail service takes letters only, but an improvement is expected shortly whereby all classes of mail will be carried more regularly and more frequently.

OUR EUROPEAN LETTER.

RUBBER AND OIL DISTRACT INVESTORS' ATTENTION FROM MINES. THE TROUBLES OF MAIKOP. NEW TRINIDAD AND CANADIAN OIL FLOTATIONS IN LONDON. THE CUMBERLAND MINING DISASTER. COAL DUST EXPLOSIONS AND IGNITION BY ELECTRIC FLASHES. EARTHED VERSUS INSULATED NEUTRALS IN COLLIERY INSTALLATIONS. SOUTH WALES COLLIERIES UNITING. BIG ENGLISH TIN MINE SHAFT. PURE AIR FOR RAND WORKERS.

Exclusive correspondence to the "Canadian Mining Journal.

London, May 18th, 1910.

Mining shares on the London Stock Exchange continue to rank as second favourites to rubber and oil. Despite this reports from the mining fields speak of progress almost everywhere. The Rand, helped by increasing labour supplies, has maintained its phenomenal prosperity. One giant company, for example, Rand Mines, has paid its shareholders a total dividend of 350 per cent. for last year. Many new stamps are to start crushing during the next few months. Sensational discoveries of great promise continue to be made in Rhodesia. In West Africa developments are favourable in the extreme, and there are very far from being any signs of waning prosperity in Australia.

Still the attention of the investor is for the moment given elsewhere although in connection with the Maikop oilfield the market shows some signs of suffering from the absence of any definite news of an encouraging character. Six months ago a spouter was tapped, which gave out such a quantity of oil that it became

necessary to stop the flow in order to prevent the surrounding area from being devastated. Even as it was, the rivers in the district were polluted and a large quantity of fish destroyed.

The present difficulty is not to discover other similar deposits but to avoid any step which would bring about a repetition of last year's experience. In other words, a good many spouters could be tapped at very short notice if required, but preparations for storing the oil are not yet complete.

The damage wrought by the spouter already referred to, was a very serious matter for the owners, as the Russian Government came down upon them for compensation, and I understand that the original proprietors of the property were ruined as a consequence. It may be taken, therefore, that the absence of any news regarding further discoveries of oil is due not to the inability of the officials at Maikop to announce further discoveries, but is attributable to the necessity of first of all installing a sufficient storage plant to cope with the supply.

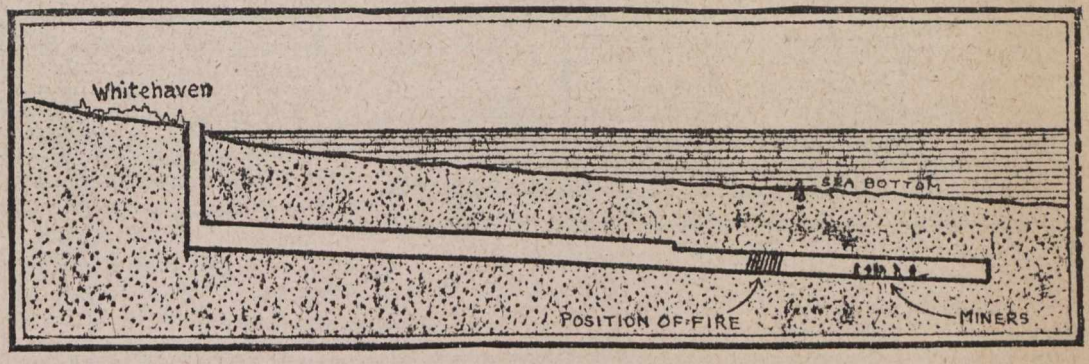
At present the only storage accommodation afforded those companies which have already tapped spouters, is that of the ambaars, or uncovered pits. Now, under Russian mining law, the storage of large quantities of oil in this way is absolutely illegal. Thus, pending the completion of iron reservoirs—the only comparatively safe means of storing oil—the companies which have achieved the preliminary success of finding oil are compelled to keep their wells capped. For the present actual production is limited to one company—the Black Sea Oilfields, which is getting all the oil it requires for the purposes of its local refinery from a small 2-inch pipe tapping No. 2 well, which is, of course, capped.

Meanwhile, it must not be assumed that work at Maikop is at a standstill. Boring operations are proceeding at an energetic pace, and I understand that by the end of the year the number of wells on the field will be not less than eighty. By that time, if not before, the establishment of iron reservoirs will be well advanced, and the first pipe line—that connecting the field with the railway which communicates with Touapse Port, will be laid. Thus, within, say, another nine months, Maikop should have begun to settle down in earnest as a big oil-producing district, and for geographical reasons, if for no other, it is not unlikely to beat Baku as an exporter, though the older field will still, probably, remain the chief supplier of oil to the native consumer.

As regards the Trinidad field, a district to which several recent flotations have directed attention, documents exist which appear to indicate that the deposits are of exceptional value as regards both quantity and quality. The oil is of several grades—that is to say, there is a large deposit suitable for fuel purposes and others of lighter quality. Some of the largest oil consumers in the world are making business arrangements in connection with the Trinidad field, and the outlook for companies operating or about to operate in this district is regarded with every confidence by those concerned. The present set-back in the share market is not taken seriously, but merely as a temporary matter, attributable to the excessive activity recently noticeable, and a recovery is anticipated before very long. Several important propositions have still to make their appearance, and may be expected during the next few weeks.

Canada also has made her appearance with several oil companies, the biggest being the Canadian Oil Producing & Refining Company, which has a total authorized capital of $625,000, and has been formed to acquire oil lands at Petrolia, Ontario, and elsewhere. It has emphasized its claims as "an oil-producing company with ample plant in the British colony—a growing concern."

Although the Cumberland mining disaster was probably due to another cause, it has revived discussion of the subject of coal-dust explosions in mines. It may, therefore, be useful to draw attention to certain facts relating to such explosions. In the first place, the dust must be raised into a cloud before it will explode; when in bulk it is not dangerous. A blown-out shot will, of course, do this, and no doubt under certain conditions the exhaust from air-drills or other mechanical disturbance would be sufficient to stir up a dangerous cloud, and in any case the advance wave preceding the flame of an explosion will stir the dust up. Once stirred up it can be directly ignited by an ordinary naked light as well as by the flame from an explosive.



Also there is good reason to believe that it is possible, although not generally likely, for the dust to be fired by the momentary rise in temperature caused by the passing of an intense sound-wave such as that from a shot. No stone-dust zone would form a barrier against this last. As regards the suppression of coal-dust explosions, isolating with stone-dust is most strongly favoured at present. Watering is perhaps the simplest method, but, apart from health considerations, it is liable in some ground to increase the risks of falls of roof, and these kill eight times as many as coal-dust and gas explosions together. The efficacy of stone-dust isolation seems fairly proved, provided the conditions are right, for it must be remembered that the explosion flame from a coal-dust zone can be projected several hundred feet into the stone-dust zone. In any case isolation only restricts the magnitude of the explosion and does not ensure that those outside the explosion zone shall not be cut off from safety, as at Whitehaven.

A paper by Dr. Thornton and Mr. Bowden on the ignition of coal-dust by electric flashes was read at

Newcastle recently, which is interesting at the present time in view of the fears expressed as to the safety of electricity in coal mines. The experiments showed that dry coal dust in bulk was a non-conductor of electricity, but that when made into a paste with water it was liable to cause a short-circuiting flash if placed between electrodes. If a flash was produced—as by opening a switch—in a cloud of dust an explosion was produced. The character of the dust-cloud and the strength and voltage of the current broken affected the readiness with which the dust ignited, and at medium voltages direct current appeared to be more dangerous than alternating.

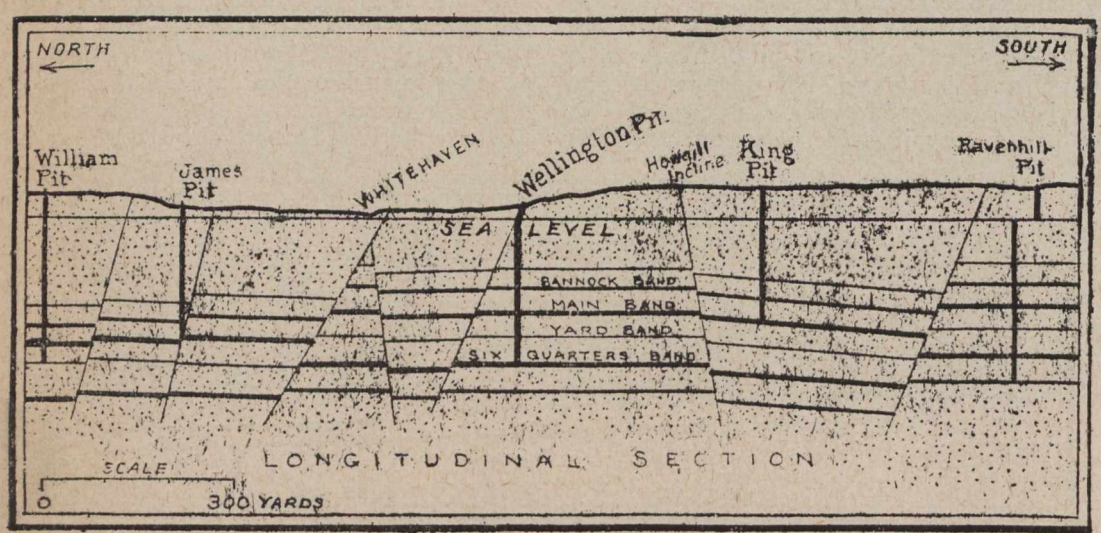
In view of the conclusive experiments on coal-dust explosions produced by the discharge of a cannon, as carried out at Altofts, the results obtained by Messrs. Thornton and Bowden were to be expected. It would, however, be unwise to jump to the conclusion that electricity in mines is a very dangerous thing. It is all a question of the immediate local conditions, and these are rarely such as to encourage an explosion of coal-dust. Indeed, it has been stated that no serious explosion has been produced electrically, and certainly the danger from shock has been much more in evidence. Of course, it is desirable to sift the whole question thoroughly with a view to safety, but the use of electricity in mines promises to do so much to improve conditions for the miners themselves, and also to effect economies in working, that it would be regrettable if ill-considered restrictive regulations were introduced.

Great interest has been aroused by the paper read by Wellesley Wood on "Earthed versus Insulated Neutrals in Colliery Installations." Mr. Wood disclaimed any sympathy with the present scare in regard to the use of electricity in mines, but urged the necessity of considering how accidents could and might occur. He said that the number that actually did occur was extraordinarily small considering the present widespread use of electricity and the insufficient electrical staff employed in many collieries.

His lecture was mainly upon the question whether a three-phase colliery installation should work with an earthed or with an insulated neutral. Not only are there a number of supporters of both systems, but there are also a number of long standing examples of each system at work both on high and medium pressures and with current taken in some cases from a supply company, and in others from their own generating plant.

He summarized the advantages of earthed insulators as follows: (1) Maximum potential to earth of any phase limited to 58 per cent. of line voltage; (2) leakage to earth probably resulted in isolation of the damaged circuit; (3) leakage tripping devices could be used, which switched off the supply when an earth occurred on one phase, reducing danger of shock and explosion. The advantages of the insulated neutral were: (1) Danger of shock and explosion was reduced, as contact with earth and one phase did not complete the circuit; (2) an earth on one phase did not cause an interruption of supply; (3) stress on insulation under normal circumstances was less, and the liability of flashing to metallic casings was considerably reduced; (4) only two-strip coils instead of three, were required to protect each circuit where an automatic switch was installed.

South Wales colliery shares have been strengthening lately and it is generally anticipated that 1910 will show better results than 1909. Numerous rumours are afloat respecting amalgamations of various Welsh coal undertakings. One absorption scheme which has gone through will leave the combined undertaking able to produce about one million tons of coal per annum.



England's famous tin mine—the Dolcoath—has now its new shaft completed. This is 3,000 feet deep, vertical from the surface, is lined throughout its entire length with 9-inch brick, and is 17 feet 9 inches in diameter, inside measurements. It is the finest piece of work of its kind in the west of England.

Pure and invigorating air supply to workers has now become a practically accepted condition of Rand mining. The excellent installation of the East Rand Proprietary Mines has been followed by the adoption of fans at the Cinderella Deep and Village Deep properties. At the Cinderella Deep a Capell fan, an appliance which, among others of various makes, has been known for years in England, was erected during the past year. It has a discharge capacity of 50,000 feet of air per minute, and was adapted to the existing scheme of ventilation by natural means. Since the installation of the artificial ventilation the temperature in the mine has appreciably fallen, and the atmosphere is probably purer than in the case of nine out of every ten outcrop mines along the reef.

The efficiency of both white and native underground employees is said to be exceptionally high, thus indubitably proving that the depth of the mine has no effect on the ability of the men to get through a normal amount of work without undue exertion. Mr. Girdler-Brown, the manager, has, in view of his surroundings, made a particular study of the question of the possibilities of deep level mining, especially since the installation of the ventilating fan, and he is absolutely confident that the probable limit which was put forward a year or two ago, of about 7,000 feet vertical depth, for practicable mining operations, is a good deal short of the mark, and that, with the addition of subsidiary ventilation fans at lower depths, it will be possible to pursue mining operations without abnormal difficulty at a vertical depth of at least 10,000 feet.

