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EIGHTEENTH YEAR OF PUBLICATION

The Canadian Mining Review

Established 1882

Vol. XIX—No. II. OTTAWA, FEBRUARY 28th, 1900. Vol. XIX—No. II.

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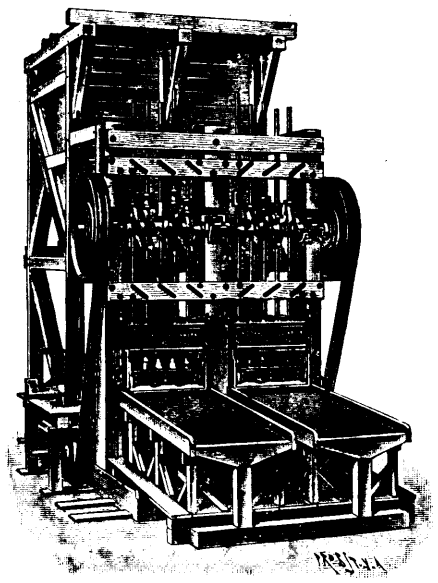

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Established 1882

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B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

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VOL. XIX., No. 2. FEBRUARY, 1900. VOL. XIX., No. 2.

The War Eagle Slump.

To readers of the REVIEW who have followed our articles on mining generally, the announcement of the closing down of the War Eagle and Centre Star mines would be no surprise, but to the vast majority of the public it came like a thunderbolt from a clear sky.

In our issue of July, 1898, we published a warning (under the heading of "The War Eagle Flurry") and in it we pointed out that the value given to the stock was purely hypothetical, and that the return upon the then quotations was entirely insufficient to justify the price ruling. In our issue for December of that year we made an analysis of the second annual Report of the War Eagle Company, in which we showed that, on the face of the report, par was a high price for the shares.

The excuse for the shut down given in the circulars issued by the company under date of February 5th is specious, but not credible to the well informed. It is stated that development has not proceeded rapidly enough to permit of profitably extracting the quantity of ore required by the company's contract with the Canadian Smelting Works at Trail, and that the reason is the inefficiency of the hoisting and air compressing machinery installed last March. Since the month of May this machinery (now condemned as broken down and inefficient) has been in daily commission; it has sufficed to break, and to raise, a product of 2,142 tons of shipping ore in one week from the War Eagle shaft, and has enabled the company to earn a sufficient sum to pay nine or ten monthly dividends of 1½ per cent.

Without in any way attempting to enter into the controversy at present existing between the War Eagle Company and the manufacturers of this "inefficient" machinery, and which we understand is now in the courts, it is quite evident that (1) either the machinery which was good enough to earn dividends for eleven months, is good enough for a slightly longer period, or (2) that the management in the interest of economy should have closed down fully six months ago. For this reason we brand the excuse as specious in the meaning that it is plausible, superficially, but not solidly right. The only other excuse tenable is a shaken confidence on the part of the management in the present or future value of the mine.

The stock exchanges have not been slow to ask explanations from the president, which however, have not been forthcoming, and as the annual report ot the company has not been issued at date of this writing, we are somewhat in the dark as to what the General Manager may have to say regarding reserves and ore values, but we feel sure that the general public will take a warning from this lesson, and will be slow in the future to pin their faith to the unsupported statements of any concern, even though the president and directorate of that concern are wealthy and influential men in other lines of business.

Let us examine for a moment into the wording of the circular issued by the Manager as his grounds for advising immediate closure. The point is made that during the past year (1899) nearly twice as much ore has been stoped and only half as much development done as during 1898. The reason alleged for this is the inefficient character of the air compressor and of the hoisting engine. But we would ask whether it was wise to continue the payment of dividends at the rate of 1½ per cent. per month, if the directors were fully aware of the fact that development must be sacrificed to temporarily please their shareholders by the payment of dividends, and possibly to keep up the price of stock? It is within the knowledge of the REVIEW that complaint was made of this machinery prior to June, 1899, and the management (present and past) must have known that either the development work, or the tonnage required by the smelter contract, would suffer and must suffer. The circular says that these faults have been endured in the hope that they would be only temporary, but it is now evident that this is not possible, and they give to the shareholders the very encouraging item that it will be several months more before it is in shape to produce a tonnage which would yield (or should yield) a dividend. For ourselves, we are not inclined to believe in all the excuses put forth, but are much more inclined to the opinion entertained by several credible and well informed mining men, which is corroborated and substantiated in a measure by a recent statement of the president of the company, and that is that the value of the ore has now reached a point when the payment of the large dividends of the past is purely a matter of conjecture, and perhaps, a matter of impossibility. The local press, both in Montreal and Toronto, has been filled with items and opinions of various shades and purport, but the most important of the paragraphs relates to an interview with Mr. Gooderham, in Toronto, (on November 15th) when this gentleman is quoted as saying that the present production is coming chiefly from the 625 ft. and the 750 ft. levels, and a smaller amount from the old 325 ft. level; on this gentleman's authority the value of the ore is quoted at $10 to $12. Reference to the second annual Report of the Company (under date of November 15th, 1898), shows a gradual decrease in the value of the ore year by year, until its average value for the year ending September 30th, 1898, was only $12.51. We showed in our issue of December above quoted, that this amount was not sufficient to continue the payment of large dividends, and a recent article in the Montreal *Herald* has figured that, under favorable conditions, the cost

of mining and marketing this ore must be close on $9 00 per ton, and has shown clearly that a dividend of 1½ per cent. per month can not be maintained upon ore of this value.

It has been known for the last four years that the War Eagle was a mine containing high grade ore in comparatively restricted streaks or chutes, and that the prior history of the mine showed much more ore of an unprofitable than a profitable grade. We hope the annual report of the company will clear doubts from the minds of the general public as to values and will give good ground for the belief that the mine has yet a profitable future.

The lesson of the whole humiliating business is that the public have been badly humbugged by pinning their faith to a concern solely because its directors contained the names of reputable and responsible business men. Upon this directorate unquestionably must be laid the blame of the systematic robbing of the mine to produce dividends, and to keep up the value of the shares entirely regardless of the future and and permanent welfare of the mine; the question as to whether this has been done to boom the stock and to facilitate the sale of the Centre Star mine is not pertinent at present, but the fact remains that in no published report of the company, and in no statement issued by them has the mine *ever shown reserves of sufficient quantity and value to justify the absurdly high price which the stock has obtained in the market.* And, in a special way, the management in Rossland must also be held responsible, if it has not been strong enough and firm enough to impress upon the directorate the folly of discontinuing development when it was falling behind. The effect of this slump upon the general good of the mining industry in Canada is obvious. The War Eagle has been as widely known perhaps as any other mine in British Columbia or in Canada, and to have a reflection cast, not only upon the mine itself. but upon its management, is sufficient to counteract to a very great degree the deservedly increased attention which Canadian mines have been receiving both from the home and foreign markets. The "Street" has characterized the stoppage as a bit of "stupidity" and bungling on the part of the directorate, but foreign markets do not excuse stupidity nor stop to consider the disqualifications of the men who have been on the Board, rather they will place the blame upon the mine itself, and another black eye will be given to Canadian mines abroad. For years now the REVIEW has endeavored to promote legitimate mining and to show up without fear or favor such enterprises as it believed to be unworthy of public support. While it has had a high opinion of the War Eagle mine, under a proper capitalization and with good management, it has constantly decried the overestimating of values and the booming of stock beyond a value which can be given to it by the actual examination of qualified technical men; and while we are not giving our final word upon this matter until after receipt of the annual report of the company, yet we desire to again impress upon the investing public the advisability of shunning all stocks which are fictitiously boomed or promoted in the interests of a coterie, or of the market, and irrespective of the value of the mine as ascertained by competent technical men. In the light of recent events the following reprint of excerpts from our articles of July and December, 1898, will perhaps be of interest:—

(From THE REVIEW, July, 1898.)

A phase of lunacy, sometimes exhibited by business men, has been on exhibition in Toronto and Montreal for nearly a month. We refer to the sudden and unwarranted jump of War Eagle stock from 90 cents to nearly $3.00 per share. We say "lunacy" advisedly, though fully cognizant of the fact that the bulk of the trading has been done on legitimate stock lines—a man buying to-day in the expectation of selling to-morrow at several points advance. The lunacy comes in in giving to this stock hypothetical values that no living man, competent to judge, believes are in existence in the mine. The highest quotation reached puts a value on the property of about $6,000,000.00, and we believe that we are quite within the mark in saying that no engineer of reputation or prominence in his profession would endorse the property to-day to his clients at one-half that figure.

Buyers for investment are certain to get badly left at present prices, for the return is barely 7 per cent., with no possible guarantee of its continuance. The most staple mining stock in the world (Calumet and Hecla) is returning better dividends than this rate, and the Anaconda, which is paying double this per centage, is not quoted above par.

For a mine that but lately showed more of $10.00 ore than of a higher grade, that made a loss on last year's operations of over $56-000.00, and whose past history has shown its pay ore to lie in comparatively restricted chutes, the present values given to it must be regarded as purely hypothetical and unjustified. A mine of such an uncertain character as the War Eagle should be expected to return from 15 per cent. to 20 per cent. yearly upon its par value, and upon that basis the stock to-day intrinsically is not worth more than par.

The whole of this phenomenal rise savors of Toronto's vagaries, and not the least significant feature is the fact that the stock could not be boosted until a certain Toronto Bank announced that it would lend upon the shares. The crash will come, and when it comes it may be found that certain Torontonians are not beneath; they will be found on top of the ruins, praying louder than ever and donating churches and missionaries to the heathen.

(From THE REVIEW, December, 1898.)

We must confess to a feeling of extreme surprise after reading the second report of the War Eagle Consolidated Mining and Development Co., Limited, dated Nov. 15. Paragraphs which have appeared from time to time during the past season in the daily press, and the very high price to which the shares have been forced during the last five or six months led to the belief that developments must have shown new and large bodies of high grade ore. Our surprise is to find no evidence whatever of such development nor for such a belief, in the printed report now before us.

In the Manager's Report we can find only six lines devoted to "Ore Reserves" the substance of which is that the aggregate tonnage in sight is 100,000 tons of a total gross value of $1,700,000 or a total net value of only $625,000, since the total cost of extraction and treatment (according to Mr. Hasting's figures) is $10.75 per ton.

That the present market value of a mine showing only $625,000 net should be $5,600,000 seemed to us so contradictory that we read and re-read, figured and re-figured, only to end as above said, with a feeling of great and unmixed surprise.

The report is a strong confirmation of the remarks we published in our July issue concerning the share values on the market.

Referring to details of the report, we note, in President's Gooderham's address, that charges for transportation were reduced during the year some $3.50 to $4.00 per ton, but on examining the tabulated figures in the General Manager's Report, we find the difference put at $2.46 only. Moreover, we are surprised to find the difference of only 84 cents per ton between the *net values* per ton received for ore shipped during 1897, when the Directors announced that charges were so high it was expedient to stop ore shipments and the values received in 1898, when the policy is one of pushing shipments It is doubtful whether a smelting proposition, whose policy is dictated by a margin of only 84 cents a ton, can long remain "gratifying" to shareholders

MR. EDMUND B. KIRBY,
MINING ENGINEER,
The New Manager of the War Eagle Mine, Rossland, B.C.

who have gone into it as an investment. Taking into consideration the reduction in charges ($2.46 if we believe Mr. Hastings, $3.50 if we believe Mr. Gooderham) it becomes evident that the grade of ore shipped during the period when the stock was ruling about $2.90 was some $3.30 to $4.34 per ton *lower* than when the stock was ruling at 80 cents; again a matter of surprise!

* * * * * * * * * * * *

President Gooderham's ingenuous statement that the C.P.R. smelter at Trail "continues to smelt at cost" will bring a smile to the faces of the management of the Hall Mines and Northport smelters; what margin there is between $7.50 per ton and *cost* these gentlemen know well.