RESCUE APPARATUS IN COAL MINES.

(Reprinted from the Weekly Times, Engineering Supplement, May 27th.)

The recent terrible colliery accident at Whitehaven, causing the loss of 136 lives, has drawn attention to the tardy recognition of the necessity for providing breathing apparatus immediately available for rescue work. On this occasion a delay of 30 hours occurred before the arrival of rescue apparatus, and there is reason to believe that, had this been at once available, the fire which followed the explosion might have been reached and extinguished, and many lives saved. It is true that except with a recollection of the fact that the employment of breathing apparatus with a view of saving life after colliery disasters has been hampered by the constantly recurring element of delay, the record of its success up to the present can hardly be looked upon as encouraging. It is manifest, however, that the system has not, on this account, received as yet a fair trial. The success of a rescue party, like that of a fire brigade, depends upon the speed with which the apparatus can be brought to bear upon its object, and the Whitehaven disaster will not have been all of evil if it has the result of converting colliery owners generally to the view that, to be of service, there must be a rescue station within easy reach of, and trained men at, each colliery.

The first report, issued on May 30, 1907, of the Royal Commission on Mines, which was appointed in 1906, dealt exclusively with breathing appliances, and the Commissioners stated that, after fully considering the results of experience in this country and abroad, they were of opinion that the question was ripe for further development, and demanded the serious attention of the industry, though they came to the conclusion that sufficient advance had not up to that time been made in Great Britain to justify a recommendation making the provision of breathing appliances compulsory. Mine owners were, however, urged to take steps toward their introduction.

In their second report, issued in July, 1909, the Commissioners became more emphatic. They said: "We have come to the conclusion that the provision and use of breathing apparatus should be general throughout the country and that every mine should either be provided with a properly trained brigade of its own, which appears to us the best arrangement, or have the right to call for a sufficient number of equipped and trained men from a rescue station." But in spite of this expression of opinion the question is still left entirely to the industry, the State neither requiring the provision of rescue apparatus nor facilitating its introduction at the mines. Still a certain amount has been done. Three central rescue stations have been organized and equipped in Yorkshire at Altofts, Tankersley, and Wath-on-Dearne respectively; one has been provided in Lancashire at Atherton, and one at Newcastle-on-Tyne in connection with Messrs. Armstrong, Whitworth & Company's Elswick works, available for Northumberland and Durham. A scheme has been projected in South Wales to embrace 13 stations, one of which has been erected at Aberaman and another at Crumlin; a central station is to be erected at Cowdenbeath for the Fifeshire and Clackmannan coalfields; and a central station is being organized in conjunction with the experimental mine at Birmingham University. The expenses of these stations are borne entirely by the coal owners, without any assistance from the State. The Home Office, however, has arranged for a conference with colliery owners next month, with the object of seeing how ambulance work and rescue appliances can be improved and systematized.

That greater progress has been made in some foreign countries is indicated by a summary of the situation by Mr. Henry Briggs, which appears in the "Colliery Managers' Pocket-book" for 1910, and gives particulars of the attitude assumed by the various Governments in regard to the provision of breathing apparatus.

In the United States of America it appears that the subject has been taken up, officially by the Mine Accidents Division of the Technology Branch of the United States Geological Survey, four stations having been erected, while nine others are contemplated, and privately by large corporations, as the Frick Coke Company and others. Compulsory legislation is in the hands of the individual States, but no general movement towards it appears to have been made. In Canada no compulsory legislation has been passed. The Dominion Coal Company has established a large and successful station.

In Germany the utility of breathing appliances is widely recognized. In the Dortmund district over 690 and in the Breslau district 673 sets were ready for use at the beginning of 1908. In the inspection district of Breslau, Upper Silesia, by a regulation dated January 18, 1900, at least two apparatus must be provided for every mine working true coal or lignite, the Government engineer being empowered to order an increase in the number if need be, while the managements of the mines are made responsible for the upkeep of the apparatus, and are also obliged to see that a sufficient number (not specified) of trained miners are always available to use it. In the inspection district of Bonn, Saarbrucken, and Aix-la-Chapelle, by a regulation dated May 1, 1907, two apparatus have to be provided for every mine working, and must be kept at the mine, or at a station from which they are quickly available; while the managements are again held responsible for their upkeep. In Alsace-Lorraine similar instructions were issued in May, 1905. In the Kingdom of Saxony, by a regulation made in January, 1901, breathing apparatus and electric lamps (no number specified) must be kept at all collieries. Several neighbouring mines may affiliate, under the approval of the administration, to form a central station wherein to keep the apparatus.

In Austria, the regulations, made in June, 1908, for the Brux district of Bohemia, require respiratory apparatus to be provided at every mine, and to be kept in good order in a depot in the immediate vicinity of the pits. Only the Draeger, Meyer (Westphalia), Giersberg (new type), and Pneumatogen apparatus are permitted, though apparatus of new design, or improvements on old designs, can be used on authorization being obtained from the head mining office of the district (Berghauptmann-

schaft.) Permitted apparatus are divided into two classes. Those of Class I. must allow of work being accomplished with them for a period of one and a half hours; those of Class II. for at least one hour. Precise regulations are issued fixing the number of apparatus and accessories which must be maintained in working order in different classes of mines and also detailing the equipment of the rescue stations and the organization of the men who are to use the appliances.

In France, since April, 1907, it is obligatory to provide breathing apparatus at all mines which employ more than 100 persons underground in the largest shift. In gassy mines which are in connection with a central rescue station the number of appliances at each mine may be reduced to two; otherwise the number must be at least two for the first 200 underground workmen on the largest shift, plus one for every 200 men above the first 200. No mine, however, is required to keep more than six appliances. In each non-gassy mine two apparatus have to be provided. The number of appliances at a central station is determined on the same system, having regard to the largest pit of the group, providing that there be not less than one apparatus per 1,000 underground workmen in all the affiliated mines; but no station need contain more than 20 sets. The central station must be able to furnish at least ten trained rescuers, or as many rescuers as there are apparatus in the station. The apparatus at the mines must be kept in depots within easy reach, and under the charge of authorized persons; and the number of trained rescuers in connection with each depot must be at least double that of the apparatus kept there, and must never be less than eight. They should be distributed as equally as possible among the shifts, and live as near as possible to the mine, and at least one-quarter of all underground employees should b eable to use breathing apparatus to assist the trained rescuers.

In Belgium, since June, 1908, rescue depots have to be provided at all collieries classed in the second or third class of fiery mines, the number of appliances in each depot being one for every 200 underground emplooyes, providing there are not fewer than five appliances at a depot; but there is no need to provide more than ten at any mine. The apparatus must allow of the wearer stopping at least one and a half hours in an irrespirable atmosphere. Each depot must be provided with the stores necessary to ensure the possibility of keeping all the apparatus therein at work for at least 48 hours. At least four workmen must be trained as rescuers for every apparatus provided, these men to be distributed among the shifts, to live near the mine, and to exercise periodically. The Ministry may authorize the formation of a central rescue station for neighbouring mines. The number of apparatus at such a station must be one for every 200 underground workmen at the affiliated mines, but must never be less than ten, though it never need be more than twenty.

In Holland the number of apparatus to be provided at a mine must be at least 2 per cent. of the number of men in the largest underground shift; 50 per cent. of these apparatus must be of the "diving helmet" type, air being blown in through a tube. The number of trained rescuers is left to the discretion of the owners.

In Russia since March, 1907, a rescue corps has to be provided at every colliery. In every mine affiliated with a central rescue organization the number of rescuers must be at least 4 per cent. of the largest shift. For every four trained rescuers there must be at least one breathing apparatus and one electric lamp, but at each mine there must not be fewer than three complete apparatus. In mines not affiliated with a central station the number of rescuers comprising a corps is determined in the same way, providing that there are not less than six such men. For every three members at least two breathing apparatus and two electric lamps must be provided. At mines in which there are fewer than 50 men at work the corps may consist of only three men with two apparatus and lamps, providing, first, that the inspector's approval is obtained, and, secondly, that such a mine is within 5,250 feet of a mine having a normal sized corps, if connected by telephone, or within 3,500 feet, if not so connected.

SAFETY CHAMBERS IN FRENCH MINES.

The use of safety chambers is not very common in French mines. Such chambers consist of galleries, generally "blind," the entrances of which are provided with an air lock and in which is stored compressed air at such a pressure as to prevent the inflow of deleterious gases.

The value of such chambers has just been practically proved by the Compagnie des Charbonnages of Singles, in the centre of France, whose experience seems likely to commend their adoption to other companies which up to the present have been holding back. The works at Singles consist of a main shaft 288 metres deep, from the bottom of which runs a cross gallery 388 metres long. About two-thirds of the distance along this gallery a secondary shaft has been sunk to 312 metres. The sinking was effected by compressed air, and as the working contained firedamp safety explosives were employed. The safety chamber was placed at the end of the cross gallery. Recently, as a result of firing a number of shots in the mine, there was rapid and extensive liberation of carbonic acid, sufficient to fill the two shafts and the gallery. During the time the shots were being fired, the men were ordered to shut themselves up in the safety chamber. Five of them, who did not obey the order, were suffocated by the gas and could not be saved, but the others, who did take refuge in the chamber, remained safe and sound.

Such chambers are of value in all mines which are subject to sudden outbursts of irrespirable gases, and it may be presumed that, in consequence of this accident at Singles and of the report of the Government inspector, their employment will become more frequent in French mines.

The petroliferous areas of Newfoundland are attracting much attention. A company, the Newfoundland Oil (Parent) Development Syndicate, Limited, has been formed in London, Eng., to acquire and exploit claims aggregating 119,680 acres in extent. The Government of Newfoundland has more or less pledged itself to exempt such enterprises from payment of import duties on all necessary plant, material, and machinery.

Within the last ten years considerable prospecting has been done in the Silurian schists on the northwest coast. At Parson's Pond oil was struck at 1,200 feet and at 2,160 feet. A considerable quantity was shipped to St. John's. Fuller details will be found in the CANADIAN MINING JOURNAL for September 15, 1909.

The only available records of shipments of molybdenite from Canada date back to 1902 and 1903. In the former year Mr. John Webber, of Toronto, shipped 6,500 pounds of ore from the township of Laxton, Victoria County, Ont.; and in 1903 Mr. A. Chisholm shipped from Sheffield Township, Addington County, about 85 tons of ore.

PROGRAMME OF THE MINES BRANCH.

The work of the Mines Branch of the Department of Mines for the ensuing season has been arranged as follows:—

The fuel testing plant in Ottawa is to be operated, under the direction of Mr. B. F. Haanel, for the purpose of experimentation and demonstration. A second producer, suitable for lignite and bituminous coal, is to be installed at the plant.

The Government peat bog at Alfred is to be operated for a period of about three months to demonstrate the latest process of manufacturing air dried peat. Several thousand tons will be produced during the present season. Part of the peat fuel produced will be shipped to Ottawa for use in the peat-gas producer plant now installed, and part will be sold in the neighbourhood for domestic use. The operation of the plant at the bog, which is open to public inspection, is under the direction of Mr. A. Anrep. The bog can easily be reached from Caledonia Springs, or from Alfred, on the Canadian Pacific Railway.

A cordial invitation is issued by the Mines Branch of the Department of Mines to all who are interested in the development of a peat fuel industry to visit the fuel testing plant in Ottawa, or the peat plant at Alfred.

The investigation of peat bogs in Canada, to ascertain their extent and to determine the quality and quantity of peat available, will be continued by Mr. A. Anrep, after the operating plant at Alfred is closed down for the season.

The iron ore deposits in the vicinity of Bathurst, N.B., will be investigated and additional magnetic surveys made by Mr. Einar Lindeman. Mr. Lindeman will also visit the magnetic sand areas on the north shore of the St. Lawrence.

The iron ore deposits of the Nictaux-Torbrook basin in Nova Scotia will be surveyed magnetically by Mr. Howells Frechette.

The investigation of the copper resources of Canada will be continued by Dr. A. W. G. Wilson. This season's work will be carried on in Ontario and in the Maritime Provinces.

Commercial processes for utilizing the sulphur content of pyrite ores are to be investigated with the object of preparing a special bulletin on the subject. Pyrite burning is of special importance at the present time with respect both to the sulphite pulp industry and to the preparation of mineral fertilizers. This work is to be undertaken by Dr. A. W. G. Wilson in the autumn.

The investigation of the molybdenum deposits of Canada will be continued by Dr. T. L. Walker for the purpose of completing and publishing a monograph on the subject.

A special report on the building and ornamental stones of Ontario is to be prepared by Dr. Wm. A. Parks. This report is to be the first of a series of monographs on the building materials of Canada.

A second edition of the monograph on mica for which there is a constant demand, is to be prepared by Mr. Hugh de Schmidt.

An ore dressing plant for experimental investigation into methods of concentrating certain iron ores, is to be installed at the testing plant in Ottawa by Mr. G. C. Mackenzie.