The financial statement calls for little comment; it is significant to note that but for the sale of 100,000 shares of treasury stock, which brought into the exchequer some $270,000, there would have been no 1½ p.c. dividends and no profit balance of $85,747.

The item of $10,000 for remuneration of Directors, we should think, required some explanation to the shareholders; the work of the Board must have been very heavy to justify such remuneration; and the item of "Interest and Exchange" $8,439.93, is also very heavy but is accounted for, we suppose by the interest on loan from Geo. Gooderham; why this loan was not paid off with the first receipts and why a dividend was declared and paid with this loan account still standing are questions an English company would have to answer satisfactorily

The report is distinctly unfavorable to the maintenance of the stock at any price above par, and we cannot but conclude that the Board is not in sympathy with the coterie of speculators who have manipulated the shares to a price which is wholly unjustified by the facts.

Colliery Consumption.

It is sometimes hastily assumed that at a given colliery a consumption of fuel relatively large to the output reflects on the management; and that the converse is also fair, a relatively small consumption a feather in the cap of the manager; but a proper consideration of the individual conditions at each mine is necessary to arrive at a fair decision. To enable this to be done, the matter should be regarded from two main points of view—the causes leading to a large colliery consumption that undoubtedly are beyond the control of the management, and those that are in part remediable.

The former are due to extra depth, quantity of water to be pumped, waste material to be extracted and where an output is small and restricted by the narrowness of the available market.

The latter have been very fully taken up by Mr. J. A. Longden in a paper read before the Chesterfield and Midlands Counties Institute of Engineers*, and he speaks of colliery consumption as one of the standing charges which help to swell the cost of production of coal, while he admits it is often regarded as outside the power of the manager to effectually control.

The importance of the subject may not be realized when the expense does not show on the mine cost sheets, and the coal used is either not charged at all, or only at a mere nominal price. That the matter is worthy of attention in Canada is apparent on inspection of the returns from mines in Nova Scotia, which are given in the official reports. These show a wide range, but give no explanation therefor. Enquiry, however, brings out the following:—That the coal pits of Nova Scotia vary greatly in depth, and also in the flow of water that cannot be diverted or tubbed back; further, that the practice varies in making out the returns to Government, some mines including, while others do not, the consumption of coal on the railways and workshops, &c., connected with the mines; and again, while some pits extract nothing but good coal, others bring to the surface large quantities of coarse unmarketable coal, for which there is no sale, but which answers well enough for raising steam in colliery boilers. To produce the necessary amount of steam, however, these coarser coals must be used in larger quantities than would be required with clean fuel, and thus the tonnage appearing under the head of colliery consumption is made so much larger than it otherwise might be.

Taking up the second series of causes that enlarge this item of cost of working, the paper of Mr. Longden supplies many illustrations and gives data which may be studied with advantage by the economist.

Engines will suggest questions relating to cut offs and compounding, to packing, jacketing and lubrication, and in short to the general condition in which they are kept.

Boilers will suggest the questions:—Of what make are they? What pressure of steam is carried? How are they set? How stoked? Are they light for the work to be done and forced? And how pure is the water that is used?

Every practical engineer will admit that large economies may be effected under certain circumstances in the directions enumerated, and that the following percentages are not overestimates of improvement possible under conditions still to be met in actual practice.

An efficient cut off will result in a saving of		20	per cent.
Lancashire in place of egg-ended boilers	"	20	"
Coating boilers and steam pipes	"	20	"
Use of economisers and heated feed water	"	20	"
High pressure instead of low pressure	"	20	"
Scale in boilers a loss	"	20	"
Engines out of condition	"	20	"

And an equal amount of economies in several other directions, so that it is not out of the way to say that a dirty, egg-ended boiler, uncovered, using cold water, driving a tumble down engine only produces 11 per cent. of the power which a modern plant, efficient in all particulars, would do for the same consumption of fuel.

In the item of steam pressure, there is at present no difference of opinion as to the economy of substituting for a working pressure, say of 50 lbs. on the square inch, one of 150 lbs.: with a modern cut off, for the saving of fuel may thereby be one half.

In the matter of draught and proper admission of heated air it has been clearly proved that too much air is as bad as too little. Mr. Box in his *Practical Treatise on Heat* shows that by forcing the firing and consuming twice as much coal as is theoretically needed the loss is 15 per cent., by doubling the necessary quantity of air the loss is 23 per cent, but by allowing the fire half the quantity it should have, shows a loss of 52 per cent.

Then the number of trips the engines make with men and timber, and in winding water and dirt form a large and variable item of difference between one pit and another. It has been calculated that the intermittent work of a winding engine might do its duty with 10 lbs. of coal consumed per hour per horse power, but taxed with the extras put upon it, it is found to call for 20 lbs. or more.

In comparison with this result take the report of the South Staffordshire Drainage Commission, showing where steady pumping of large columes of water is accomplished by 6·6 lbs. of coal per horse power per hour; and then further remember, that one lb. of coal theretically should generate heat sufficient to maintain 5 horse power per hour.

* Vol. XXIII. Part I.

Make of boilers: Managers who have used plain cylindrical boilers with ample grate surface and slow combustion, got a fair return, until the growing necessities of their pits called for a larger supply of steam, when the absence of response soon showed itself in the enlarged consumption. Now this make of boiler is seldom seen, and its place is taken by improved Lancashire or water tube boilers. Mr. Longden mentions a case where by the substitution of Lancashire for Cornish boilers, the output fell from 6·4 to 5·3 per cent.; and in another case, where one plain cylindrical boiler used 75 tons of coal per month, two of the same sort to do the same work required only 65 tons and when replaced by one Lancashire the consumption fell to 55 tons per month.

Scale in boilers is another well known source of loss of power and when ⅛-inch in thickness wastes 10 per cent. of the fuel. When ½-inch thick it will raise the temperature of the plates from, say 320° Fah., the normal for a pressure of 90 lbs. per square inch to 700° Fah., and so deteriorate the quality of the iron. Among the advantages claimed for modern boilers with highly inclined water tubes is this, that the formation of thick scale is impossible, in that so soon as it has substance it blisters from off the tubes and drops down into the mud drum.

While a new colliery with modern appliances may be operated with 2½ per cent. of the output for generating steam, 10 per cent. is not uncommon in a heavily watered mine of comparatively small production, and this rate is exceeded where the plant is scattered and several engines are employed to do the hoisting and pumping. On comparing a series of years the Nova Scotia returns show at each of the pits a variation in the colliery consumption synchronous with the energy and regularity with which it is worked.

The Golden Star Fiasco.

The circumstances leading to the slump in the Golden Star should serve as a valuable educational example to mining investors, for we assume that, among those who have suffered, there must have been some whose purpose was to make a legitimate investment of capital, and not to speculate. For the speculators we have no sympathy whatever, but must, rather, indulge in some rejoicing over their discomfiture. They are a worse evil in the mining business than even the scalliwag promoters. They are responsible for more of the mismanagement of mines than any other single cause. It is because of them that mining enterprises are "manipulated," so as to produce rapidly for a time, then to fall off, and so back and forth according to the state of the stock market. It is because of such vicissitudes that mining engineers who are jealous of their reputations will not attach themselves to properties so conducted, and, in consequence, it is always these properties, which are ever in the public eye, with stock fluctuating between the upper air and the nether abyss, that enjoy the poorest, least competent management. A first class man would never allow a mine to be robbed of all its ore-reserves to feed the mill for temporary dividend purposes, to the utter neglect of development. Had the Golden Star gone on quietly developing until a mine was really in sight, the present flurry would not have occurred. The fact, is, there was no warrant for putting up a mill at the Golden Star, at the time of its erection. Evidently, judging from the results, there has been no warrant for putting one up since.

Had all the time which has been spent in running this mine into disrepute, been used for steady development under a competent engineer, a mill might be in order, with a certainty of profitable operation. Instead of that the mine, so far as anything is definitely known of its ore body, has been stripped to boost stock on the market, and now a prudent management will have to labor against the prejudices created by the errors of the past.

Licensing Mine Foremen.

One of the best things that could happen for the mining industry of Ontario would be the revision of the mining statutes in so far as to require that all foremen should be obliged to obtain certificates after proper evidence of fitness, as shown by successfully passing an examination, and giving evidence of a sufficient apprenticeship in well conducted mining operations, so as to insure their ability to assume the responsibility for life and property devolving upon them. Such laws are usual in all parts of the world, and while entailing no hardship upon competent men, serve to protect the mining industry by raising the efficiency of the labor performed, and in consequence decreasing the cost of operations. In many portions of the United States an apprenticeship of five years in actual, continuous, underground work is required, in addition to the creditable passage of an examination before a properly constituted board of examiners. It is also commonly provided that no mine shall be operated for a longer period than thirty days without the supervision of a licensed foreman. This renders it possible for preliminary prospect work to be done by men who may not have qualified as foremen, a provision which is clearly necessary in order to facilitate discovery and exploration of new properties. The mining laws of Ontario are particularly illiberal toward this deserving class, whose efforts should be stimulated, rather than obstructed, in every manner legitimately possible. Revision of the laws in this particular also might justly be undertaken.

But, after all, the number of new discoveries made is out of all proportion to the effective development subsequently carried out. The amount of money expended in so-called development is so great, however, that if it does not throw discredit upon the importance of the reputed mineral wealth of the province, then it must reflect upon the management of the companies or syndicates engaged in exploratory work. We do not believe, where promising prospects exist in such profusion over large areas, that these preliminary showings are as illusory as the results of some years of unprofitable effort would indicate. We do believe that the difficulty lies mainly in the fact that both the miners, and those who direct their labor, are incompetent. If a high grade of foremen should be called into being, this would soon result in an improvement of the body of miners employed. There would be less wasteful development work done, and the mine owners, and the whole community, would profit in consequence. When we see open cuts of vast dimensions being driven, consuming a large expenditure of labor and supplies, with no ore in sight worthy the name after all has been done; when one may count by the dozens, shafts of such size as would suffice for the raising of many hundreds of tons *per diem*, where less than half the expenditure would have revealed the character of the deposits to far greater depths; when instead of concentration of effort on one wisely located working, the energy and money of men who have the courage to take chances in opening up new properties is wasted by distribution among a number of shallow pits, none of which proves anything conclusively; we are forced to the conviction that more intelligent guidance is needed. Although the licensing of foremen is primarily with a view to insuring greater safety in operating, it also insures a broader understanding of correct methods of opening up mines, and hence such a regulation would go far toward improving the condition of the mineral industry of the country. We presume it is too much to expect that mine owners will resort to mining engineers for advice in the initial stages of their undertakings, although it would be to their advantage to do so. Consequently the next best thing is to raise the standard for the men whom they must employ to conduct their operations.

Licensing Mining Engineers.

It is rather curious that the serious consideration of licensing engineers, civil, mining and others, should have preceeded that of licensing foremen, in most of the Provinces of the Dominion. This has been due to the interested initiative of the Canadian Society of Civil Engineers, which seeks to make of the engineering profession in all its branches a close-corporation. If it is fair for the foreman to show skill and knowledge suited to their responsibility before being allowed to accept a position or direct work, so much the more need is there for an engineer to show like fitness for his higher duties. We are in full sympathy with the plan for requiring engineers to be approved by a suitable examining board, just as physicians are tested before being turned loose upon a trusting public. But there the thing should end. Let him show fitness, and, this once demonstrated, accept him. Let us trust the man because of his proven knowledge and ability, regardless of how or where he acquired his special talents, and regardless of the company he keeps. It is wholly impertinent, and a clear restriction of the rights of the individual, to require that he shall b a member of any particular society, before he may be admitted to earn his living by the application of his knowiedge and skill.

One of the worst features of the plan proposed by the Canadian Society of Civil Engineers, which we understand will be pressed energetically once more at the present session of the Ontario Legislature is that a condition precedent to admission within the charmed circle consists in an apprenticeship of two years, on the part of graduates from schools of engineering, to some member of that society, together with fees which to many a struggling but capable young man would be onerous, if not prohibitory. The outcome of this would be, first, that the engineering professions in Canada would be recruited only from the ranks of the well-to do, giving them an aristocratic cast, with an inevitable deterioration of grade, and, second, that it would force the best talent, which invariably comes from the sturdy middle and lower classes, out of Canada into the United States. Canada has certainly suffered enough from the loss of her energetic population by emigration, without adding unnecessary hardships to drive out the young generation of engineers upon whom will devolve the task of developing her larger industries where technical training is requisite. We may, if we choose, establish an inquiry as to the competency of engineers before entrusting them with responsibility, but we cannot afford to restrict their freedom in the manner proposed by this Montreal society.

Electricity in Cyaniding.

Some valuable experiments have recently been reported by T. M. Chatard and Cabell Whitehead, on the application of the electric current as an aid in the cyanide treatment of gold ores. Hitherto the only process combining the use of electricity in cyaniding which gave much promise of an economical application, was that known as the Pelatan-Clerici, which was introduced at De Lamar, Idaho, and later at Republic, Washington. According to Bosqui (Practical Notes on the Cyanide Process), the crushed ore was agitated with a cyanide and salt solution in a vat provided with a mechanical stirrer. While this process was going on an electric cnrrent was introduced into the central shaft, and carried down to iron anodes fixed to the lower part of the revolving arms. The cathode was a bed of quicksilver covering the copper bottom of the vat. The gold-bearing solution is thus decomposed, and the gold amalgamated at once. A charge consisted of 2½ tons, with 2½ to 3 lbs. of K.C.N. and 6 lbs. of salt per ton. The charge was kept in motion by about 20 revolutions of the agitator per minute, for 1 - ½ hours. The amalgam was cleaned up once a month. At the Republic the charge was 3 tons of crushed ore, 10 lbs. of sodic oxide. 12 lbs. of potassium cyanide, 15 lbs. of common salt, and 1 lb. of pieric acid. The extraction at Republic is stated to have been 80 per cent. on an ore averaging about $13 per ton. The objections to this process are that it can treat only small charges, that it is discontinuous, and that such large resistances have to be overcome by the electric current in seeking out the precious metals to be dissolved that only a small part of the energy expended performs useful work. The method devised by Messrs. Chatard and Whitehead is intended to overcome these difficulties. They use what is termed an "Aurex Sluice," a trough, upon the floor of which are laid curved wooden blocks closely butting each other, upon which are placed amalgamated copper plates, curved to fit the blocks, but made slightly smaller, so that they do not touch, the electrical connection being through mercury poured into the spaces between. Above each plate is placed a similarly curved lead anode, but shaped so as to produce a a constriction of the channel sufficient to cause a higher velocity of the current at the centre, which prevents the heavier ore particles settling in the valleys, This arrangement also causes the electric current to exert its greatest effect at the point where the ore particles are brought into most intimate contact with the nascent cyanogen liberated by the action of the current. The beneficial effect of the electric current is shown very conspicuously. In simple amalgamation without the electric current the extraction was only 62.68 per cent. against 65.29 per cent. with the current. Using 0.15 per cent. K C.N. without the current, 66.42 per cent. extraction was obtained, while with a 0.10 per cent. K.C.N. solution 83.21 per cent. of the gold was extracted with the aid of electricity. The method at present is only in an experimental stage, but enough has been done to warrant expectations of success, especially in the hands of so capable a man as Mr. Chatard.

The Treatment of Slimes.

In the treatment of slimes by the cyanide process some notable improvements are being made. The decantation process is winning the day against the filter press method, chiefly because of the larger quantities which can be handled at a small cost. The successive dilution of the decanted liquors is one of the chief drawbacks encountered, necessitating provision for the handling and storage of large bulks of weak solution. In many cases, also, there is difficulty in obtaining large drawings at one decantation of the gold-bearing liquors sufficiently free from aluminous matter to permit of precipitation without soon covering the zinc with a practically impermeable coating of clayey deposit. A simple method for overcoming this trouble is to pass the decanted liquors through a centrifugal machine, such as is built, adapted to this work, by the American Tool and Machine Co., of Boston, Mass. By the use of this appliance the liquors may be drawn down closer to the sediment in the solution vat, all the fine clay in suspension being arrested in the centrifugal machine. The residues thus collected may either be thrown back into the first vat of the series, or preferably retained until a quantity has been accumulated sufficient to warrant separate treatment. By this system the number of dilutions and decantations may be materially reduced. The centrifugal machine should have a lining in the basket made of steel wire Dutch cloth, followed by a second lining of artificial "lamb-skin," consisting of specially woven wool.

The extraction may be greatly increased by a preliminary agitation with the cyanide solution, accomplishing this by circulation with a centrifugal pump.

The amount of true slimes in most ores is far less than the quantity separated under this name in many mills. It is an extraordinary ore indeed, which will produce 20 per cent. of the slimes, and 5 to 8 per cent. is much nearer the average. The true slimes consist of the argillacious portion of the ore, existing in it either as infiltrated clay, or as kaolin from the kaolinization of feldspars, or as hydrous magnesian silicates. The separation of this material from the granular portion of the crushed ore can be very perfectly done by hydraulic classifiers, a system which is being adopted in the best mills throughout the world. As long as the particles are granular, no matter how fine they may be, it is preferable to treat them by leaching. It gives higher extractions, at less cost of manipulation. But mixed sands of all sizes percolate badly, hence the advantage of hydraulic classification, which produces grades each of which will leach readily without "packing" or "channelling." In one large plant in the south-west, where 30 per cent. of the ore issued as so-called "slimes," the adoption of this method reduced the quantity of unleachable true slimes to 14.4 per cent. of the total ore, resulting in an increase of the actual recovery value of the remaining 15.6 per cent. which could then be treated by leaching, from 65 per cent. to 82 per cent.

Proposed Export Duty on Nickel.

The unreasonable agitation for the imposing of an export duty on nickel ores and matte is based upon the statement, the false and misleading assertion, that Canada controls the nickel markets of the world. Canada has never yet produced one half of the world's consumption, as the following table from The Mineral Industry, 1899, will show:—

Year.	Canada.	World's Total.
1893	1,807	4,424
1894	2,226	4,755
1895	1,764	4,420
1896	1,541	4,624
1897	1,813	5,429
1898	2,503	....

The statistics for 1899 are not yet obtainable, but the world's total production will not exceed 6,000 tons, to which Canada contributed about 40 per cent., or say 2,400 tons. New Caledonia is the principal producer, and from it Le Societe Nickel drew about 3,500 tons. This company is preparing to increase its output, and Mr. Higginson, another large mine owner there, is offering nickel ore both in Europe and the United States at very low figures.

Mr. Whitaker Wright, of London, has organized the Nickel Corporation, Limited, to work nickel ores in New Caledonia. The company owns 90 square miles, on the opposite side of the island from the French Nickel Company The intention is to mine and smelt 10,000 tons of 5 per cent. ore a month, equivalent to an output of 6,000 tons of refined nickel a year, or enough to supply the whole consumption of the world. The cost is estimated to be 7½ pence sterling per pound, or say 15½c., a figure at which no mine in Canada can compete.

In Norway last June, the writer examined extensive deposits of nickel ore on the island of Ostero, 16 miles north of Bergen. These are being developed, and within a year, it is expected, they will be producing 300 tons of ore a day, equal to 10 tons of fine nickel. This is equivalent to fully one-half of the world's consumption. The cost of nickel in the matte laid down in England or New York will not exceed 8c. a pound. Labor and fuel are cheap there, and great water power convenient.

In Canada there are other nickel mines being developed besides those of Ontario. The enormous masses of pyrrhotite which are found near St. Stephen, New Brunswick, carry nickel and copper ore in paying quantities, and from near Fort Steele, British Columbia, samples of nickel ore have been sent, carrying from 8 per cent. to 13 per cent. nickel.

Recent important discoveries are reported from Australia, Tasmania, and various parts of the United States.

It will be seen that from producing mines and those in course of development outside of Canada, a yearly production of 13,000 tons fine nickel may be calculated on, which, added to the present production of Copper Cliff, to be supplemented by the output of the Mond and other companies, an annual production of 18,000 tons will be offered in a ruinous struggle to get a share of a 6,000 tons consumption. What will be the effect of an export duty on our Canadian product in the face of such competition?

Metallurgy.

The ores of New Caledonia occur as a silicate of nickel, in combination with no other metals. A special process has been devised and patented by M. Garnier, of Paris, for the smelting and refining of such ores, but is wholly inapplicable to the treatment of our Canadian mattes, which are an alloy of copper, nickel, iron and sulphur. For the separation and refining of the copper and nickel a new process was evolved out of a long series of costly experiments by the President and technical staff of the Orford Copper Company. It is known as the Orford process, and has been patented in the United States, Canada and other countries. Until this process was introduced the Canadian Copper Company could not find a market for its accumulating stock of matte, but the high quality of refined metal produced by the Orford Company makes it a favorite with consumers, both in the United States and Europe.

The matte undergoes a series of six re-smeltings, which require a large consumption of coke and bituminous coal, besides chemical fluxes, and at one stage of the operation it is found highly beneficial to use a certain percentage of New Caledonia ore. None of these materials exist in Ontario, and consequently the cost of the operations would be much increased if these had to be imported for works here.

In the event of an export duty being imposed and a refinery established in Ontario, the miner in British Columbia would be compelled to send his product here and accept whatever price the refiner would be disposed to give, instead of shipping by Vancouver, at low ocean freight, to the best markets in Europe. Likewise, the miner in New Brunswick would be compelled to send his matte west, away from the market, instead of being permitted to take advantage of the natural advantages of the situation, his mines being within gun-shot of tide-water. Would it be just to place the miner at the mercy of the refiner? Or would the Government undertake to establish a smelting and refining rate, to be paid by the miner, or regulate the price of the metals according to their ever-varying market values?

Freight.

Freight from New Caledonia to Glasgow is usually about 20*s*/ (5 00) a ton. From Bergen, Norway, to New York 10*s*/ to 12*s*/ ($2.50 to $3.) From Sudbury to New York, $6.50; to Liverpool, $8.00 to $9.00.

Duty.

Copper and nickel ores, and mattes and nickel oxide are admitted to the United States free of duty. Refined nickel in metallic state only is subject to duty. Two thirds of the refined nickel is used in the United States tn the condition of nickel oxide, and this is admitted free. If an export duty should be placed upon these ores, mattes or oxides by the Canadian Government, the United States tariff provides for an equivalent import duty, thus strangling our nickel trade by a

double handicap. The sales of nickel in the United States last year were:—

Metallic Nickel	2,987,122 lbs.
Nickel in Salts (Oxide)	5,042,425 "

The market of the United States is the best in which our Canadian nickel product can be sold, but an export duty would cut it off entirely.

The quantity of nickel ore, so far as one can see, in Ontario, has been grossly exaggerated. In the light of practical developments, if the estimates made some years ago, by United States officers, were divided by a hundred, the result would be nearer the probable resources of the Province. The deposits are far from being persistent, either in length or depth. Within twelve months the Canadian Copper Company, at present the only producers of nickel in Canada, has had to equip three new mines with very costly plants in order to take the place of those already exhausted.

R. G. LECKIE.

Colliery Returns.

The following returns of the coal trade of the country are incomplete, as we are still without official figures of the output of the mines in the North-West Territory and of British Columbia. We hope however to be able to give these in our next issue.

DOMINION COAL CO.

Mr. Hiram Donkin, C.E., General Manager reports:—"In a general way the future of our operations here is about as follows:—Sinking a large coal shaft with a view of taking out 4,000 tons per day from Phelan seam; sinking slope Phelan seam to give 1,000 tons per day; sinking slope on Emery seam to give 1,000 tons per day.