Plants where explosives are manufactured and stored in Canada are to be visited by Mr. Joseph G. S. Hudson.

An invitation has been issued through the Home Secretary of Great Britain to Captain A. P. H. Desborough, to visit Canada to consult with the Government with regard to the regulation of the manufacture and storage of explosives and with respect to the establishment of an explosive testing station.

Officers of the Division of Mineral Resources and Statistics will visit mining districts in various parts of the Dominion for the purpose of collecting statistics of mineral production and of securing information of general interest relating to the mining industry, including a record of new and recent developments, and data as to character of ores and products, prices, markets, and demand for various mineral products.

Mr. F. W. Harbord, London, England, is to investigate and report on recently invented processes in Europe for the production of spelter and zinc oxide.

Experts are to be engaged to investigate and experiment for the purpose of attempting to develop a process or processes for the utilization of the zinc ores of Canada in the production of zinc and zinc products in Canada.

A special expert is to be engaged to investigate metallurgical problems of economic importance. The plant of the School of Mines at Kingston has been placed at the service of the Mines Branch for this purpose.

NORTHERN QUEBEC.

The attention of prospectors is being drawn to the northern part of the Province of Quebec, adjacent to the Ontario boundary line. There are present, in this part of the province, important developments of Huronian rocks, such as those in which are found the large ore deposits of Ontario, and it is not unlikely that such finds as have been made in Cobalt, in Porcupine and in Larder Lake, may be duplicated on the Quebec side.

Realizing the importance of critically examining and mapping such areas, the Bureau of Mines of the Province of Quebec is sending a party into the country to the east of Lake Temiskaming, to map out, in great geological detail, parts of the Townships of Fabre, Duhamel and Laverlochêre. At the same time a careful examination will be made of all the workings, prospects and discoveries which have been made in the region. It is the intention to publish maps on a large scale, of one-half and one-quarter mile to the inch, which will be sufficient to show accurately the outline and the outcrops of the rocks. These maps will accompany a report which will have special bearing on the mining economies of the region.

Mr. Robert Harvie will be in charge of the party. Mr. Harvie is a mining geologist who has had several years' experience in the field, and whose training specially fits him for the work with which he has been entrusted. He is a graduate of McGill University and is at present instructor in mineralogy at Harvard University.

The rate of the growth of pig iron production in various leading countries is astounding. In the last forty years Great Britain's annual production has seen an increase of 66 per cent.; that of France has grown 147 per cent.; while the industries of Germany and of the United States have increased 740 per cent. and 830 per cent. respectively. In 1869 the order of producers was: Great Britain, United States, Germany, France.

To-day Great Britain has slipped to third place, and the present order is: United States, Germany, Great Britain, France.

Not less than 80 per cent. of the fluorspar produced is consumed in the manufacture of steel, chiefly in the basic open-hearth branch.

TOOL STEEL DIRECT FROM THE ORE IN AN ELECTRIC FURNACE.

By Alfred Stansfield, D.Sc., Montreal.

(Paper read before the Canadian Mining Institute, Annual Meeting, Toronto, 1910.)

At the Eighth Annual General Meeting of this Institute, which was held in Quebec in 1906, Mr. J. W. Evans, then of Deseronto, gave an interesting account of some laboratory experiments which he had carried out during the previous two years on the production of tool steel directly from the ore in the electric furnace.[1]

Mr. Evans had been obliged to construct with his own hands the 1 1-2 kw. electric generator he used for these experiments—thus proving his ability and determination—while he demonstrated his audacity by basing a large electric furnace industry, in the Provinces of Ontario and Quebec, upon the results of his laboratory tests in which one ounce of ore was smelted at a time to yield a button of steel.

The experiments made at that time showed (1) that from a sulphurous ore, containing 1 per cent. of sulphur, low carbon steels could be obtained having 0.05 per cent. to 0.07 per cent. of carbon and 0.08 per cent. to 0.17 per cent. of sulphur, and (2) that from a titaniferous ore containing 45 per cent. of iron and 7.6 per cent. of titanium a steel could be obtained with less than 1 per cent. of carbon and with the titanium varying from 0 to 1 per cent. The whole of the titanium could readily be removed by using enough lime in the charge, but it was desired to retain some titanium in the steel, on account of its valuable properties, and this could be done by using less lime. Lowering the amount of lime in the charge had, however, the attendant result of causing more silicon to enter the metal; the silicon ranging from 0.05 per cent. to 2.31 per cent. in the steel obtained. Some samples of electric furnace tool steel were shown which had proved satisfactory in small machine tools; they contained one-half per cent. of titanium.

The writer, at the next meeting of the Institute, criticised these experiments on the ground that so small an amount of metal might be more perfectly refined than would be possible in a larger furnace working more continuously, and showed this to be the case, experimentally, in regard to the removal of sulphur from sulphurous ores.[2]

Since the date of his paper, Mr. Evans has been enlarging his electric furnace plant and has directed his experiments mainly to the production of tool steel from magnetite ores containing titanium and traces of vanadium. The writer had the opportunity last summer of inspecting Mr. Evans' plant and assisting in his smelting operations, and considered that an account of these might be of interest to the members of the Institute, although, owing chiefly to Mr. Evans' ill-health, the data now available are by no means as full as could be desired, and this communication can only be regarded as a preliminary note.

Mr. Evans' plant, last September, consisted of a small cylindrical furnace about 18 inches high and 14 inches in diameter, having a pair of lateral electrodes and supplied with electric current at 110 volts from a transformer of about 20 kilowatts capacity. A rheostat was used to regulate the current, and it was necessary to keep the latter below 200 amperes. In general, it was only possible to utilize some 6 or 8 kilowatts in the furnace.

Figure 1 is a section of the furnace and shows the original brick lining, B, eroded by the action of the slag in the furnace, and a lining, L, rammed into the cavity before each operation of the furnace. M is the melted steel in the furnace, S the slag and C the partly reduced but unmelted charge of ore, charcoal and limestone. The electrodes, E, are 1 inch square graphite rods provided with holders for supplying the current and capable of being inclined more or less during the operation of the furnace. The openings through which the electrodes entered were closed as far as possible with an asbestos mixture, and a couple of bricks served as a cover for the furnace.

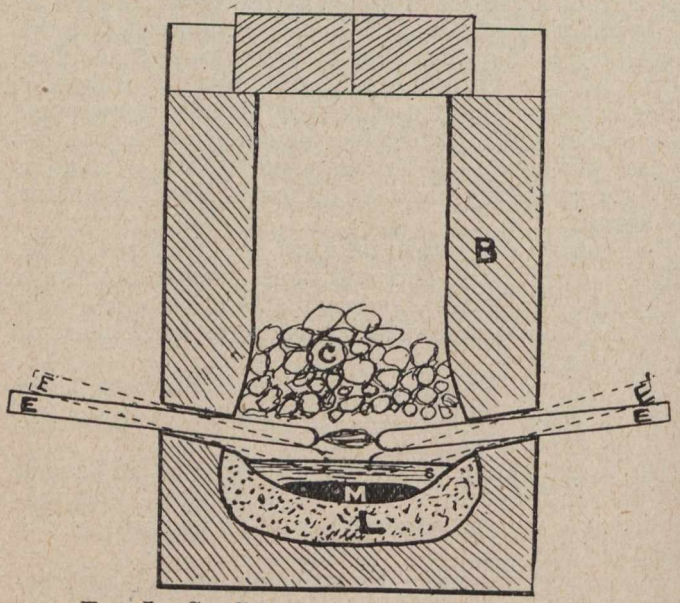


FIG. I. Small Furnace with two Electrodes.

The peculiar feature of the smelting practice in this furnace consists in the way in which the electrodes are manipulated. In the early part of each smelting run an arc is established between them, as in the Stassano furnace, and the heat of the arc is utilized for reducing the iron ore to metal and melting the metal and slag. The electrodes are shown in this position at EE. When the slag has filled up the furnace so as to immerse the ends of the electrodes, or by purposely depressing the electrodes, as shown at E, E, the arc is stopped and the current flows from one electrode to the other through the molten slag and metal. Mr. Evans found the latter method of heating to be more satisfactory and considered it essential for the refining of the steel.

The behaviour of the furnace was somewhat peculiar in this particular:—When running with the arc between the electrodes EE, the resistance was very low, so that the electrodes had to be drawn widely apart and even then a current of 200 amperes was produced with a voltage of only 30 or 40. Immediately the electrodes were dipped into the slag at E, E, and the arc broken, the resistance was increased so that 60 volts only produced a current of 100 amperes or less. This condition was unstable, and there was always the possibility of an arc

forming between the electrodes above the slag, and this would immediately cause a great increase in the current. As the immersion of the electrodes in the slag led to a heavy loss of electrodes, the attempt was made to keep them just above the slag and to maintain a short arc between each electrode and the molten slag. Owing to the high resistance of the slag, this was found to be impossible, but a later type of furnace has been found to work very satisfactorily in this way.

The ore treated was a magnetite from the Orton mine in Hastings County, Ontario, and contained:—

Iron	51.45 per cent.
Sulphur	trace
Titanium	7.50 per cent.
Nickel	0.12 per cent.
Vanadium	trace

For smelting on a small scale it was found desirable to crush the ore, the charcoal used to reduce it and the limestone used as flux. These powders were mixed together, briquetted with the aid of molasses and water and baked before smelting, a typical charge being:—

Ore	100 ounces.
Limestone	20 ounces.
Charcoal	18 ounces.
Molasses	10 ounces.
Water	16 ounces.

Starting with a hot furnace and using between 5 and 6 kilowatts, the operation would be completed within the hour and would produce about 3 pounds of steel.

The steel was tapped from the furnace without any addition of ferro manganese or other deoxidizer and always gave a perfectly sound and tough ingot. Mr. Evans has obtained in this way many ingots of steel, which have proved to be a very good quality of tool steel. Unfortunately at the time of the writer's visit the lining material had become contaminated with a little plaster of Paris, and, in consequence, the steel was found to contain over 0.10 per cent. of sulphur, which impaired its forging quality, though it made good tools. The presence of sulphur in the furnace lining was not discovered until it was too late to obtain a fresh supply. One sample of steel, from which good lathe tools were made, contained:—

Carbon	1.25 p.c.	Phosphorus	0.051 p.c.
Silicon	1.06 p.c.	Titanium	Nil
Sulphur	0.124 p.c.	Vanadium	Nil

Mr. Evans has found that the steel produced by the direct reduction of this titaniferous magnetite in the electric furnace has peculiarly valuable qualities as a tool steel. He attributes these to the titanium and perhaps also to the nickel and vanadium in the ore. Non-titaniferous magnetites, from the Rankin mine, did not yield sound steel when smelted in Mr. Evans' electric furnace.

He has submitted samples of his steel to various steel experts, obtaining very satisfactory reports, and a piece of his steel made into a lathe tool and tested at McGill was found to be decidedly better than the Firth tool steel. The tool was tested just as received from Mr. Evans. It was ground when necessary but not retempered. The tools were usually cut from the ingots—not forged—but a knife has been forged from some of this steel.

In connection with these facts it should be noted that in operating a small furnace it is not practicable to take a sample of the steel from the furnace and make a quick chemical test of it, as would be done with a larger furnace, and that, in consequence, the composition of the steel could not be adjusted in the furnace and the analysis of the resulting steel will not in general be as good as it could easily be made when working on a larger scale. It should also be noted that no ferro-manganese or other additions have been made to any of the steel obtained up to the present. It is, therefore, quite likely that when working on a larger scale, steel can be produced of even better quality than has so far been obtained, and it is certain that the steel can be obtained of practically constant composition.

At the meeting, a number of tools were shown which had been made from steel produced in the Evans furnace. Several of these tools were made from a bar of steel which analyzed:—

Carbon	0.91 p.c.	Titanium	trace
Sulphur	Nil	Vanadium	Nil

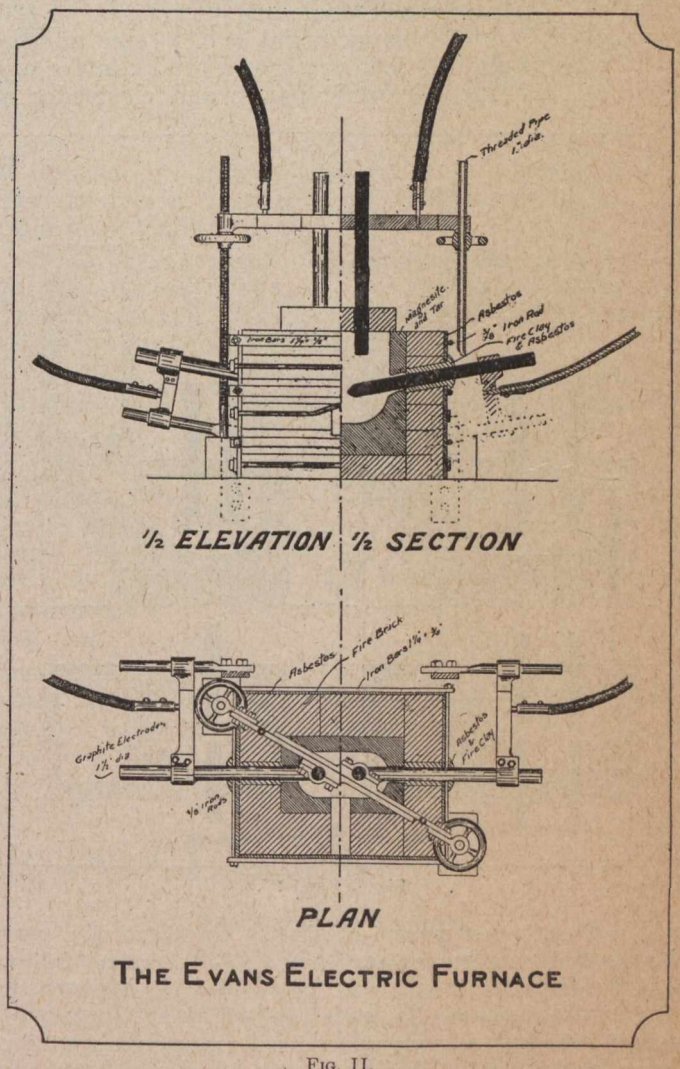


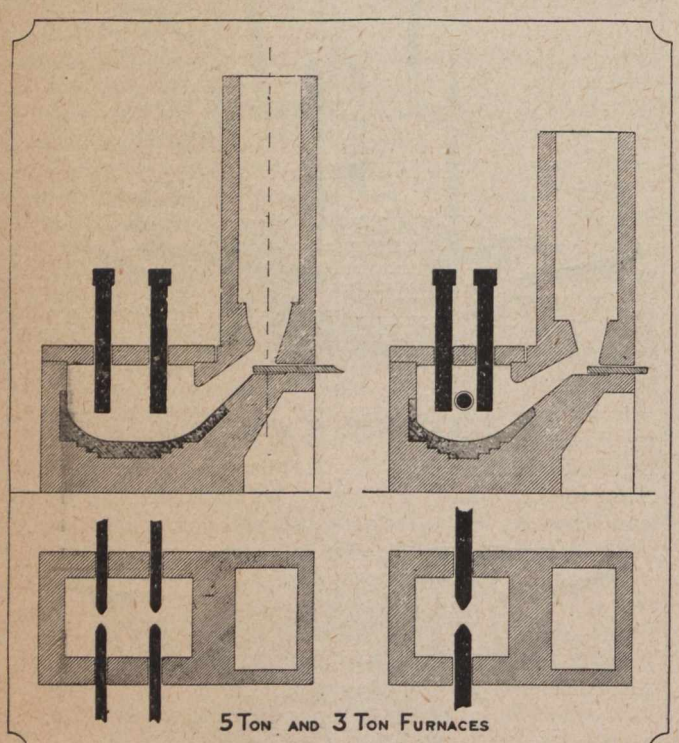
FIG. II.

Mr. Evans has quite an extensive workshop in which he constructs his furnaces, crushes the ore and fluxes, and tests the steel he obtains. Views of this are given in the accompanying photographs.

If it is admitted that a good tool steel can be made directly from the ore in the electric furnace, the most important remaining question is whether the cost of the process will be low enough to render it commercially practicable. With this object in view the writer made careful observations of the consumption of charcoal, limestone, electrical energy and electrodes in Mr. Evans' experiments, and the results of these observations may be stated as follows:—

1 lb. of tool steel reduced in the small electric furnace required
2.1 lbs of magnetite ore from the Orton mine.
0.4 lbs. of limestone.
0.4 lbs. of charcoal (including carbon in binding material).
0.08 lbs. of electrodes (Acheson graphite electrodes at 12c. a lb.).
3.0 kilowatt hours.

Most of these figures could undoubtedly be reduced in the case of a larger furnace, and it will be safe to state that a furnace making one ton or upwards of steel in 24 hours would not require more than 0.35 lbs. of charcoal and 2 kilowatt hours per pound of steel, while the electrode losses could certainly be reduced to not more than half the above figure, or say 0.03 pounds per pound of steel. Taking the electrical horse-power year at $20, the cost of 2 kilowatt hours would be 0.62 cents, and the electrodes would cost 0.36 cents, or a total cost for ore, charcoal, limestone, electric power and electrodes of



Figs. III and IV.

about 2 cents per pound of steel. The electrode losses in the test runs were greatly increased by the practice of allowing the ends of the electrodes to dip into the slag in the furnace. If, as is the case in the larger furnaces, the electrodes do not enter the slag, but are merely employed for producing an arc, the losses should be very much less. The rate of loss must also be proportional, more or less, to the surface of the electrode, and as the surface of the electrode, or at least the hottest part of the electrode, becomes proportionately less in larger furnaces, there is no doubt that a decided improvement will be shown in this particular.

Independent information with regard to the cost of running such a furnace on a somewhat larger scale can be obtained from the published test of the Stassano furnace in Italy made by Dr. Goldschmidt, in 1903.[3] The test was made on quite a small furnace of about 80 kilowatts, turning out 70 pounds of mild steel in two hours, smelted directly from pure hematite ores. One pound of steel required:—

1.63 lb. hematite ore.
0.20 lb. limestone.
0.26 lb. charcoal.
0.20 lb. carbonaceous additions.
0.012 lb. electrodes.
1.44 kilowatt hours.

These figures confirm what has been stated above with regard to the probable cost of the Evans process on a working scale and show that even better results may be expected.

The cost of labour, management, etc., will vary so much with the locality and particularly with the scale on which the plant is constructed that it does not seem worth while to attempt to estimate them. It may be mentioned, however, that Dr. Goldschmidt, in the report already referred to, states that in a plant of 5,000 h.p., located in Italy, producing 30 tons of steel in 24 hours, from rich hematite ores, the total cost of the steel, including ore, power, electrodes, labour, maintenance, etc., but not apparently interest or depreciation, would be very close to 1 cent per pound.

In connection with the above figures it should not be forgotten that the best tool steel is not rolled from the ingot but is drawn down under the hammer to obtain the finished bar. The cost of this process would have to be considered in determining the cost of production of the steel bars.

In Mr. Evans' experimental furnace only two electrodes were employed, and these could be placed nearly horizontal, or could be inclined at an angle in order to enter the slag. On the large scale it is intended to attain the same results by having two pairs of electrodes; one pair being vertical and the other nearly horizontal. This arrangement, which is shown in figures 2, 3 and 4, enables the horizontal electrodes to be used, as in the Stassano furnace, for the purpose of melting the charge, while the vertical electrodes can then be substituted and used as in the Heroult furnace for heating the molten charge during the finishing stages of the process.

Figures 2 and 3 show furnaces of this kind which Mr. Evans has constructed. The lateral electrodes are slightly inclined so that the arc may be near the charge while the openings through which the electrodes enter may be well above the slag level. The vertical electrodes pass through the roof of the furnace, and their holders are insulated from each other but are bolted together for greater strength. In this way the two electrodes are regulated together. In these furnaces it is necessary to withdraw the lateral electrodes before the vertical pair can be lowered into position, but in a larger furnace the electrodes could be placed so as not to interfere with each other, as in the right hand drawing in Figure 4.

With the furnaces shown in Figures 1, 2 and 3, the ore is introduced directly into the body of the furnace, as is also the case with the Stassano furnace. In the latest designs, see Figure 4, Mr. Evans is adopting a suggestion of the writer and adding a tower, in which the ore is heated, and partly reduced before it enters the electric furnace itself, and this modification should effect a considerable saving of electrical energy and even of charcoal and electrodes.

When promising this paper for the Toronto meeting, the writer expected to be able to make further tests with Mr. Evans' furnace in order to obtain more exact data for the cost of operation, and to have a supply of steel for a full set of chemical and mechanical tests. Mr. Evans' unfortunate illness prevented these tests and the writer was therefore unable to present as complete an

account as he would have liked of this interesting process.

Mr. Evans has acquired the Orton iron mine, in Hastings County, and informs the writer that more than 2,000,000 tons of titaniferous iron ore has been proved there by the diamond drill. The core shows the ore body to be 60 feet wide at 280 feet below the surface. The last analysis of the ore gave:—
60.84 p.c. iron, 7.5 p.c. titanium, 0.11 p.c. vanadium.
There is a quantity of limestone on the property, an abundance of wood for charcoal, and power can be brought from Campbellford at a reasonable figure.

The process of making steel in the electric furnace from titaniferous magnetites, which was inaugurated on such a small scale four years ago, should prove of great value in Canada, where these ores, charcoal and water power are all available, and where tool steel is at present imported.

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[1] J. W. Evans, Jour. Can. Min. Inst., Vol. IX., 1906, p. 128.

[2] A. Stansfield, Jour. Can. Min. Inst., Vol. X., 1907, p. 129.

[3] Electro-chemical Industry, 1903, Vol. I., p. 247.

PERSONAL AND GENERAL.

Mr. J. B. Tyrrell has returned from a professional visit to Quebec.

Mr. Martin Nordegg leaves for Alberta and British Columbia on June 30th.

Mr. J. B. Tyrrell has been elected a fellow of the Royal Society of Canada.

Mr. T. J. Vaughan-Rhys has assumed management of the Portland Wonder mine.

Mr. H. P. Davis passed through Toronto on his way to New York, on Friday, June 10th.

Mr. Frederic Keffer, of Greenwood, B.C., was in Colorado, U.S.A., during the early part of May.

Dr. J. Bonsall Porter, of McGill University, will shortly leave Montreal on a visit to Europe.

Mr. Fred. Pearson, of Halifax, N.S., is in Venezuela arranging to obtain control of large iron deposits.

Mr. W. S. Lecky has been elected an associate member of the Institution of Mining and Metallurgy.

Mr. W. M. Brewer, of Victoria, B.C., recently went north on one of his periodical visits to southeast Alaska.

Mr. Alexander H. Smith, consulting engineer for Porcupine Goldfields, Limited, has returned to Porcupine after a brief visit to Toronto.

Mr. O. N. Scott, general manager of the Cobalt Provincial Mine, was in Toronto recently. Mr. Scott reports most satisfactory progress.

Major, the Hon. J. E. P. Vereker, Kenora, has returned from a trip to Gold Rock. He reports considerable mining activity in the Manitou region.

Mr. Charles Levick, representing Swift, Levick & Company, Sheffield, Eng., passed through Toronto during May on an extended business tour through Canada.

Mr. A. T. Graham, formerly connected with the Red Cliff (Portland Canal) mine, has been placed in charge of the MacDonald-Pearson and Lydden-Bunting groups on Glacier Creek.

Mr. A. G. Larson, superintendent of the Le Roi mine at Rossland, B.C., was lately at the Ikeda Bay mine, Moresby Island, of the Queen Charlotte group, in the capacity of consulting engineer.

Mr. Lawrence Adams, late vice-president and general manager of the Guanajuato Amalgamated, is leaving for Montana and California in connection with mining properties in which he is interested.

The Hon. Mr. Templeman and Mr. R. W. Brock, Director of the Geological Survey, have returned to Ottawa from New York, Washington and Philadelphia, at which cities they inspected various museums.

Mr. W. Murdoch Wiley, of New York City, accompanied by Mr. R. B. Lamb, mining engineer, of 15 Broad Street, New York City, has left for Montana to examine the Ohio-Keating mine. They will also make mine investigations in Idaho and California.''

Mr. W. Anderson, civil and mining engineer, of Vancouver, has gone to Peru to report upon a hydro-electric power scheme for the Cerro de Pasco Mining Company, of which Mr. A. B. W. Hodges, late of the Granby Company, is general manager.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay.—The Dominion Coal Company's output for May will be approximately 297,000 tons, comparing with 316,000 tons in May of last year. The output for 1910 to the end of May is 1,195,000 tons, against 1,273,000 tons in 1909, so that the difference between the two periods amounts to only about 78,000 tons in favour of last year. The Lingan collieries have put out a fairly large amount of coal during May, amounting to over 13,000 tons. No. 12 colliery is now producing over 500 tons daily, and on several occasions has almost reached 600 tons. The output for June will probably be about 340,000 tons. In June, 1909, the output was 355,000 tons, but it is hardly likely that this figure will be reached, as last year the men were working steadily, expecting the coming strike.

The Sydney & Louisburg Railway, which up till recently was owned by the Dominion Coal Company and operated as a part of their works, has been incorporated under its own charter as a separate corporation. Some modifications of the hitherto established routine of this railway will no doubt take place under the rearrangement.

The Whitehaven Disaster.