"It was the intention in the early part of the season to have banked out 300,000 tons coal against next season's demands, but the shipments to the United States have been so heavy so far this winter that little has been spared for the bank. This state of things will be no better until about the first of March, when we probably will have most of the output for March and April to bank out, except of course, the constant supply to the Everett Gas and Coke Company, which is now 2,000 tons per day, and will by the first of May, probably sooner, be 2,500 tons. The demand for Dominion Coal Company's coal is now away beyond the possibilities of the present output. Sales will have to be curtailed for next summer and the summer after; when the shaft and slopes of which I have spoken will give their full production, the output ought to be three millions and a half of tons. This, I understand, is the maximum point of production which the Dominion Coal Company, Limited, will permit.

At present there is a great scarcity of men, owing to the tremendous numbers employed by the Dominion Iron and Steel Co., wages at the mines have been advanced slightly, which is unprecedented for winter work, miners having generally had to suffer a reduction at this season of the year.

For next summer's operations, and as far as I can see for all time following, there will be be from 1,500 to 2,000 men required by the Dominion Coal Company, Limited, in addition to what they now employ. Preparations are being made to comfortably house and look after this large addition to the population here."

Output and Shipments.

	Raised.	Shipped.
Reserve	555,867	
Old Bridgeport		
Caledonia	405,629	
International	211,668	1,540,842 tons.
Dominion	489,326	
Hub	1,486	
	16,654,376 tons.	

Disposals.

Nova Scotia, including land sales	234,847	United States	274,263
P. E. Island	17,833	Steamers	89,773
Newfoundland	55,281	Colliery consumption	39,158
Quebec	813,006	Company Railway	8,347
New Brunswick	50,708	Colliery employees	21,368
St. Pierre	7,721		1,612,305

Recapitulation

Shipped	1,540,842	
Land Sales	2,590	
Colliery and Railways	47,505	
Employees	21,368	
		1,612,305

Labor Employed.

Number of persons above ground	2,000
" " below ground	2,000

ACADIA COAL COMPANY.

Mr. Henry S. Poole, General Manager, reports:—"The year 1900 opens with fair prospects for a steady demand. To meet the growing necessities of depth and extent of workings, a boiler plant will be added to, and a more powerful hoisting engine built by Matheson, of New Glasgow, will be set up in the spring at the McGregor pit."

1899.

	Tons.
Total coal raised	269,250
" coal sold	*238,961
" coke made	14,185
" coke sold	14,288

Labor.

Employed above ground	257
" below ground	555

Coal Disposals.

	Tons.
Nova Scotia	136,471
P. E. Island	21,139
Quebec	24,452
New Brunswick	34,040
Newfoundland	.....
Colliery employees	5,296
Bunker steamers	.....
Engines and coke ovens	47,598
	268,996

*In the item of coal sold we do not include the coal used by our engines.

GENERAL MINING ASSOCIATION, LIMITED.

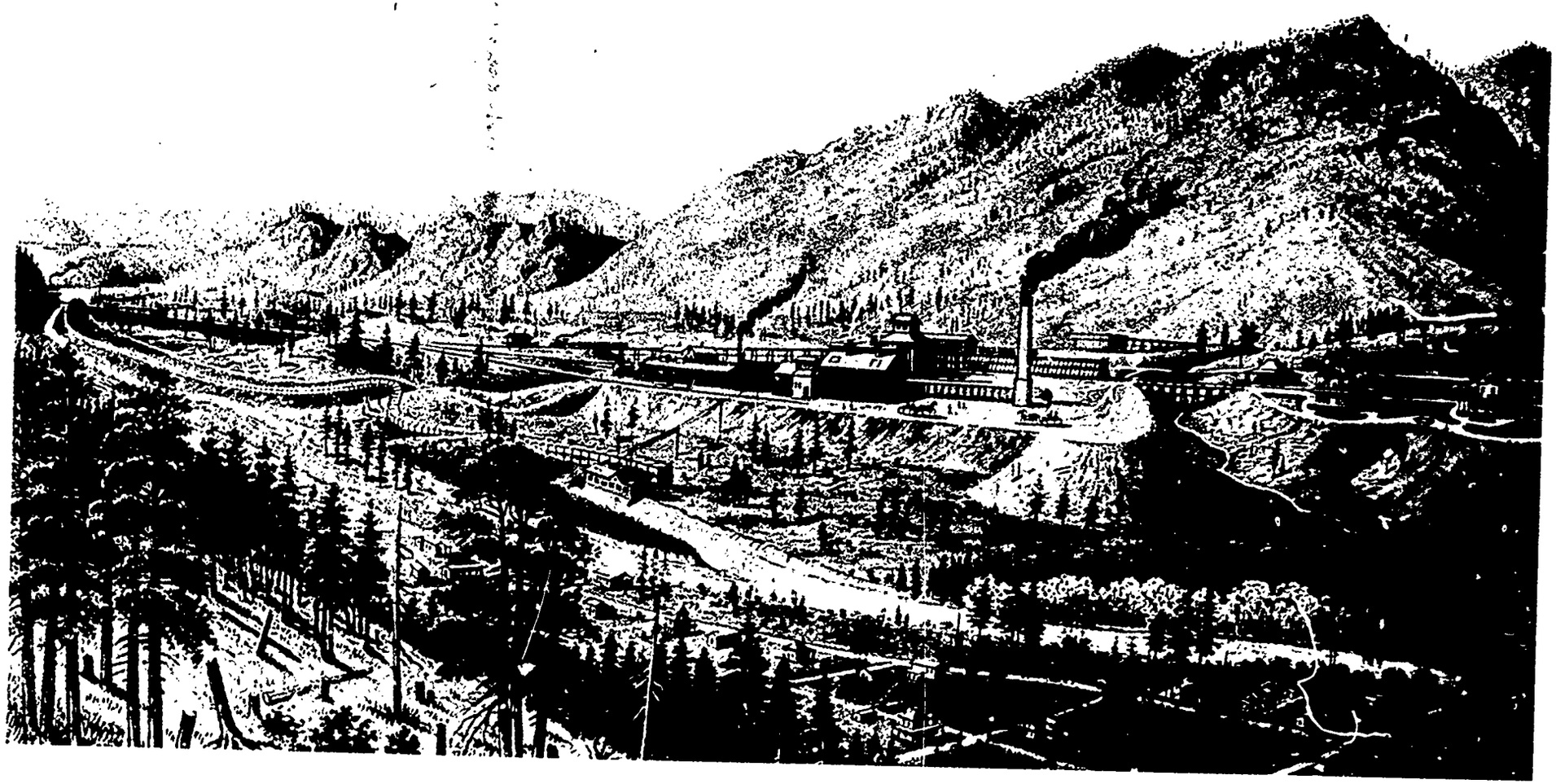
Mr. R. H. Brown, General Manager, writes:—"During the year some exploration and boring were done along the outcrop of the main seam of coal, and a system of waterworks was inaugurated to supply pure water for the use of the colliery workmen and other inhabitants of the town, and to supplement the already existing supply of water for use of boilers, &c., when necessary."

	Tons.
Shipped	221,431
Intercolonial Railway use	9,759
Local sales	7,397
Workmen at the Colliery, &c.	8,576
Coal gifts to widows, &c.	281
Colliery use, fixed engines, locomotives, shops, &c.	18,712
	266,156

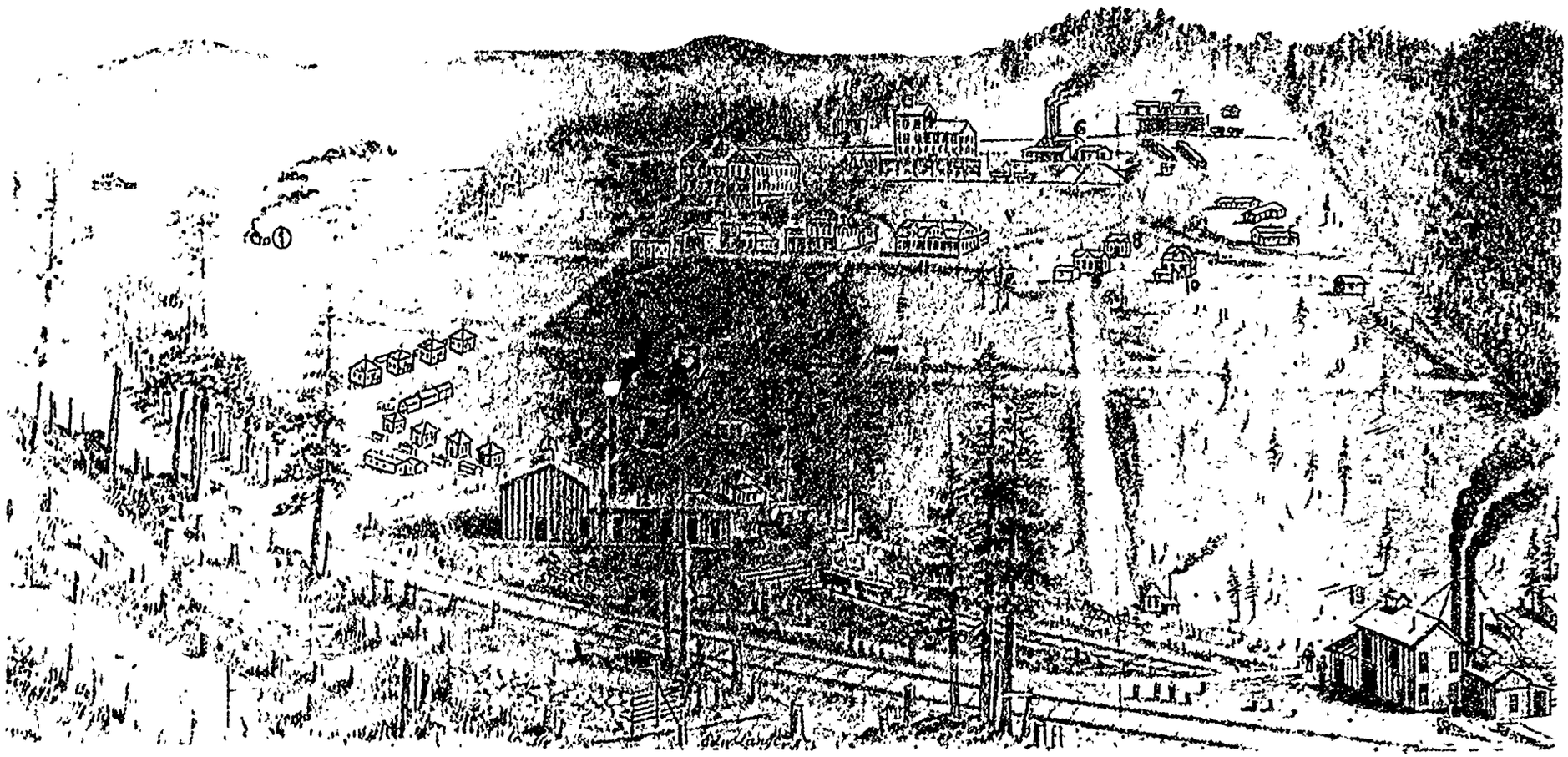
INTERCOLONIAL COAL COMPANY.

Mr. Charles Fergie, General Manager, reports that the outlook for Drummond coal was never brighter in the history of this old colliery.

GRANBY CONSOLIDATED MINING AND SMELTING CO.



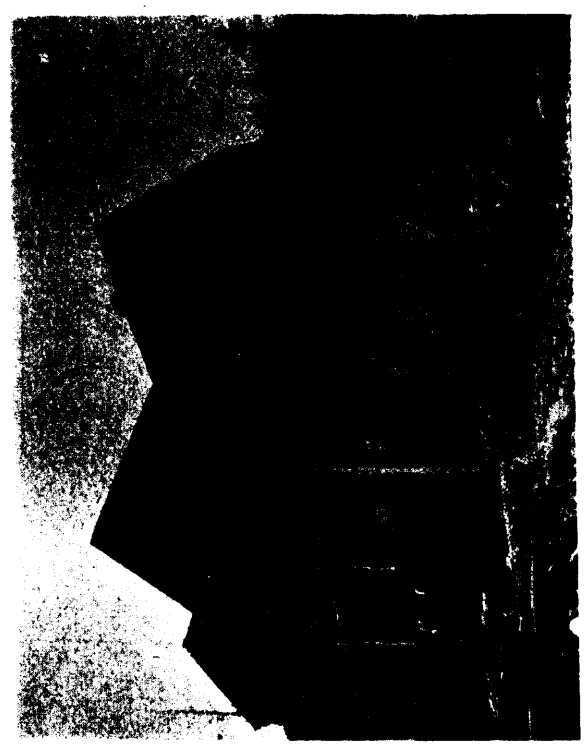
GENERAL VIEW OF NEW SMELTING WORKS AT GRAND FORKS, B.C.