The catastrophe at Whitehaven has an especial interest for Cape Breton readers, because the conditions under which coal-mining is conducted at the Wellington Colliery are similar to those under which much of our Cape Breton coal will have to be won. The colliery stands close to the edge of the cliff, and the workings extend to a distance of five miles out under the sea. About three and a half miles out, there is a large friction haulage plant actuated by an endless rope from the shaft. The main haulage transmission shaft serves five ropes, which branch out along as many roads extending into the further workings. The origin of the disaster is not fully cleared up. It is supposed to have arisen through an explosion in one of the branch haulage roads beyond the main friction gear, but the fate of the entombed men appears to have been sealed by a fire at this point which was fed by the wood around the haulage gear and the dust and oil that naturally accumulated in such a place. Two men only managed to get past the friction gear, and all the remaining men, 130 in number, must have been quickly suffocated by the fumes from the burning wood and oil. A desparate fight was made to subdue the flames, but after progressing

some 140 yards and getting within 80 yards of the supposed seat of the fire, the rescue parties were driven back. An hour before midnight two men from the Mining Engineering Company of Sheffield, equipped with "Shamrock" apparatus, descended the mine, but were only able to get within 130 yards of the fire, when they had to beat a hurried retreat. Their helmets and cylinders were too hot to touch. Such courage is magnificent, but there is no due advantage to be gained by sending men into such danger. Rescue apparatus has many possibilities, but it will not aid men to do the impossible. Other rescue parties afterwards arrived from Normanton and Hanley, but they could do nothing, and the intake was bricked up. Many indignant protests were made against the management for their action in sealing off the burning section and the entombed men, but all those competent to judge express the opinion that nothing else could be done. Whitehaven is six hours' journey from Sheffield, and the Mining Engineering Company's men started within two hours from the time they received news of the fire. From the short account contained in the letter received by your correspondent it cannot be stated that the rescue apparatus would have been of more avail had it been immediately on the spot, as owing to the fire being so far "in-bye" it appears to have gathered violence unnoticed by those on the intake side of the friction gear. Certain it is, however, that it would not have been any more difficult for the rescue parties had apparatus been available at the commencement of the fight, as without such protection they fought the fire for hours before being compelled to leave the entombed men to their fate. This disaster again emphasizes a point which has often been made in the JOURNAL, namely, that if oxygen rescue apparatus is to be of any use in mine disasters, it should be treated as an auxiliary to the underground fire brigade, should be immediately available, with a sufficient number of trained men to make effective use of it, and to relieve one another rapidly. Two men, with all the courage and skill in the world, are impotent in face of a mine fire that has had time to gather strength. In planning the extensive haulage ways which some day will convey the submarine coal which lies off the shores of Cape Breton this disaster should be borne in mind. It would seem that the entire avoidance of inflammable material in the construction of the elaborate haulage plants which will be necessary would be advisable, and the substitution of concrete for wood should be enforced strictly.

After the foregoing had been written the "Colliery Guardian" of the 19th May came to hand, containing an editorial article on the Whitehaven fire. The conclusions reached by this authoritative journal, with access to more exact sources of information than those possessed by your correspondent, are so strikingly corroborative that it will be well to quote them. Speaking of the hostility aroused by the decision of the management to brick up the intake, the "Guardian" remarks: "The real test of moral bravery on such occasions is to know when to desist from futile attempts to rescue; whenever a colliery explosion occurs there is always a multitude of willing volunteers ready to run the greatest hazards, but it requires bravery of a higher order to close the shafts against them." In connection with the magnificent bravery shown by Thorne and Littlewood, the Mining Engineering Company's men, and the usefulness of rescue apparatus in such cases, the article goes on to say: "From the details, however, that are before us at this stage it is a reasonable conclusion to form that had breathing appliances been on the spot at the time of the explosion instead of thirty hours later, lives might have been saved; the chief justification for this belief exists in the fact that two men, after persistent efforts, managed to traverse the fire area from the workings, and left beyond several workmen who were then in full possession of their faculties. The moral is that, to be of service, there must be a rescue station within easy reach of, and trained men at, each colliery. One of the few happy results of the Whitehaven disaster may be to convert colliery owners to this view, not only in Cumberland, but in some other districts."

There is not as yet a single breathing appliance on the mainland of Nova Scotia. Surely there is no need to point a further moral.

The Barometer and Mine Explosions.

Commenting on the recent disastrous mine explosion at Whitehaven, England, elsewhere referred to in this letter, the "Montreal Gazette" touched upon the statement that was given considerable currency by the cabled newspaper reports that the explosion was coincident with a high barometer, the approach of which had been predicted in the newspapers by what in known as a "colliery warning." The "Gazette" expressed the opinion that in the future the colliery manager would pay "the same careful attention to his colliery manager would pay "the same careful attention to his barometer as the master of a vessel does to his compass." The comment is a little *naive*, as under the Coal Mines Regulation Act in England, every coal mine must be provided with two barometers, one at the mouth and the other at the foot of the shaft. The reading must be daily taken and recorded by a responsible official—usually the underground manager. The "Gazette" is, however, not wholly to be blamed for the importance it attaches to the "colliery warning," for many people even in England itself are not aware that the "warning" is not an official announcement. The "Colliery Guardian" of London recently poked fun at the expense of these solemn "warnings." They have appeared regularly in all the English newspapers for some years past, and forecast an approaching change in the atmospheric pressure which will cause disturbance in the equilibrium of the mine gases. Where large wastes or "goafs" exist it is well known that a change in the barometric pressure may force out accumulations of dangerous gases into the workings, or conversely a diminution of the pressure may liberate gases which are confined in cavities, but bodies of gas of this nature are much more sensitive to changes in atmospheric pressure than any barometer ever invented. The result of a change of pressure will be felt in the mine long before any published "warning" can be given circulation. The "colliery warning" which appears in the newspapers is generally read long after the atmospheric change has passed and gone, and in mining circles these announcements are regarded as an elaborate joke. The Meteorological Bureau disclaims all knowledge of these "warnings," and the Government know nothing about them, so that their origin, like the birth of Jeames, "is wropt in mystery."

ONTARIO.

Cobalt.—At the Hudson Bay a new vein has been discovered on the 100 foot level, to the south of the shaft. It is about an inch and a half wide and carries high values in silver.

Another important ore shoot has been located on the Lawson property, on the No. 11 vein. From the shaft a drift was run on the vein at a depth of 50 feet, and high grade ore was encountered. Some work was done from the 75 foot level, but at that depth the values in the vein were low. Now that the property is no longer handicapped for lack of power, work will be carried on much more rapidly, and all the veins will be opened up.

Several engineers for the Dominion Government are in the district, making examinations of the different lakes and rivers, with a view to conserving the great bodies of water that are wasted every spring. Practically all this section drains into the Ottawa River, and in the spring the water is much higher than is necessary, while in the fall the water gets so low as to prove a serious handicap. On account of the heavy snow-fall the lakes and rivers rise to great heights after the break-up. Lake Temiskaming, the largest body of water in the district, usually rises about fourteen feet, and every spring this great supply goes to waste. It is the intention of the Government to build a series of dams, at the points where they will hold back the greatest amounts, and by letting out the water as it is needed, thus regulate the flow in the lower Ottawa. Some of these dams are now under construction, and work will be commenced on others in the near future. The possibilities for the generation of power that these dams will afford are practically un-

limited, and although they will not likely be used for some time on account of the small market, due to the sparsely settled conditions of the country, they will always be a vast reservoir for future needs.

A new vein carrying high-grade ore has been found on the Nova Scotia property. The ore body, which was opened up by underground exploration, varies in width up to five inches, and consists of calcite and native silver. Now that the difficulties between the Peterson Lake and this company have been settled, the Peterson Lake lease is being worked again. The new mill is in operation, but has been working such a short time that it is impossible to state how the process will turn out. The ore is treated by straight cyanidation, which is a decided departure from the majority of plants in the district.

The Standard Cobalt Mines, which is the operating company of the Cobalt Central, is in the hands of a receiver, with liabilities amounting to about $50,000. The company controls over 700 acres of ground, only a small portion of which, however, has been prospected. The mine and mill are on the Big Pete claim on Diabase Mountain, and although the ground has not been very well developed, several good veins have been found. As a general thing the ore is found in small stringers over a width of about eighteen feet, but on the fourth level there is one vein showing in the bottom of the drift that will average about three inches in width, and that can be traced for several hundred feet. The mill has a capacity of 100 tons a day, and there are several months' supply of mill rock broken in the mine. The mill also treats considerable custom ores from the surrounding mines. During the last few months a sharp fight for control has been waged by a minority interest among the shareholders, headed by J. S. Bradley, a New York broker. In the meantime the financial affairs of the company steadily grew worse, although the property made more or less regular shipments of ore to the smelter.

After many delays and disappointments, the Cobalt Hydraulic Company has at last started the big plant at Ragged Chutes, and as a consequence a good many more mines have shut down their compressors and are operating with the new power. The pressure at the mines is about 120 pounds, but the reducing valves cut this to about 100 pounds. After the water was turned into the shafts, but before the air was allowed into the pipes, the automatic blow-off that operates through the tail shaft, formed a regular geyser hundreds of feet high that was one of the most remarkable sights ever seen in this country. This plant is the largest natural air compressor in the world and has an estimated capacity of about 5,000 horse-power. The air is transmitted from the plant through nine miles of twenty-inch pipe. From the end of this line a twelve-inch loop encircles the camp, and the air is drawn off in smaller pipes to the various mines. One great advantage of this air is its remarkable freedom from moisture, due to being compressed at a constant low temperature. Since consumers have started using it, however, it has developed that the miners find some difficulty in keeping candles alight, and the effects of dynamite smoke after blasting are also said to be more serious than formerly. The inventor claims that this is due to the oxygen being absorbed by the asphalt with which the pipes are coated, and that this feature will shortly disappear. The Mines Power Company is now running steadily, supplying air and electricity, and will shortly have the fourth compressor in the Brady Lake sub-station in operation. This will give practically one spare compressor in case of an accident happening to any of the four. The three at present installed handle the load easily, but without having very much to spare. The Cobalt Power Company will shortly have all its generators installed, and will then have no difficulty in handling the load. With these three companies operating, Cobalt will be in a very enviable position with regard to power, as the supply is ample and the price is very low compared with the previous cost when generated by steam. On the face of it, the supply seems much greater than the demand, and it is not outside the bounds of possibility that an amalgamation of some sort may take place in the future.

At the Temiskaming Mine a new vein of exceptionally high grade ore has been discovered on the 400 foot level. No. 2 vein on this level is also making good ore, the vein being in some places eight inches wide of ore that will run about 4,000 ounces to the ton. The mill is handling up to 100 tons a day and is stated to be producing about $1,000 worth of concentrates every twenty-four hours. From the time it commenced operating until the end of May the mill treated 2,218 tons of ore, having an average assay of 33 ounces, and produced 59,400 ounces of silver. The main shaft is being sunk to a depth of 500 feet, and when this level is reached it will be the deepest working in the camp.

Surface prospecting on the Nipissing property has already this season yielded excellent results, and five new veins carrying high grade ore have already been found. Three of these varying in width from one to two inches and running parallel about thirty feet apart, were discovered in the vicinity of No. 49 shaft. These will be opened up from tunnel No. 28, the end of which is between two and three hundred feet away. The last discovery was made in the Keewatin area in the vicinity of Cart Lake, where som geood silver was found. This territory had been partly prospected before, but a more careful examination of the ground resulted in the discovery. This company is finding that running the trenches 100 feet apart is not working close enough, and now the ground is being cut up with trenches about fifty feet distant from one another. The management is convinced, however, that even with this careful method of doing the work many veins escape their notice. As a consequence they will experiment with washing off all the overburden on some portions of the property. A couple of large pumps are now being installed, and it is expected will be operating shortly. The disposal of the tailings will present serious difficulties, but it is believed that the ground will be worked in sections, and that when one part has been washed and thoroughly examined the overburden from the ground above will be washed down on it. This method will make absolutely certain that no veins showing on the surface escape notice. The cost will be high and the work will take a long time, but the results will undoubtedly be large.

It is stated that the production of the Buffalo for their fiscal year amounted approximately to 1,500,000 ounces. The reserves have been considerably augmented by the extension of the territory to the west, where it was not expected to find ore. In drifting on the vein to the west, a roll in the underlying Keewatin was cut, and the values gave out entirely. Some time afterwards work was again started in the drift, which shortly passed into the conglomerate. With the change of formation the values came back as high as formerly, and now the drift has been pushed several hundred feet more and the heading is still in good ore. It is understood that the cyanide plant is not as great a commercial success as it was expected to be, and that it may be shut down before long. Results from the concentrating plant are, however, very satisfactory, and it is thought that if a little closer saving were made on the slime-tables the cyanide plant could be done away with.

Another high grade vein has been struck on the Cobalt Provincial, which was formerly owned by the Government. The discovery was made in the bottom of the new shaft, where there is from four to five inches of ore carrying high values in silver. This was at a depth of 120 feet and is believed to be a different vein than the one cut at a depth of 80 feet in the shaft.

The opening up of the third level of the Coniagas is giving much better results than was anticipated by the management. Work is now being carried on at a depth of 225 feet, and a few days ago the cross-cut opened up the No. 2 vein. It is considerably wider and more consistent than on the second level, and the values are fully as high. This is the first of the known veins to be located on the third level, but it is expected that the No. 6 vein will be cut in a few days. The management has been prevented from running the new addition of thirty stamps on account of an insufficient supply of water. A new pump is being installed, however, and this defect will be remedied very shortly.

The new plant for sampling the high and low grade ores of Cobalt is now practically completed and will be receiving consign-

ments in a few days. All the ore when it is received is crushed in a ball mill, and from the fines four separate and distinct samples are taken. This ensures a thorough check on the assays. The metallics from the ball mill are melted down separately and the resulting product shipped as fine silver bullion. One of the great advantages of the plant will be the possibilities it offers to grade the values of the ores to meet the requirements of the smelters. Several of the smelters pay a certain percentage of the silver contents, depending on the assay of the ore, and this usually varies one-half of one per cent. for each five hundred or thousand ounces to the ton. The sampler has several storage bins where the ore may be held in order to change the grade if required. Arrangements have also been made with some of the smelters to accept the sample as taken at the Cobalt plant, and this will do away with the necessity of having a representative at the point where the ore is treated.

Diamond drilling on the Foster property has resulted in the discovery of a vein carrying values at a depth of 400 feet. It is not known how high the returns from the assays were, but they were encouraging enough to determine on further exploratory work with a shot drill. This drill has been ordered and will be here almost any time.

The management of the cobalt smelter at Copper Cliff has decided to increase the capacity of the plant to 800 tons a month. This was the first smelter in Canada to treat Cobalt ores, and for the year 1909 they treated practically half of the high grade output of the camp. From the time it started in 1905 till the end of 1909 it treated 13,616 tons of ore and produced 22,633,430 ounces of silver. They also produce refined arsenic, but the shipper receives no payment for this. The cobalt and nickel are collected in the form of a speiss, which also contains considerable silver, and this is sent to the States for treatment. The company also intends to put up a silver refinery, and when this is completed they will be able to pay for the ores in a much shorter time than is now possible. At the Deloro smelter an oxide plant has been built that treats the speiss and produces commercial cobalt oxide and recovers practically all the values in the ores. As the supply of cobalt has been steadily increasing the last few years, this company has been carrying on some interesting experiments, with a view to extending the uses to which it is put and thus increasing the demand. One result of these experiments has been the production of several pigments in different colours. This plant also produces refined white arsenic.

Since the advent of the new power a decided improvement has taken place in the Savage property. No. 4 vein has been cut in a cross-cut from No. 3 vein and shows a good width of high grade ore. Before this the ore reserves on the property were estimated at three-quarters of a million ounces, and if this vein proves up well on the lower level they will be considerably increased. The shaft is to be sunk another 75 feet and a new level opened up. At the present time the stopes and drifts are full of ore, but with the small sorting plant in operation this will soon be cleared up and underground development can proceed. New camp buildings are also to be erected.

BRITISH COLUMBIA.

As the spring advances there is much activity in the mining districts, especially in those in which little can be done during the winter. With the melting of the snow prospectors are busy again, and numbers of them are already afield, preparing to take full advantage of the whole time in which prospecting can be done to advantage. There has been quite a rush of men to the North—to Queen Charlotte Islands, the Skeena country, and especially to the Portland Canal district. Much excitement has prevailed in the British Columbia coast cities relative to reported finds of high-grade ore on several mineral claims in the vicinity of Portland Canal, and much is expected from that district. As yet, though, substantial development work has been restricted to only a few properties, so that the question of tonnage of ore available has still to be dealt with. The prospects are generally regarded as most hopeful. Probably some of the so-called mining companies are mere promoting schemes, but there is no doubt several other organizations are genuine and their main object, bona fide mining.

Coal Mining Prospects Good.

The outlook for coal is more promising, perhaps, than for any other mineral being mined in the province. This applies to all the districts in which coal has been developed, and as well to several others in which coal measures believed to contain workable seams of coal have also been found. In Southeast Kootenay there are, beside the well-known and productive coal mines of the Crow's Nest Pass, Hosmer, and Corbin companies, respectively, large quantities of coal of excellent quality in the upper Elk River country, while other fields, though as yet not nearly so well prospected as those of the upper Elk, are known to occur in the Flathead and contiguous districts comprising the extreme southeastern part of the province. A six-foot seam of coal is being developed near Midway, in the Boundary district. In the Similkameen and Nicola Valley districts, now to some extent provided with railway transportation facilities, coal is being produced on a commercial scale, in small measure near Princeton, Similkameen, and to the extent of from 800 to 1,000 tons a day at Nicola Valley mines. One company has been formed to develop coal lands north of Kamloops, in a part of the country soon to be made accessible by the construction of the extension through British Columbia of the Canadian Northern Railway, which system is well established in the adjoining province of Alberta. In different parts of the very large area of country north and south of the route of the Grand Trunk Pacific Railway—in Northern Cariboo and in several widely-separated parts of the big Skeena country, coal has been found, and the construction of railways is being awaited to provide necessary transportation facilities so that coal may be mined and sent to whatever market shall be found for it. It is claimed by experienced coal prospectors that a large and productive field will be opened on Graham Island of the Queen Charlotte group, and if this be done the value of this fuel supply will be great, chiefly on account of the comparative nearness of the coal seams to tidewater, the good quality of the coal, and the convenience it will be to steamers engaged in the northern British Columbia and southeastern Alaska coast trade, which is yearly expanding and becoming of considerably increased importance. Then there are the newer developments on Vancouver and adjacent islands, some of which are already adding an appreciably large tonnage to the output of the British Columbia coast coal mines. Beside the big mines that have been productive for many years—the Western Fuel Company's and Dunsmuir collieries—there is the Pacific Coast Coal Company's South Wellington mine, now an established producer with a fairly large tonnage, and two or three small mines, with as yet but a small production. Then there are other coal properties being developed in the northern part of Vancouver Island, beside some on two or three of the smaller islands close by. The foregoing information is incomplete, but it will serve to indicate in a general way that there is ample warrant for the claim that the coal-mining industry of British Columbia is in a flourishing condition and that its expansion will be considerable in the near future.

In the Kootenay Districts.

It has been reported that the Consolidated Mining & Smelting Company of Canada, Limited, is negotiating for the purchase of the North Star mine, in Fort Steele mining division, East Kootenay. Years ago this mine was the most productive silver-lead property in British Columbia, but its output during recent years has not been large, although it has been operated at a profit. It is managed by Mr. Neil McL. Curran. The group contains six mineral claims and fractions, having a total area of about 300 acres, situated within two miles of Kimberley, the northern terminus of a branch of the C. P. R. Company's Crow's Nest line. The mine has been extensively developed and, according to the published report of one of the officials of the

Mines Branch of the Dominion Department of Mines, has produced a large tonnage of silver-lead ore, averaging, approximately, 30 ounces silver per ton, and 40 per cent. lead. The quantity shipped up to 1906, inclusive, was 69,500 tons. In 1907, the output was 3,094 tons, having an average lead content of 20 per cent., and of silver 15 ounces per ton. The 1908 returns are not now available to the writer, but in 1909, nearly 3,000 tons was shipped, this containing approximately 39,000 ounces of silver and 711,000 pounds lead. The bulk of the ore shipped contained an excess of iron in oxidized form, and very little sulphur, consequently, the smelting charge on it was low. Mining costs were stated several years ago as having been $2.33 per ton of ore mined. A former manager described the ore-bodies as being basins of ore, lying flat, and having a maximum thickness of about 70 feet. During recent years, though, the ore shoots mined have generally been small and disconnected. An important discovery of ore was reported a short time ago. The power equipment of the mine includes three 60 h.p. boilers, one large and two small hoists, a 5-drill air compressor, and a diamond drill. An aerial tramway, one mile in length, connects the mine with ore bunkers on the C. P. R. line near Kimberley.

The season in the Slocan mining camp has opened auspiciously, for there is much work in progress, more is to be undertaken, and the railway from Kaslo to Sandon will hereafter be operated right through, after having been closed beyond McGuigan for a comparatively long time. All the zinc concentrate made at the Whitewater mill during the winter has been shipped to the United States, the silver-lead product going to the Consolidated Company's works at Trail, B.C. Near the end of the cold weather season shortness of the water supply necessitated closing this mill for a few weeks, but it will soon be running again. Meanwhile, new ground has been explored in the Whitewater Deep mine, and a contract has been let for putting up an incline raise from the breast of the 2,000-foot adit tunnel driven last year, by the Deep Mine, Limited, from the railway level. When the raise shall be up, 150-foot cross-cuts, driven to prospect for ore before continuing to raise toward the old workings at about 500 feet above the deep-level adit. Zinc ore is again being shipped from the Lucky Jim mine, now that the weather is favourable for the railway company handling it without difficulty. The erection at Kaslo of a mill for concentrating the second-grade ore from the Lucky Jim is promised. Progress at the Rambler-Cariboo continues to be satisfactory and the outlook for a profitable year is promising. The annual general meeting of shareholders in the Rambler-Cariboo Mines, Limited, has been called for June 14th, at Kaslo. Byron N. White, managing director of the company owning the Slocan Star group, has gone to Sandon from Spokane, Washington. The operation of both mine and mill on a similar comparatively large scale to that in progress before the Star vs. White lateral rights litigation led to the closing of both several years ago, is now looked for, all legal difficulties having been overcome. The Richmond-Eureka-Summit group will continue shipping ore to Trail. The Ruth-Hope group will keep its mill going and send out both silver-lead and zinc concentrates. Up Cody Creek the several mines mentioned in the last number of the Journal, are continuing to make progress. Similarly, the outlook is good for the Slocan Lake district mines.

There is little that is new to report relative to mines in Nelson mining division, conditions being much the same as described last month. A resumption of work at the Queen Victoria mine, situated a few miles west of Nelson, and which was acquired by the Consolidated Mining & Smelting Company about eighteen months ago, has been announced. In both Ymir and Sheep Creek camps there is activity, especially in the latter, developments being encouraging. The prospective sale of the Queen mine, near Salmo, has been reported; this is a gold-quartz property, having a 20-stamp mill.

Rossland mines show little change. The Le Roi is still working, but its ore production figures remain small as compared with those of most earlier years, during which it has been worked. Le Roi No. 2 maintains its output regularly. The Consolidated Company's mines are shipping a considerable quantity of ore to Trail every week. Some ore was lately shipped from the Nickle Plate, which in the busier days of Rossland camp was one of its best known mines, but has not been heard of in recent years until now. The Consolidated Company's smelter is gradually increasing its tonnage of ore treated and quantities of metal produced. Among its receipts last month was a quantity of concentrate from the Hedley Gold Mining Company's 40-stamp mill at Hedley, Similkameen. Rossland men are developing the Fife mine, a copper-gold property situated on the Boundary slope of the divide between the Columbia and Christina Lake valleys.

In the Boundary District.

The British Columbia Copper Company's mines and smeltery will be operating again before these notes shall be printed, labour troubles having been got over for the time, and sufficient men having been obtained to take the places of those who left the district when the strike took place. Mr. Paul S. Couldrey, formerly manager of the Le Roi No. 2, Limited, Rossland, and for rather more than a year superintendent of the B. C. Copper Company's Mother Lode mine, goes to Peru to take charge of a big mine there owned by the company for whom Mr. A. B. W. Hodges, late local manager for the Granby Company, is now general manager. Mr. Couldrey has been one of the hardest working, and most successful mine managers (successful as regards results of his mine development work) in this province, so his departure is much regretted. He was not given a fair deal by the English mining engineers who have the direction of Le Roi No. 2 affairs, but he has the satisfaction of knowing that his good work is appreciated by other large companies, and his services sought after.

The Granby Company lately had an examination made of some mineral claims situated in Franklin camp, up the North Fork of Kettle River, 50 miles or thereabouts, from Grand Forks. The company's 4,500-ton smeltery is at Grand Forks. There are some big ore-bodies in Franklin camp, but the value of the ore in bulk has not yet been ascertained, for railway transportation facilities have not yet been provided for this camp. Rails have been laid for a distance of 17 or 18 miles from Grand Forks, and recently it was announced that a second section, of 10 miles, of line would be constructed this summer, but a commencement with this work has not yet been made. There will still be a gap between the far end of the second section of the railway and Franklin camp mines, so that there is no immediate prospect of ore being shipped thence to a smelter. Owners of mineral claims are earnestly hoping the Dominion Geological Survey will give the camp attention during the summer, so that a map of the district and a report may be issued with as little delay as shall be practicable, for no official information relative to this part of the Boundary country has been published since Mr. Brock's account of his short visit in 1907.

Melting snow is in some measure hampering the shipment of ore from Phoenix camp mines, the surface of the ground being soft, and work above ground consequently hindred. Another disability slightly affecting the mines now that spring is well advanced is that numbers of men who work at the mines throughout the winter go into the hills prospecting or doing assessment work on their mineral claims, so there is a temporary shortage of men. Under these conditions it has been found advantageous to run only six of the eight blast furnaces at the Granby smelter, so that costs may not be made higher at the company's mines by requiring them to ship ore up to the full capacity of the eight furnaces at the smeltery. As soon as normal conditions shall prevail, it will be practicable to operate all eight blast furnaces without inconveniencing the mine officials to keep up a full supply of ore. The tonnage with six furnaces in blast is about 3,400 tons of ore per diem.

GENERAL MINING NEWS.

NOVA SCOTIA.