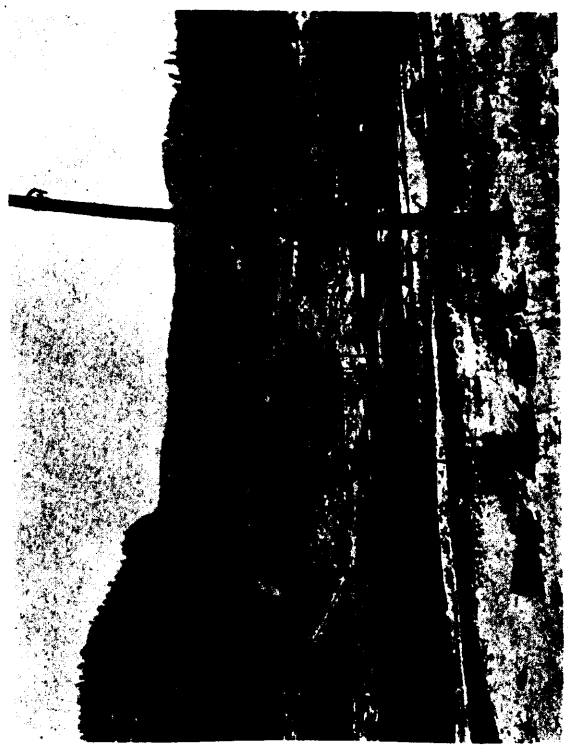
GENERAL VIEW OF TOWN OF PHŒNIX, B.C.

1.—Company's Pumping Station.
2.—Lodging House.
3.—Reservoir.
4.—Victoria and Ironsides Shaft No. 2.
5.—Victoria and Ironsides Ore Bins
6.—Compressor Plant.
7.—Knob Hill Tunnels and Ore Bins
8.—Company's Office.
13.—Brooklyn Plant.
9.—Fireman's Residence.
10.—Agent's Residence
11.—Old Ironsides Hotel.
12.—Stemwinder Plant

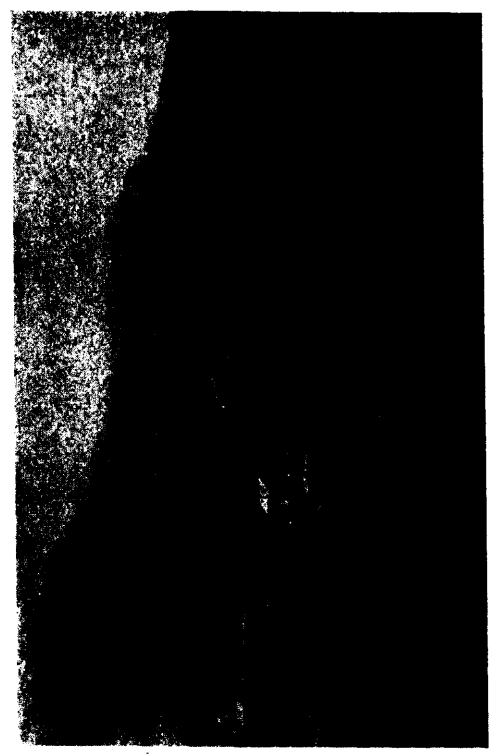
Station No. II Shaft, 200-ft. level, Ironsides Mine.



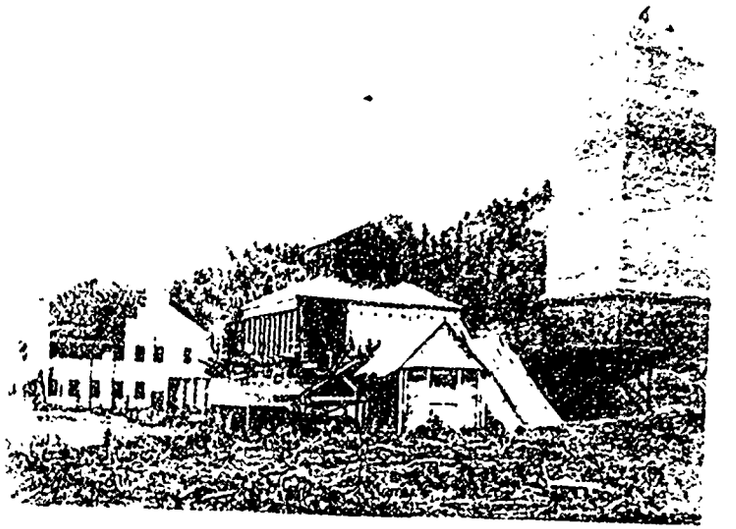
Ironsides Hotel, Phœnix, B.C.



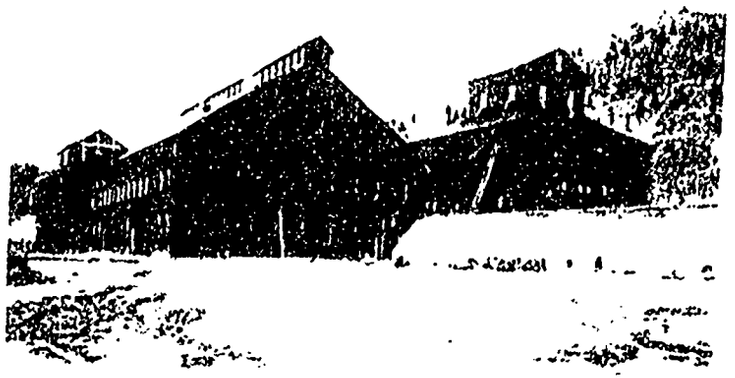
Another View of Works nearing completion.



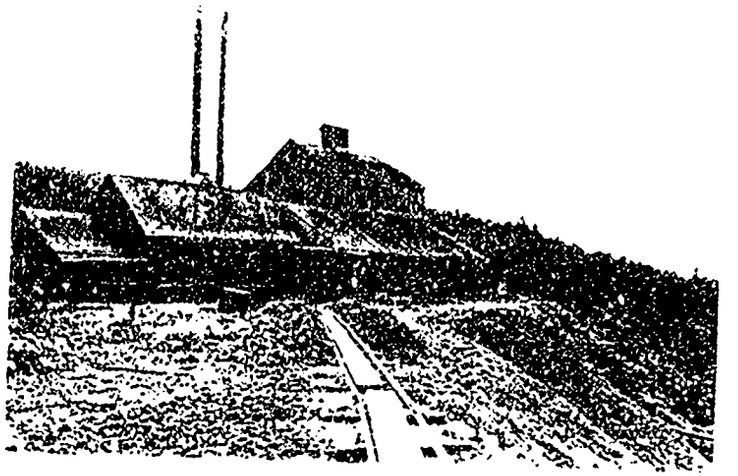
Laboratory, Office, and Superintendent's Residence, nearing completion.



Showing Progress of Construction of the Company's Smelting Plant Nos. [illegible]



Sampling Works, Furnace Room and Dust Chamber

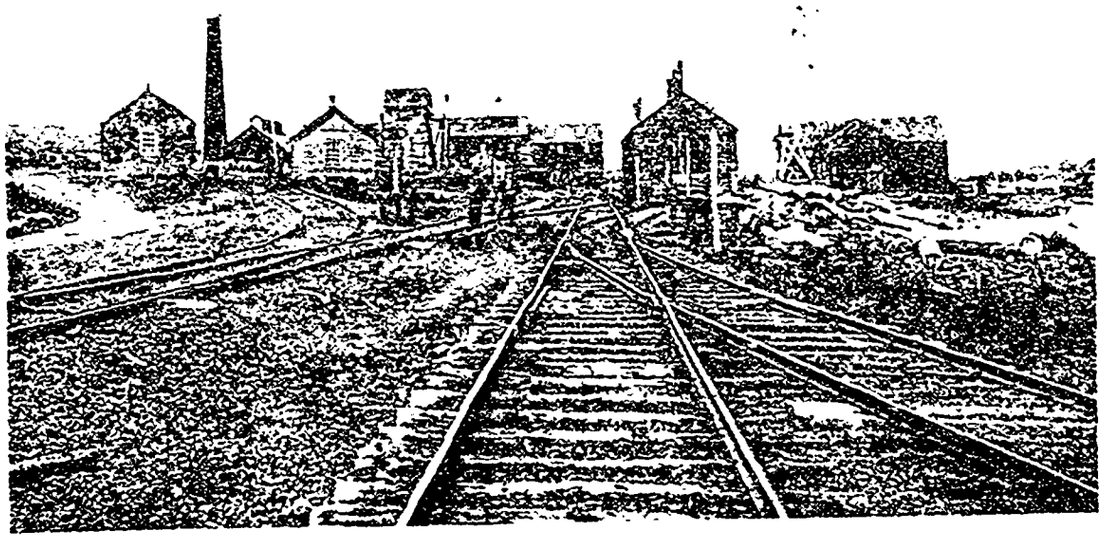


Ironsides Compressor Building

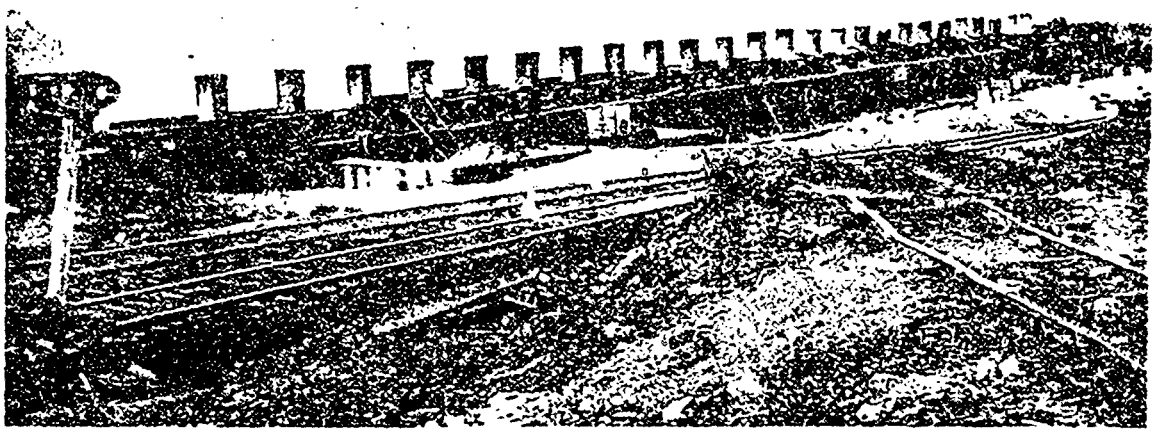
Acadia Colliery, Westville, N.S.—General View from the South.

Acadia Colliery, Westville.—Hoisting Engine House and Screens from the S.W.