Halifax.—Mr. A. A. Hayward, general manager of the new scheelite mines near Moose River, Halifax County, has named the new settlement, Scheelite. New roads have been surveyed and the camp buildings are practically completed. Four shafts are being sunk. Three of these showed no scheelite on the surface, but are now in rich ore. The ore will be hauled to railway by means of a traction engine and trailer. Hugh McAskill is foreman.

Stellarton, May 30.—The executive of the Board of Mining Examiners for the province will meet in Stellarton on Wednesday, June 1st, for the purpose of preparing questions and other work preliminary to the annual examinations to be held during June, at the various examination stations throughout the province.

ONTARIO.

Ottawa.—During the last fiscal year the total bounties paid by the Government amounted to $1,808,533. The bounties on pig iron totalled $573,968, on a total production of 740,244 tons, of which 547,063 tons were made from Canadian ore. The steel bounty amounted to $695,762 on a total production of 740,390 tons. The bounty on wire rods was $538,812 for a total output of 89,802 tons.

Cobalt, May 30.—In the cross-cut northeast from the 225-foot level, the No. 2, one of the principal veins of the Coniagas, has been cut in the past week. The Coniagas veins, though small, are so regular that there was some surprise expressed when the lead was not tapped at precisely the spot expected, but it was found later. It is at the 225-foot level four inches wide of smaltite ore heavy with native silver and running several thousand ounces to the ton.

Cobalt.—With the starting of the new plant of the Trethewey Mining Company, thirteen mills are in operation in the Cobalt district. The skips from the No. 2 shaft are now running regularly up the 650-foot tramway to the Trethewey mill and the plant is working with the exception of some minor adjustments at almost full capacity.

Toronto, June 7.—A deputation of mining men waited on Hon. Frank Cochrane, Minister of Lands, Forests and Mines, representing the holders of iron ore claims in the Mattagami River region, some 80 miles north of Cochrane, to ask for an extension of time for developing their claims. Those present were Messrs. W. F. Powell, Ottawa; R. J. Flaherty, H. P. Glidden and John Martin, of Cobalt. The region has been inaccessible hitherto and it is only the last few months when attention has been attracted by the coal discoveries in the district to the west, that hope is felt that there may be an extension of the T. & N. O. Railway line there. The iron ore is recognized as valuable and needing only transportation facilities to enable machinery to be taken in and the ore brought out to the smelter. The mine owners feared that the Government might cancel their claims.

BRITISH COLUMBIA.

Vancouver.—The first gold brick from the Queen Charlotte Islands has been delivered to the Dominion assay office in this city. It was the output of the Early Bird free milling group, on the west coast of Moresby Island, and is the result of a day's run of a five-stamp mill. The value of the brick is $400. The mining property is owned by Messrs. J. McLellan and F. J. Bourne, M.E., of Cobalt, who acquired it some three years ago. There is a 100-foot shaft on the property and 250 feet of drifting. Commencing with a two-inch stringer, which has now widened to six inches, in places the vein gives exceptional values. On the surface the vein has been exposed for 250 feet.

Mr. Bourne, who has been in the city for a few days, en route east, considers the proposition a very promising one and he is very optimistic regarding the mining industry on the islands.

Creston, May 28.—An excursion party of McGill College mining students, numbering some twenty-five, in charge of Dr. J. B. Porter, Professor of Mining at McGill University, arrived in Creston at 9 o'clock on their way to Nelson. This party is making its annual tour of Canada, with a view of visiting the principal mining camps. Last year they visited mining camps in Nova Scotia and New Brunswick. Before reaching Creston on this tour they had visited Cobalt and Sudbury. They have also visited Coleman, where they stayed seven days, as well as Moyie, where they remained six days. These students, who are mostly three-term men, are being distributed among the various mining camps in British Columbia this season, where they can obtain a practical knowledge of the way the work is done. After visiting the mines at Nelson, they will proceed to Phoenix, and from there to Greenwood and Rossland. It is expected that the tour will be finished by June 2nd. By that time all of the students will have been distributed among the various mining camps. Dr. J. B. Porter, who is in charge of the party, appears to be a great favourite with the students.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

London, June 1.—Six miners were overcome by fire damp in a pit at Croy, Dumbartonshire, and were gallantly rescued by companions, one of whom collapsed during the process.

Final attempts were made on May 21st and 22nd to penetrate the workings of the mine by the return airway, but they proved absolutely impracticable. Experts were enabled by the aid of breathing apparatus to get to a point about 500 yards from the seat of the outbreak in No. 3 junction; but they were obliged to return by reason of the intense heat, after having passed through a stroke of fume gas, which was succeeded by dense smoke. In consultation with the managers afterwards they very reluctantly came to the conclusion that there was absolutely no possibility of any of the men getting past the fire and the smoke and gas in the return airway.

It is quite certain that long ago all the imprisoned miners must have succumbed to the fumes that have been carried inbye, and the quickest way of recovering the bodies will be to exclude all air. Although it is thought that the fire may have been in a measure subdued, any admission of air would kindle the slumbering embers and produce perhaps further regrettable consequences.

The fund for the relief of the sufferers has reached £23,150.

ROUMANIA.

During March the total exports of petroleum and petroleum products from Roumania amounted to 36,151 tons, as compared with 25,637 in March, 1909. In the same period the production amounted to 111,456 tons, as against 109,199 tons produced in February.

RUSSIA.

The Baku Black Sea Company has commenced the construction of the pipe line which will bring oil from the various plots

of the company to the iron tanks erected in the neighbourhood. This will be the first pipe line in the Maikop district.

Great activity is reported in the export of petroleum products from Baku. The loading of tankers and sailing boats is proceeding with great speed, and some twenty boats are waiting their turn at the wharves of Messrs. Nobel Brothers and the Caspian Society.

The Surakhany spouters are increasing in number in addition to the spouters on the properties of Benkendorff and of the Baku Petroleum Company. The well No. 5, of Messrs. Mirzoeff Brothers started spouting on the 27th March last from a depth of 1,190 feet. The yield in oil averages from 15,000 to 20,000 poods a day. On the 11th April another spouter on the field of the Baku Petroleum Company broke out from a depth of 1,568 feet, producing 200,000 poods a day. It is now nearly three months since the spouter on the Benkendorff's property broke out, having approximately produced over 5,000,000 poods of petroleum. The yield of oil averaged from the start about 300,000 poods a day. For about a month it kept at the level of 100,000 poods a day, falling finally to 35,000-40,000 poods a day.

SOUTH AFRICA.

A cablegram from Johannesburg states that during April the mines of the Rand alone (that is, excluding outside mines) crushed 1,763,104 tons. The average working expenses per ton were 17s. 6d., the profit per ton was 10s. 7d., and the aggregate profit £932,975. Below will be found similar figures for the previous three months, from which it will be observed that April shows no marked variation. The profit per ton is 3d. higher and the total profit about £19,000 more than for March.

UNITED STATES.

Seattle, Wash.—Officers of companies operating steamships to Alaska points on the Behring Sea estimate that 15,000 people will leave Seattle for Nome and St. Michaels on the early sailings, drawn by reports of rich gold discoveries in the Idatarod gold fields.

The first regular liner to leave Nome will sail from Seattle to-morrow; every berth had been sold weeks in advance. Men of wealth have been compelled to take accommodations in the steerage, and there is a waiting list at the steamship offices larger than the combined capacity of the northbound steamships. So great is the rush to the North that passengers and freight officers of the Alaska steamship lines say the movement, which amounts to a stampede, has been equalled but once in the history of the North, and that during the Klondyke rush thirteen years ago.

Bishop, Cal., June 2.—Two shifts are now at work in the property of the Bishop Creek Mining Company. The water has been lowered to the second level, which is 290 feet below the surface and the pump will be transferred from the upper station to this second level preparatory to continuing the development work at this point. A little later in the season, after most of the snow has melted and there will be less trouble from seepage water, it is probable that another hundred feet of shaft will be sunk to run a third level and further open up the ore body.

Los Angeles, May 31.—On three days of last week the Lakeview gusher was carefully measured and its flow was found to be 48,000, 49,000 and 51,000 barrels for each 24 hours. It broke out on March 21st; consequently, at the moderate estimate of only 40,000 barrels a day, it has produced up to date the enormous amount of 2,600,000 barrels of petroleum.

Montrose, Colo., May 31.—News is received here of a rich strike of vanadium ore in the Newmire district. This is a new district, and the veins now are only in process of development.

A mill for the reduction of the ore is now in operation at Newmire, and the latest strike will necessitate an addition to the mill. The force of men working on the veins will be largely increased at once, and development work will be prosecuted with vigour.

Recently a consignment of this ore was sent to London, Eng., where it was to be used on trial by a big British steel manufacturing concern. The shippers were assured that if this ore proved satisfactory England would become a large consumer of western slope vanadium ore.

Cripple Creek, Colo., June 1.—The output of the mines of the Cripple Creek district for May was 57,105 tons, with gross bullion value of $1,349,502.50.

With the exception of the Golden Cycle mill, all treatment plants reported an increase, and it is understood that while heavy tonnage was shipped to the Cycle plant, the ore was bedded down for future treatment.

There has been no decrease in output, and the average value of the ore was 60 cents per ton higher. The value per ton for all grades of ore treated was $23.63, as against 23.03 in April.

Joplin, Mo.—The 200-ton concentrating plant of the Missouri Zinc and Lead Mills Company, on a 20-acre lease of the Smith ground at Cave Springs, west of Joplin, has been finished and is rounding into steady operation, early runs having showed the machinery to be working nicely.

Unlike the ore run worked by the Herald Zinc and Lead Company, to the north, the Missouri Company has mineral at 100 feet, while in the adjoining mile the ore run is worked below the 200-foot level. Both zinc and lead are found in the new mine.

MEXICO.

Mexico City, June 2.—The reduction mill of the Santa Rosa Milling & Mining Company operating the old Chinos group of mines on the Pelayo ranch, near Ayutla, State of Jalisco, will be reconstructed with a capacity of 100 tons of ore per day by the addition of new machinery received at Ameca a few days ago. The new appliances have been forwarded to the mines and are now being set up in the mill building of the company. They consist of a No. 5 Huntington ore mill, four Overstrom tables, two Woodbury tables, two Richards classifiers, two large Callow settling tanks, together with a number of smaller apparatus. The new machines will be run in connection with the old ten-stamp mill which has been on the property for several years. Steam power will be used.

Chihuahua, Mex.—The Lepanto mine at Naica is said to be shipping 2,000 tons of silver-lead ore per month.

The Rio Tinto Copper Company has accumulated 2,500,000 pounds of copper during the past year. The ore will be put through the converter when the new plant is put in operation about July 1st.

The Reina silver mine, in the Cusihuiriachic district, will soon change ownership and management, according to reports which are current here.

Pachuca, Mex.—Engineer Azan has gone to Ixmiquilpan to make a complete survey for the installation of the 5,000 horse power hydro-electric plant for which his firm holds the concession. The plant will be situated some 20 kilometers east of the town of Ixmiquilpan and Actopan, in all of which districts large denouncements of mineral lands are being constantly made.

Mexico City.—For months past there has been a serious drawback to the mining interests in the Etzatlan, Hostotipaquillo and neighbouring districts in the state of Jalisco by the failure of the electric power company, the Compania Hidroelectrica e Irrigadora to make good its proposal of supplying power for mine and mill purpose.

This delay was caused by a condition of affairs that was extremely unfortunate and worked some stress upon the mining concerns alluded to. However, all these circumstances have been overcome and construction has been actively resumed on the transmission line and is being pushed energetically and there is no doubt that by October at the latest there will be an abundance of power.

COMPANY NOTES.

VAN ROI MINING COMPANY, LIMITED.

The following cable was received at the London office from the company's managers at Rossland:

"Mill Report for Month of April: Total amount crushed, 3,269 tons, yielding 140 tons lead concentrates, assaying 210.7 ounces silver, 62.6 per cent. lead, 10.8 per cent. zinc; and 100 tons zinc concentrates, assaying 74.2 ounces silver, 3.4 per cent. lead and 43.9 per cent. zinc. Total approximate value $19,834 (£4,089). Mill ran 568 hours.

"Estimated expenditure for corresponding period, including mining, milling, developing, and other expenses, $17,000 (£4,505).

"No. 4 Level (main vein driven eastward 45 feet). Raise east of main stope successful—are now stoping in.

"No. 4 Level (continuation of Footwall Fork) south vein, west part: width 3 feet, 19 ounces silver, 9 per cent. lead, 9½ per cent. zinc. East part: width 2 feet, 7½ ounces silver, 4½ per cent. lead, 5¼ per cent. zinc.

"Crosscut to south vein following Diamond Drill Hole No. 4. Crosscut has reached reef."

INTERNATIONAL NICKEL DIVIDEND.

The International Nickel Company has declared an extra dividend of 25 per cent. on the common stock, payable July 15 to stockholders of record June 6.

At a special meeting of the directors it was resolved that this extra dividend be paid out of the surplus earnings of the company for the period from April 1st, 1906, to March 1st, 1910, after the payment of the full dividend of 6 per cent. on the preferred stock in each and every year of such period, and the dividends heretofore declared and paid on the common stock during the fiscal year ended March 31st, 1910.