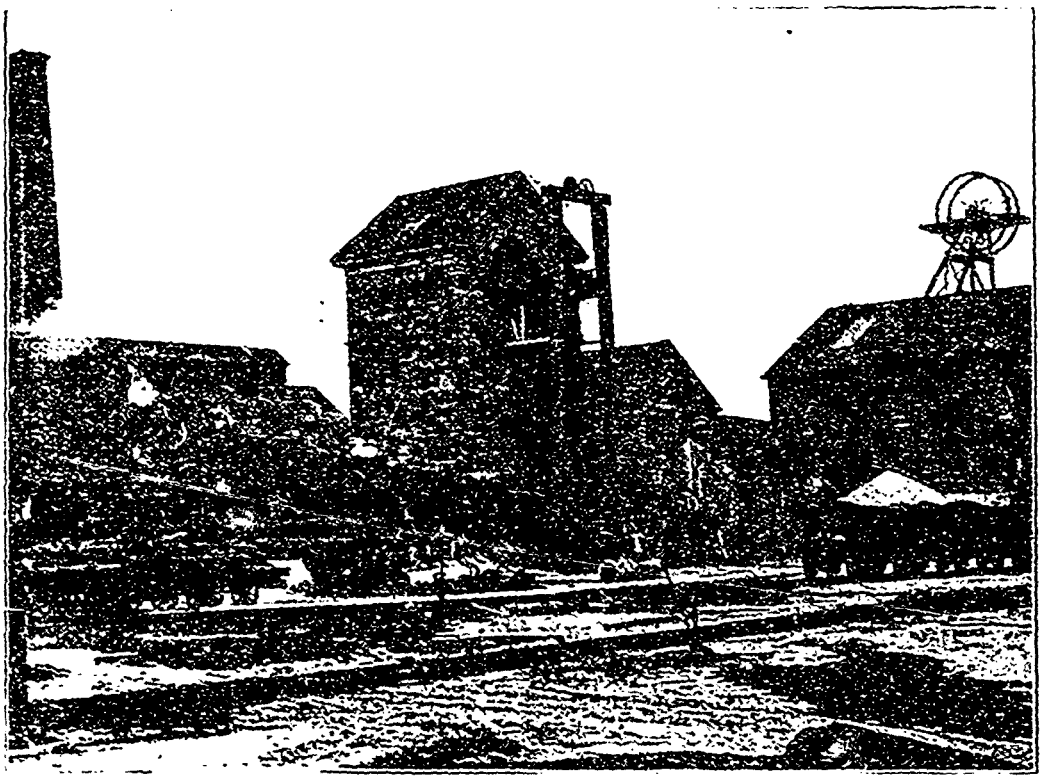
[illegible] Co.'s Westville—Looking towards Slope Entrance Bank Head Screens etc



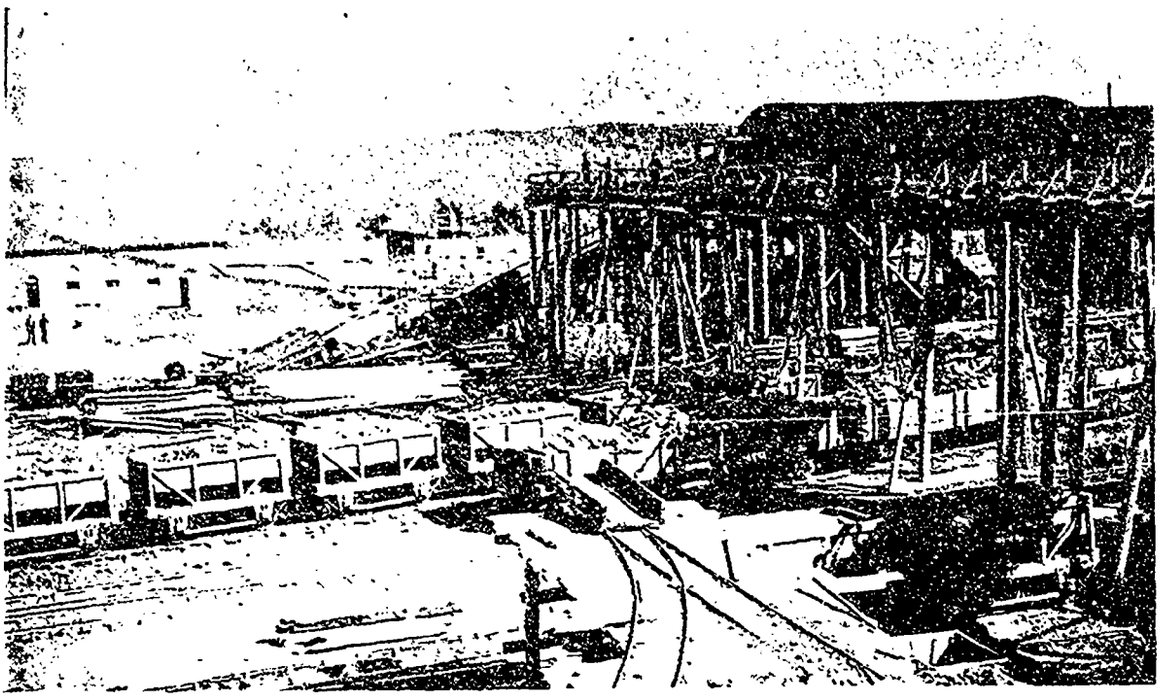
View of Foord Pit Works, Albion Mines, owned by the Acadia Coal Co Limited.



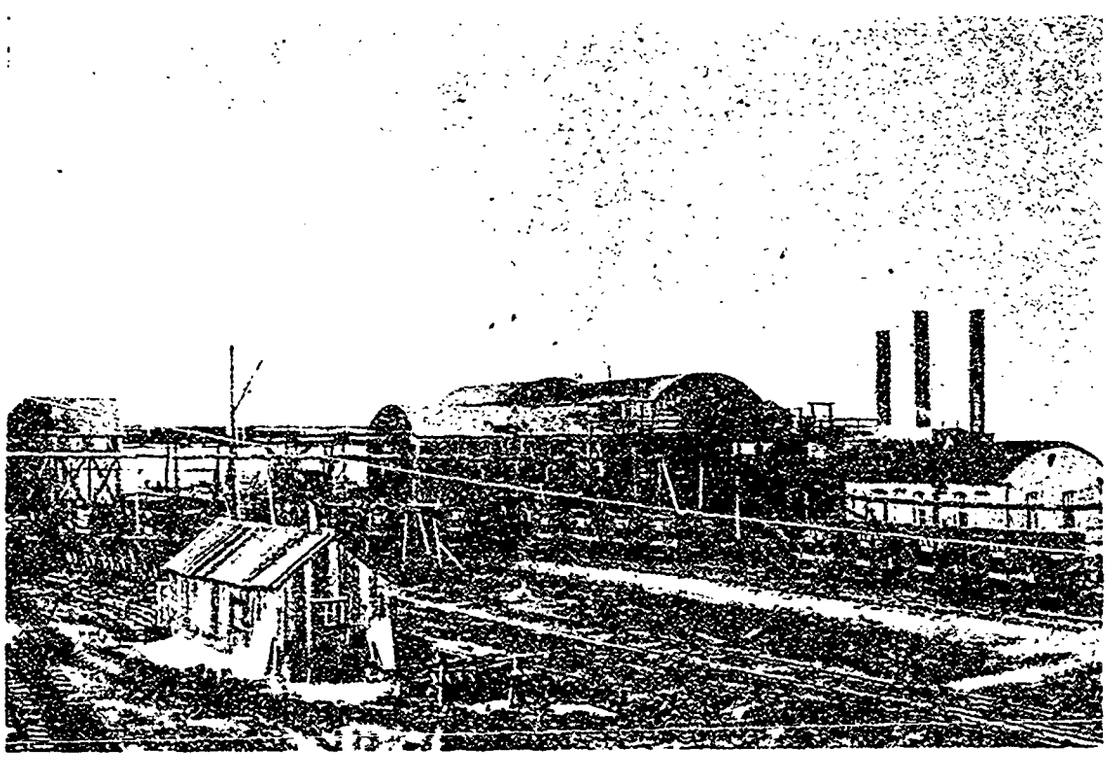
Fifty Bee Hive Coke Ovens at *Albion* Mines owned by the Acadia Coal Co. Limited.



Acadia Coal Co. Limited—Lank-Head and Pumping Shaft, Foord Pit, Stellarton, N.S.



Hoisting Engine House Bankhead, Screens etc., of the Albion Colliery of the Acadia Coal Co



Slope Entrance and Bank-Head, Albion Colliery of the Acadia Coal Co. Limited.

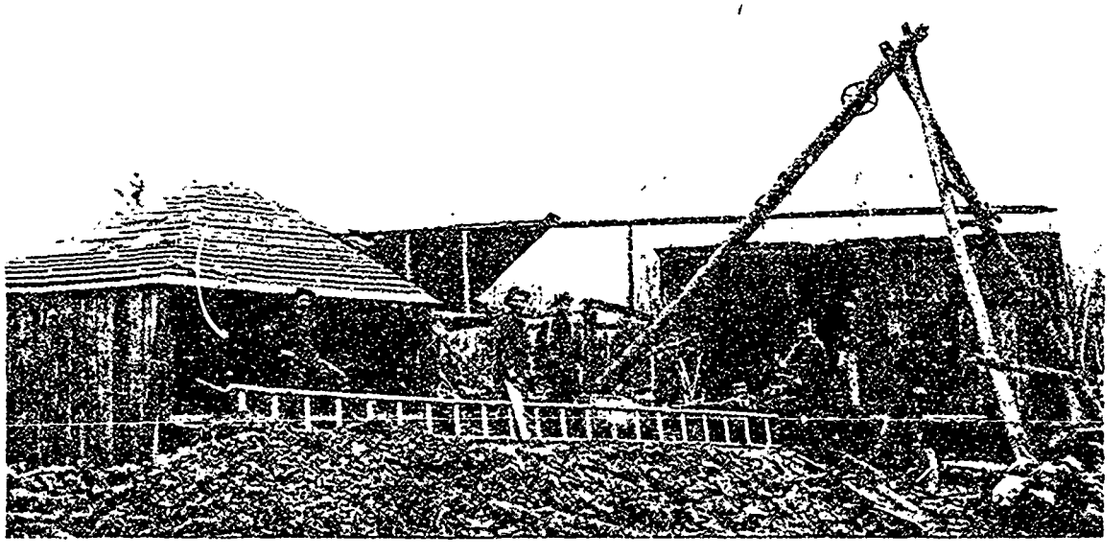
Mikado Mine Mill and Camp

Sirdar Gold Mining Co.—Sirdar Shaft No. 1

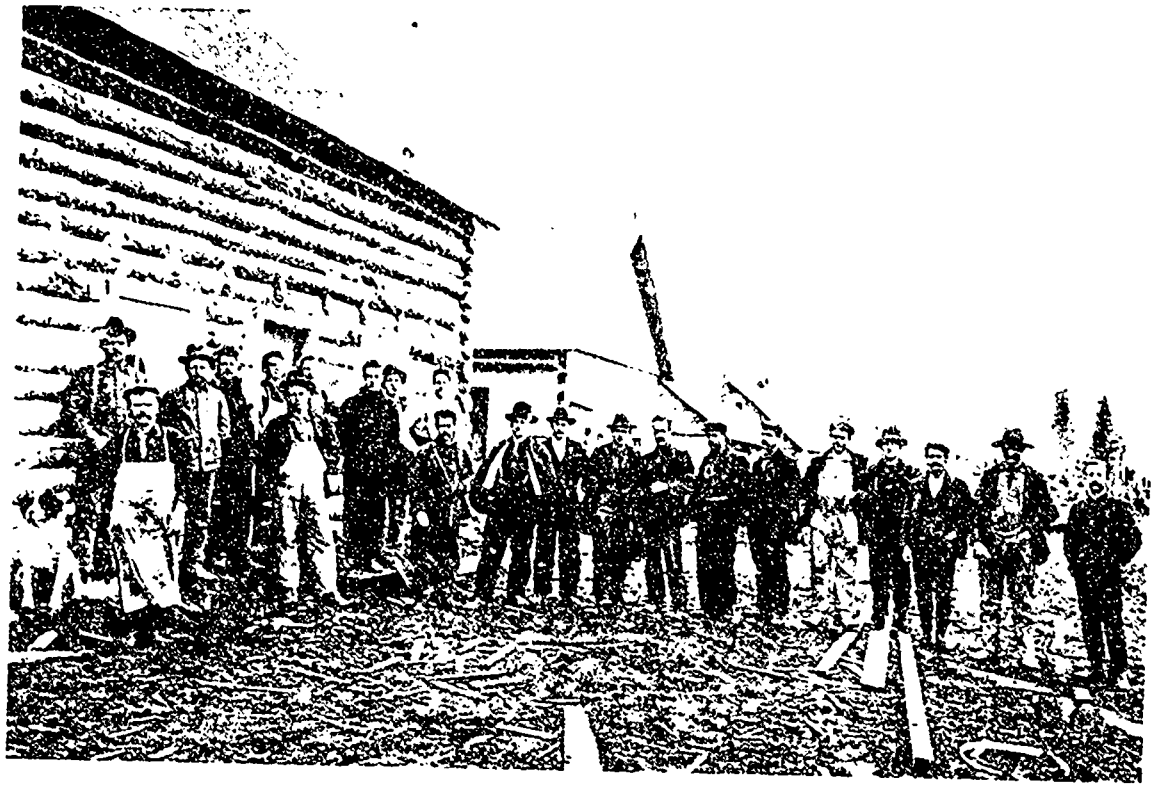
General View of the Mikado Mine and Mill.

Bullion Gold Mining Co.—Shaft No. II.

Rear View of Sudar Shaft No. 1



Imperial Shaft.

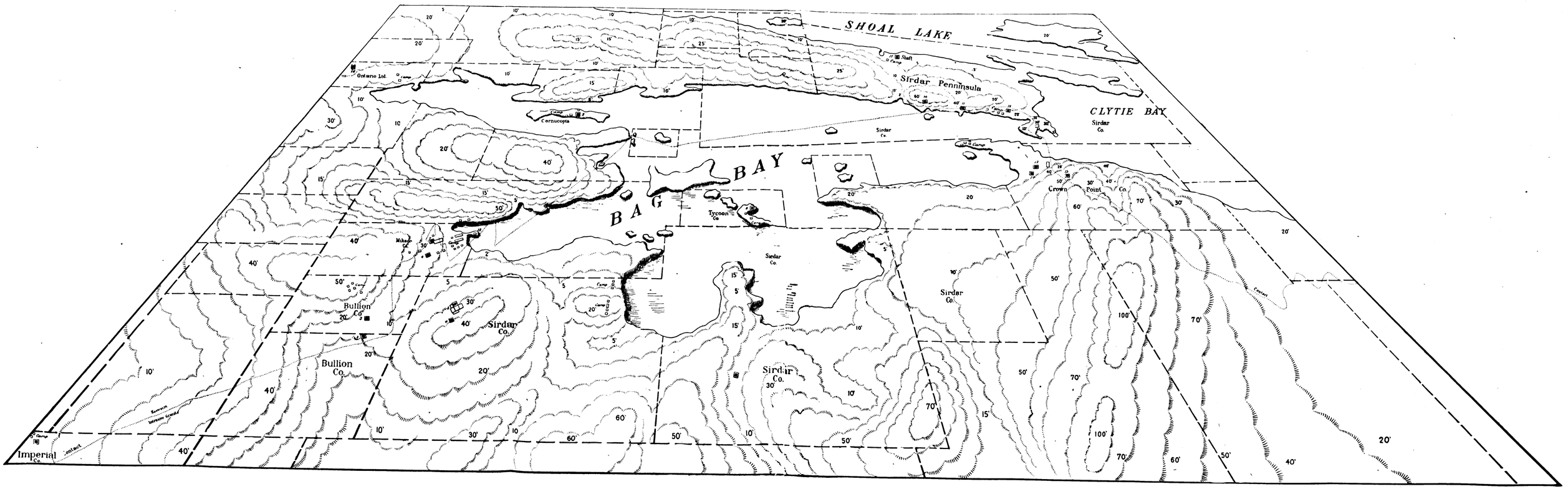


Sirdar Camp

Residence of the Manager of the Sirdar properties.

Bird's Eye View of the Bag Bay Gold District

LAKE OF THE WOODS, ONT.



No. 1.—Shaft of Imperial Co., high poppet head.
No. 2.—Shaft No. II of Bullion Co., high poppet head.
No. 3.—Shaft No. I Bullion Co., Horse Derrick.
No. 4.—Shaft No. II Sirdar Co., high poppet head.
No. 5.—Shaft No. I Sirdar Co., high poppet head, two boilers, air compressor house, etc.
No. 6.—Shaft No. II Mikado Co., high poppet head, one boiler house.
No. 7.—Shaft No. I Mikado Co., high poppet head, 3 boiler smoke stacks, 20 stamp mill, cyanide plant, extensive camp and 10 family houses.
No. 8.—Shaft of Cornucopia Co., high poppet head.
No. 9.—Shaft of Tycoon Co., high poppet head.
No. 10.—Shaft of Sirdar Co., no head gear.

No. 11.—Shaft of Sirdar Co., no head gear.
No. 12.— " " horse derrick.
No. 13.—Shaft of Crown Point Co., high poppet head, close by 5 stamp mill.
No. 14.— " " " no head gear.
No. 15.— " " " horse derrick.
No. 16.—Shaft of Ontario Co. Ltd., no head gear.
No. 17.—Shaft of Sirdar Co., no head gear.
No. 18.—Residence of Mikado manager.
No. 19.— " Crown Point manager.
No. 20.— " Sirdar manager.

The open squares mark houses or mills.
The inked squares mark shafts.
The figures mark height in feet.
The lines mark areas of equal elevation.

Coal Disposals.

	Round.	Slack.	Total.
Nova Scotia	53,470 14	33,930 14	$7,401 12
New Brunswick	13,529 09	2,132 17	15,662 06
Prince Edward Island	13,505 10	8,555 10	22,061
Quebec	51,035 02	16,535 09	67,570 14
Ontario	190 4	0	19 04
Newfoundland	111 19	0	111 19
Coke ovens	66	8,140	8,206
Colliery employees	3,055	21 19	3,076 1
Colliery engines	3,847 04	9,144	12,991 0
	138,640	78,460	217,100

Coke Made.

1899 ..... 4,359 3/5 tons.

Labor.

Above ground	137 men.	24 boys.	9 horses.
Below ground	269 "	74 "	16 "

CUMBERLAND RAILWAY AND COAL COMPANY.

The total sales from the collieries at Spring Hill amounted to 349,715 tons, or an increase of 27,172 tons ahead of 1898. The figures were:—

Coal Sales, 1899.

	Tons.
Nova Scotia	109,782 1/4
New Brunswick	186,138 1/4
Quebec	41,941
United States	11,853 1/2
Total	349,715

CANADA COALS AND RAILWAY COMPANY.

The returns from Joggins Colliery are:—

Coal Disposals, 1899.

	Tons.
New Brunswick	42,260.08
Nova Scotia	3,921.14
Quebec	10,395.19
Colliery employees, engines, etc.	6,365.01
Total	62,943. 2

CAPE BRETON COAL MINING COMPANY.

Mr. J. T. Burchell, Managing Director of this company's colliery New Campbellton, C. B., resports:—"Our shipments you will notice exceed the previous years by a few tons, and would have exceeded this by at least 4,000 more had we not lost the early part of the season by an accident in the mine. The outlook for the coal trade is better than we have ever seen it in our experience of sixteen years, and had we been prepared for the increased demand the past season, we could easily have disposed of from forty to fifty thousand tons. We are pushing the development and equipment this winter, and expect to be in a good position next spring to meet the increased demand. As you will notice, our property has passed into the hands of the Cape Breton Mining Co., Ltd., incorporotad by Act of the Nova Scotia Legislature last winter with a capital of $500,000."

Coal Disposals.

	Tons.
Quebec	912
Newfoundland	166
Nova Scotia	7,133
P. E. Island	1,811
New Brunswick	35
St. Pierre	....
Other countries	....
Colliery consumption	1,880
Colliery employees	720
Total	12,657

Shipment of "Dolomite" 2,000 tons.

H. W. MCNEILL COMPANY, LIMITED.

Mr. W. F. Little, Manager, advises the returns from the collieries at Antracite and Canmore to have been—

Anthracite	22,000 short tons.
Canmore	92,000 "
Total	114,000

BRITISH COLUMBIA.

The year 1899 beat all previous records in the coal industry of Vancouver Island. Nanaimo as usual took the highest position, both in the output of coal and foreign shipments. The total output for the year again overtopped the million mark, being 1,166,251 tons. The annual output only reached the million point in three previous years —1898—1,117,915 tons; 1894—1,012,953 tons, and 1891—1,029,098 tons of coal. The foreign shipments also show a corresponding increase, the New Vancouver Coal Company exceeding all other collieries combined, both in output and foreign shipments. Estimating the output from the Fernie mines at 60,000 tons we get the total out-put for the province as 1,226,251 tons.

Bounties Paid in 1899.

The following are the official returns of the bounties paid by the Dominion Government, during the fiscal year ended 30th June, 1899:—

BOUNTY ON SILVER ORE.

Hall Mines Co. ($37,171.33):	
Mined in 1895-96, 14,539 tons at 50c.	$7,269 50
" 1896-97, 35,426 tons (proportion of $30,000)	11,876 00
" 1897-98, 61,287·3 tons (proportion of $30,000)	18,025 83
British Columbia Smelting and Refining Co. ($32,693.49):	
Mined in 1895-96, 5,190·6385 tons at 50c	2,595 32
" 1896-97, 54,063·6595 tons (proportion of $30,000)	18,124 00
" 1897-98, 40,711·8565 tons (" ")	11,974 17
Kootenay Smelting and Refining Co.:	
Mined in 1895-96, 13,599.576 tons at 50c.	6,799 79
	$76,664 61

BOUNTY ON PIG IRON.

Canada Iron Furnace Co.—	
6,826·975 tons from Can. ore at $3	$20,480 93
Ham. Blast Furnace Co., ($96,069.98)—	
12,828·50 tons from Can. ore at $3	38,485 50
28,792·24 tons from foreign ore at $2	57,584 48
Nova Scotia Steel Co. ($64,111.41) Increased allce. (61 Vic., c. 11),	
2,246·943 tons from Can. ore at $1	2,246 94
1,202·075 tons from foreign ore at $2	2,404 15
Production of 1898-99—	
10,384·28 tons from Can. ore at $3	31,152 84
14,153·74 tons from foreign ore at $2	28,307 48
John McDougall & Co.—	
270·678 tons from Can. ore at $3	$12 03
Deseronto Iron Co.—	
3,240 tons from foreign ore at $2	6,480 00
	$187,954 35

BOUNTY ON IRON PUDDLED BARS.

Ontario Rolling Mills Co.—	
5,837·015 tons from Can. ore at $3	$17,511 02

BOUNTY ON STEEL INGOTS.

Nova Scotia Steel Co.—	
Increased allce. (61 Vic., chap. 11), 3,148·88 tons manufactured between April 22, and June 29, 1897, at $3	$9,446 65
Less previously paid	4,829 19
	$4,617 46
Production 1898-99—	
23,342·275 tons at $3	$70,026 82
	$74,644 28

Canadian Mining Institute.

The annual general meetings of this representative organization will be held in the Windsor Hotel. Montreal, on Wednesday, Thursday, and Friday, 7th, 8th and 9th March next. As will be seen from a reference to the subjoined list of papers, the programme is one of unusual excellence.

By special arrangement with the railways members and Canadian mining men attending these sessions will be carried to Montreal and return on all Canadian lines for a single fare. Sessions will be held three times each day except Friday when, instead of the evening session, a smoking concert at the Club House of St. George's Snowshoe Club will be given. The attendance of Canadian mining engineers and mining men promises to be large. The syllabus of papers is as follows;—

"Notes on the Mining Law of Ontario." By Mr. J. M. Clark, Q.C., Toronto

"The Treatment of Low Grade Silicious Ore of the Rossland Camp by Cyanide." By Mr. Gerald V. Hopkins, Silica, B.C.

"Notes on Mine Pumps." By Mr. C. E. Morgan, Toronto, Ont.