The company offers to its stockholders pro rata for subscription at par $2,670,000 of common stock heretofore unissued as follows: Each stockholder of record of common or preferred stock at close of business on June 6th, may subscribe for new common stock to the extent of 15 per cent. of his holdings of each class of stock.

Since April 1st, 1906, the company has earned after charges on account of bond interest, sinking fund, depreciation and dividends on common and preferred stock, $2,855,339 annually. Of this $487,977 has been declared in common dividends, leaving available $2,367,361 in the surplus account.

The Dominion Steel & Coal Corporation has issued the following circular to Steel and Coal shareholders:

"The proposed issue of stock of this corporation in exchange for the common stock of the Coal Company and Steel Company has now been arranged. The new stock has been listed on the Toronto, Montreal and Boston Stock Exchanges; transfer agents and registrars have been appointed at these places, and a large number of shares have already been exchanged.

"Shareholders who intend to accept the proposed exchange are respectfully requested to deposit their stock with one of the trust companies mentioned in the form sent on 20th April, or to send the certificates direct to the National Trust Company, Limited, Toronto, who will at once send certificates for stock of the corporation in exchange.

"It is intended to close the transfer books from the 16th June to the 2nd July, and only shareholders of record at the closing of the books will be entitled to the payment of $1.00 per share, accruing on 1st July. Shareholders who are prevented by absence, etc., from exchanging their shares in time should communicate the facts to the secretary for consideration by the board.

"A meeting of the shareholders is to be held on Friday, the 17th June, for the election of directors."

The directors of the McKinley-Darragh Company have declared a three per cent. quarterly dividend for the entire ensuing year, payments to be made in July, October, January, and April. An extra dividend of two per cent. has been also declared for the July period.

This is the first time that a dividend has been declared by a Cobalt company for an entire year ahead of time.

The Calumet & Hecla Mining Company has declared a quarterly dividend of $7 a share. The last previous disbursement was $8 a share, and at this time a year ago was $8 a share. The dividend is payable June 28th to stock of record June 4th.

STATISTICS AND RETURNS

The output of the Dominion Iron & Steel Company for the fiscal year ending May 31st shows considerable improvement over that of the previous like period. Following are the comparative figures:

	Gross Tons	
	1908-09.	1909-10.
Pig Iron	248,097	255,932
Steel Ingots	273,646	302,761
Blooms	246,323	269,810
Rails	133,064	147,948
Rods	50,554	81,001

The output of the Dominion Coal Company during May was 296,000 tons.

TYEE COPPER COMPANY, VICTORIA, B.C.

The return of results of operations at the Tyee Copper Company's smelting works at Ladysmith, Vancouver Island, B.C., for the month of April, with one furnace in blast is as follows: "Furnace ran 28 2/3 days and smelted 7,492 tons, producing 625 tons of copper matte, valued at $71,000." No ore was smelted at these works in January, owing to there having been repairs and improvements in progress that month. The figures for three consecutive months to May 1st are as follows:

Month.	Days Run	Tons Smelted.	Tons Matte.	Value.
February	16	4,354	330	$48,190
March	18 1/3	4,750	270	37,000..
April	28 2/3	7,492	625	71,000
Totals	63	16,596	1225	$156,190

COBALT ORE SHIPMENTS.

Shipments of ore from Cobalt Camp last week were 1,200,029 pounds, divided among nine mines. La Rose and Kerr Lake were the big shippers. Shipments for the year to date are 23,647,609 pounds, or 11,823 tons. Shipments for the week and year in pounds of ore are:

	Week ending May 28.	Since Jan. 1
Beaver	.....	120,450
Buffalo	57,780	883,368
City of Cobalt	.....	363,835
Chambers-Ferland	58,300	349,360
Cobalt Lake	.....	196,000
Cobalt Townsite	.....	68,000
Colonial	.....	107,260
Coniagas	....	623,796
Crown Reserve	148,315	2,529,610
Drummond	.....	664,200
Hargraves	.....	41,800
Hudson Bay	.....	123,695
Kerr Lake	304,336	3,382,337
King Edward	.....	174,966
La Rose	380,988	5,204,199
McKinley-Darragh	.....	1,246,599
Nipissing	56,000	4,428,541
O'Brien	.....	648,046
Peterson Lake	.....	270,450
Provincial (Govt.)	.....	65,000
Right of Way	58,000	654,777
Silver Cliff	.....	117,510
Temiskaming	80,000	501,830
Trethewey	56,300	503,950
Waldman	.....	63,992

La Rose continues to lead the Cobalt mines in tonnage, shipping twice as much ore last week as Crown Reserve or Nipissing, the next largest shippers. Ore shipments for the week ending June 3rd were 1,166,724 pounds, or 583 tons. Total shipments from January 1st to June 3rd were 24,814,333 pounds or 12,407 tons. Shipments for the week and year in pounds of ore are:

	Week ending June 3.	Since Jan. 1.
Beaver	.....	120,450
Buffalo	.....	883,386
City of Cobalt	.....	363,835
Chambers-Ferland	56,000	405,650
Cobalt Central	.....	293,286
Cobalt Lake	.....	196,500
Cobalt Townsite	.....	68,000
Colonial	.....	107,260
Coniagas	63,280	687,060
Crown Reserve	188,486	2,718,068
Drummond	.....	664,200
Hargraves	.....	41,800
Hudson Bay	.....	123,695
Kerr Lake	60,380	3,442,717
King Edward	.....	174,966
La Rose	377,390	5,582,381
McKinley	151,140	1,397,719
Nipissing	127,586	4,556,127
O'Brien	.....	648,046
Peterson Lake	.....	270,450
Provincial (Govt.)	.....	65,000
Right of Way	82,500	757,257
Silver Cliff	.....	117,510
Temiskaming	60,000	561,830
Trethewey	.....	503,950
Waldman	.....	63,922

B. C. ORE SHIPMENTS.

Nelson, B.C., May 30.—Appended are the details of the ore shipment and smelter receipts:

ORE SHIPMENTS.

	Week. Tons.	Year. Tons.
Boundary District.		
Granby	22,518	518,458
Snowshoe	3,457	75,766
Nickle Plate	42	248
Other mines	.....	144,050
Total	26,017	740,571
Rossland District.		
Centre Star	3,121	79,911
Le Roi, No 2	965	13,503
Le Roi, No. 1	501	6,349
I. X. L.	5	46
Le Roi No. 2 (milled)	300	6,300
Other mines	.....	229
Total	5,901	106,358
Slocan Territory.		
Ste. Eugene (milled)	2,775	58,275
White Water (milled)	600	12,600
Van Roi (milled)	800	16,800
Kootenay Belle (milled)	70	1,470
Granite Poorman (milled)	250	5,250
Queen (milled)	420	8,830
Nugget (milled)	110	2,310
Sullivan	242	4,721
Ste. Eugene	224	7,000
Van Roi	32	543
Rambler	21	421
Standard	33	324
Eastmount	32	311
Queen Victoria	61	61
Yankee Girl	109	2,051
M. T. (Trail)	28	28
Silver King	56	1,423
Butta	31	267
Other mines	.....	22,587
Total	5,894	146,277
Total shipments	36,812	993,206
Smelter Receipts.		
	Week.	Year.
Granby	22,518	518,579
Consolidated Co., Trail	9,312	207,109
B. C. Copper Co. (Greenwood)	.....	145,935
Total, tons	31,830	871,623

OPEN-HEARTH STEEL PRODUCTION IN 1909.

The American Iron and Steel Association has just compiled its statistics for the production of open-hearth steel ingots and open-hearth castings in 1909. They show that the total was

14,493,936 gross tons, against 7,836,729 tons in 1908, an increase of 6.657,207 tons, or 85 per cent. The production in 1909 was much the largest in the history of the industry and exceeded that of 1907, the next largest year, by 2,944,200 tons, or 25.4 per cent. In 1908 the production of open-hearth steel for the first time exceeded that of Bessemer steel, the totals in that year being 7,836,729 tons and 6,116,755 tons respectively. For 1909, the figures were 14,493,936 tons and 9,330,783 tons, respectively. The total production of basic open-hearth ingots and castings was 13,417,472 tons, while that of acid open-hearth ingots and castings was 1,076,464 tons.

TORONTO MARKETS.

Metals.

June 8.—(Quotations from Canada Metal Co., Toronto.)
Spelter, 5½ cents per lb.
Lead, 3.65 cents per lb.
Antimony, 8 to 8½ cents per lb.
Tin, 34.50 cents per lb.
Copper, casting, 13.75 cents per lb.
Electrolytic, 13.75 cents per lb.
Ingot Brass, 9 to 12½ cents per lb.

June 8.—Pig Iron.—(Quotations from Drummond McCall Co., Toronto.)
Summerlee No. 1, $23.50 to $24.00 (f.o.b. Toronto).
Summerlee No. 2, $23.00 (f.o.b. Toronto).
Midland No. 1, $22.00 (f.o.b. Toronto.)
Hamilton No. 1, $21.00 (f.o.b Hamilton).
Hamilton No. 2, $20.50 (f.o.b. Hamilton).
Clark's, $20.75 (f.o.b. Toronto).
Cleveland, $21.00 (f.o.b. Toronto).
Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼ inch lump.

Coke.

June 6.—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $1.65 to $1.70 per ton.
Foundry coke, prompt, $2.25 to $2.35 per ton.

June 6.—Tin, Straits, 33.10 cents.
Copper, Prime Lake, 13.00 cents.
Electrolytic Copper, 12.75 to 12.80 cents.
Copper Wire, 14.25 cents.
Lead, 4.40 to 4.42½ cents.
Spelter, 5.45 cents.
Sheet Zinc (f.o.b. smelter), 7.50 cents.
Antimony, Cookson's, 8.37½ cents.
Aluminium, 23.50 to 24.00 cents.
Nickel, 40.00 to 49.00 cents.
Platinum, ordinary, $30.00 per ounce.
Platinum, hard, $35.50 to $36.00 per ounce.
Bismuth, $1.75 per lb.
Quicksilver, $47.00 to $48.00 per 75 lb. flask.

SILVER PRICES.

	New York cents.	London pence.
May 21	53⅞	24 13/16
" 23	53⅞	24 13/16
" 24	53¾	24¾
" 25	53⅝	24 11/16
" 26	53¾	24¾
" 27	53¾	24¾
" 28	53¾	24¾
" 30	....	24 11/16
" 31	53½	24⅝
June 1	53½	24⅝
" 2	53¾	24¾
" 3	53⅝	24 11/16
" 4	53½	24⅝
" 6	53⅜	24⅝

SHARE MARKET.

(Courtesy of Warren, Gzowski & Co.)

Miscellaneous.	June 8th, 1910. Bid.	Ask.
Amalgamated Asbestos	21	22
Dominion Coal Company	65	66
Dominion Steel Company	65	66½
Nova Scotia Steel	83¾	84¼
Granby	39	41
Consolidated Smelting	77	80
Crow's Nest Pass	..	88
Cobalt Stocks.		
Amalgamated	.02	.05
Beaver Consolidated	.26½	.27½
Buffalo	2.25	2.60
Chambers Ferland	.22½	.25
City of Cobalt	.25	.27
Cobalt Central	.10	.10¼
Cobalt Lake	.23	.25
Coniagas	4.80	5.50
Crown Reserve	2.90	2.95
Gifford	.06½	.08
Foster	.14	.16
Green Meehan	.02¼	.03
Great Northern	.07	.09
Hudson Bay	100.00	110.00
Hargraves	.24	.25
Kerr Lake	8.25	8.50
La Rose	4.30	4.40
Little Nipissing	.16⅝	.17
McKinley-Darragh-Savage	.95	1.00
Nancy Helen	.04½	.05½
Nipissing	11.40	11.62½
Nova Scotia	.34	.37
Otisse	.04	.05
Peterson Lake	.22½	.23
Right of Way	...	...
Rochester	.17⅝	.18
Silver Leaf	.08	.08½
Silver Bar	.04½	.05½
Silver Queen	.10	.12
Temiskaming	.62¼	.62¾
Trethewey	1.24	1.25
Watts	.04	.10
Ophir	.20	.50
Wettlaufer	.80	.90
New York Curb.		
Boston Copper	18	18½
British Columbia Copper	5½	6
Butte Coalition	17⅝	18
Canadian Mines	6	6¼
Chino Copper	10⅝	11¼
Davis-Daly Copper	1 1/16	1⅞
Ely Consolidated	.54	.56
Gila Copper	5½	6½
Giroux Mining	6¾	6⅞
Goldfield Consolidated	8⅜	8½
Greene-Canadian	7¾	7⅞
Harcuvar Copper	32	33
Inspiration Copper	7	7 1/16
Miami Copper	19⅞	20
New Baltic Copper	6	8
Nevada Consolidated Copper	19¾	20
Ohio Copper	1 15/16	2
Rawhide Coalition	.24½	.25
Ray Central	2⅜	2½
Ray Consolidated	16½	17
Union Mines	1	1 1/16
Yukon Gold	4¼	4⅜