"Notes on Coarse Concentration at Whitewater, B.C." By. Mr. S. S. Fowler, S.B. E.M., Nelson, B.C.

"Natural Gas in Ontario." By Mr. Eugene Coste, E.M., Toronto, Ont.

"Results in the Use of a Rotary Pump as Against that of the Straight Line Type." By Mr. Charles Fergie, M.E., Westville, N.S.

"The Eight Hour Law in British Columbia and its Consequences." By Mr. Bernard MacDonald, M.E., Rossland, B.C.

"Notes on the Iron Deposits of Bell Island, Conception Bay, Newfoundland" By Mr. R. E. Chambers, M.E., New Glasgow, N.S.

"The Klondyke and Atlin Gold Fields in 1899." By Mr. Eugene Coste, E.M., Toronto, Ont

"The Factors in Concentration." By Mr. Fredk. T. Snyder, E.M., Chicago, Ill.

"On the Gravel Benches of the Klondyke." By Mr. R. G. McConnell, B.A., Ottawa.

"Recent Advances in Electro Metallurgy." By Dr. W. L. Goodwin, Kingston, Ont.

"Notes on a Prospecting Trip in Northern Omenica, B.C." By Mr E. C. Musgrave, Duncan, B.C.

"Notes on a Gob Fire." By Mr. O. E. S. Whiteside, B.A. Sc., M.E., Anthracite, N.W.T.

"On the Petrographical Character of the Ore from the Republic Camp By W. F. Ferrier, B.A. Sc., M.E., Rossland.

"Notes on the Atlin Gold Fields" By Mr. J. C. Gwillim, M.E., Ottawa.

"The Canadian Iron Industry in 1899." By Mr. George E. Drummond, Montreal.

"The Iron Ores of Hudson's Bay" By Mr. A. P. Low, B.A. Sc., Ottawa

"Notes on West Kootenay Ore Bodies." By R. W. Brock, B.A., Ottawa.

"Some Methods of Ventilating Prospect Shafts and Tunnels." By Mr. Alex. Sharp, M.E., Rossland.

"Electro-Metallurgy in Canada." By Dr. W. T. Gibbs, Buckingham.

"Notes on the Nickel Question." By Major R. G. Leckie, Sudbury, Ont.

"British and American Methods of Underground Photography" (Illustrated by Lantern Projections By Dr. J. B. Porter, M.E., Montreal.

"Notes on the North Star Mine" By Mr. J. L. Parker, M.E., Cranbrook, B.C.

"Are there Diamonds in Ontario" By Mr Archibald Blue, Toronto.

"Notes on Mining in Central Ontario." By Mr Chas. L. Meyer, Ottawa

Le Roi—The manager of the company at Rossland cables: "Le Roi survey completed, showing that the No. 3 ore shute developed in the lower workings should yield at least 1,500 tons per foot vertically on the vein of the usual average smelting ore. Crosscut to the south from the 500 feet level intersected Black River vein, which carries 4 feet smelting ore The north vein, the outcrop of which carries high grade ore, has never been tried below the surface This could be easily and cheaply developed by cross-cut to the north from the mine workings when air compressor machinery erected ready for work. Ore reserves practically in sight immense. Could double output if new shaft completed, whilst expenses per ton 2,000 lb. could be largely reduced."

Bird's-eye View of the Bag Bay Lake of the Woods.

There is no denying, that it may be more profitable to scrutinize a mining section from a window of Pluto's workshop, than to gaze at it from the clouds. Now, you will at once perceive from the above, that a mining section, like any other thing, has two sides to look at and if I undertake to exhibit in this issue of the CANADIAN MINING REVIEW, a Bird's-eye View of the Bag Bay, it is because I can but guess at the other side beneath, the reason of my shortcoming being, that we are not far enough "down."

However, also the upper side is interesting. It is, for instance, quite sufficient, to cause the Rat Portage editor calling it the greatest gold mining district in the "world," and this is better than any broker can expect. But he, whose pocket-book is interested, would rather prefer to see the "dark side" too. Though so desirable the realization of such an idea may be, there is no other way to get at it but that of labor, patience and sacrifice.

The first stage of natural proceedings to find the lodgings of the precious metal, has passed. The so-called prospectors, equipped with a hammer and a desire to hit upon a rip of quartz sticking out of the ground, has become superfluous and I venture to assert, has been always so. I do not say that his method at all is objectionable in every case and country, I only say that the peculiar geological structure of the Lake of the Woods has proved same to be insufficient and unreliable when applied to this district.

The Bird's-eye view shows conspicuous signs of mining activity. On the shores of the Bag Bay there are at present about 300 men employed, partly in the production of gold, partly in developing ore bodies and partly in searching for such. While the two first factors are noteworthy for their persistency, the last one is rewarded by success, not at the least in such places, where the quartz-prospector after having turned every stone, gave up all hope.

This is due to the fact, that gold is not associated with quartz only. There exist bodies of this fine mineral, which will not assay better than so much sea water, while a granite dyke far advanced in decomposition and therefore, looking sentimental, will warrant the erection of a stamp mill.

Another deceptive feature of quartz lenses and stringers is their contents of gold, magnificent in quality and quantity at the surface; while ten feet or so down the splendour is gone, gold and all. This feature is observed all over the district. Hence, it happens, that twenty ton loads, which means the whole reef at once, are shipped to the mill, so as to have a test made on ore broken at the surface.

It is frequently the case, that such lenses or stringers prove to be pointers for more reliable material existing in the neighborhood. If they are traced up or down, they will mainly be found butting against a small belt of more or less stratified rock, sandwiching a hard clay or quartz sand, that contains gold in payable quantities. Its homogeneousness is a prominent attribute. By the way I may say, that it often requires a keen observer to discern the slatey character of such a belt, but a guide may be found in the fact, that on its area the work of decomposing agencies is more pronounced than on that of the surroundings, and that in consequence plants thrive on such areas more vigorous; besides the diamond drill is an excellent instrument.

As is well known, there exist in the Bag Bay section a contact of the Keewatin series of rock and intrusive granite. A small portion of the contact line is given in the Bird's-eye View.

Referring to gold occurrences, the importance of this contact is well testified by the fact, that the mines cluster in its zone and that prospecting is done preferably along this line.

There are many other geological and topographical features, which this article is not meant to deal with. Mention may be made of innumerable felsite dykes, partly pre—partly contemporary to the formation of gold deposits. The main dyke of over 300 feet wide, runs tangential to the granite boss, sending, at the entrance of the Bag Bay, three branches of each 100 feet wide through the granite and parallel to the contact.

These felsite eruptions are less prominent on account of their intrinsic value, but they are answerable for those torsional movements and lateral displacements, that have taken place; shattering and rending the rock, opening of cavities and thereby forming courses for gold bearing solution were the natural effects. Illustrations of such occurrences are given at rhe Mikado and Sirdar peninsula.

There remains still much to be done in the way of rational prospecting. The study of every neck of land, of every point stretching in the lake, of every small cascade of water, of every rip and patch of felsite at the surface, of every form of swamp and high wall with its sunken hanging will act like Rontgen rays throwing light on the "dark side"; and if this study is facilitated by intelligent mapping, the prospector is enabled to do his work economically.

THEO. BREIDENBACH.

Stoping With Machine Drills.*

By B. L. THANE, SUMDUM, ALASKA.

Within the past few years, the mining industry has taken a new impetus in all its branches. New mines are being opened every day, while old ones, which have been either working at a loss, or have been compelled to shut down, are now gradually being reopened and placed on a paying basis.

This growth and new life is due, in a measure, to the discovery of new mining districts, but the most important cause of the progress is the wonderful advance that has been made in all branches of mine-engineering.

By means of the important inventions and discoveries that have been made in mechanics, chemistry, and electricity, we are now able to work ores which, only a short time ago, would have been regarded as worthless. We find, for instance, the electrician eliminating two of our greatest difficulties, those of distance and superior elevation, while the mechanic has brought to the highest degree of perfection, not only ore-crushing and hoisting machinery, but all such devices as pertain to the mechanical handling of ores and, at the same time, the metallurgist, with his combined chemical and mechanical skill, has helped us to extract the precious metals from the most refractory of ores.

But when we turn to examine methods in actual use for mining or breaking ore, we are surprised at the small amount of progress that has been made in this direction. In the handling of the ore after it is broken, almost everything has been done to reduce the operation to its simplest and cheapest mechanical form, and every form of engineering skill has been brought to bear upon the problem. But the work of the engineer usually ends with the erection and installation of the machinery that he has designed. His interest rarely reaches to the details of breaking ore; this is supposed to be the peculiar province of hand-labor. This branch of the business is usually under the immediate supervision of men risen directly from the ranks, who have learned to do exactly what was done before them, and, assuming without question that this is the only method, have bent their energies towards bringing that method to the highest degree of perfection.

There is no intention of denying the value of such work; for it is done well, and the energy, system and skill with which it is carried on are all of the highest order. But this does not prevent one who has marked the revolution which mechanical devices have wrought in other branches of mining from wishing to see the proper appliances brought to bear upon the problem of breaking ore.

The use of power-drills in stoping is one of the methods that have been proposed to solve this problem. Although their use for this purpose is not new, the method has not, in my opinion, received the consideration that it merits. We find the big machine in the shafts, tunnels and drifts a decided success, and in use almost everywhere; but, when we look for the little one in the stopes and on the vein, we find instead the miner with his hammer, pounding away, just as his fathers did before him. Perhaps I should make some exceptions here, and mention what has already been done in this line, but it has been so little, especially in this country, that it is hardly worth mentioning.

Attempts have been made from time to time, by enterprising men, to use machine-drills in stoping. Most of these, for one reason or another, have resulted in failures; and failure once made is sure to be heralded far and wide, only to be lived down by the slow growth of success.

It was the failure, or, rather, the repeated failure and final success, of one of these attempts, which I personally witnessed, that led me to become personally interested in this subject; and as it bears directly upon the question before us, I will endeavor to give a brief outline of my experiences and their results.

While working underground in the Chief Mine, at Sumdum, Alaska, I had the good fortune to be placed as helper, or "chuck-man," on one of the small machines, known as a "Baby Ingersoll." It was used for stoping and raising on the vein. This work presented an excellent example of the problem before us, as the vein varied from 1 to 3 feet in width (the most unfavorable for machine work), and the place of working was one of great difficulty, as it lay along the shaft, making any mistakes dangerous and costly. Thanks to my partner, who was a machine-man *par excellence*, no such mistakes were made.

This was the fourth attempt to use the little drill at the mine, and the first to register a success. My partner, who was a late arrival from the Cœur d'Alène, had found the little drill thrown aside in disgrace, and covered with rubbish. But he knew what it could do, and begged to be allowed to give it one more trial.

Of course, it is out of the question to use the big machine, on account of its size and weight, for stoping in such narrow veins, even though in its own sphere it is already a success. The cause of failure in the use of the small drills had been due, in this mine at least, to the fact that the men who had attempted to work them were used to the big machines, where the strength of stroke and larger size of the hole overcame many of the difficulties encountered by the smaller ones. The latter naturally require more care and skill; but this care and skill is not so great but that any man of ordinary ability can master it.

The drill used by us weighed 170 pounds when mounted on a tripod. We found the latter to be much better than a bar, as it allows greater freedom of motion, something absolutely necessary in following a hole, and takes much less time in moving from one place and setting-up in another. With the machine which we used, the bolts are so arranged that a drill may be driven in any direction by a simple manipulation of the legs of the machine, which is easily acquired by practice.

The chief cause of trouble in machine-drilling arises from the many "slips" and layers of alternately hard and soft rock, which are found running in every conceivable direction in vein formations. A drill once started, for instance, will run freely till it strikes one of these slips, which it will, naturally, have a tendency to follow; or, again, if, driven through soft seams, it comes in contact with harder material, it will immediately begin to slip along the new surface. This result, if allowed

*Read before the American Institnte of Mining Engineers.

to continue, will cause the drill to "bind" against the bend in the hole, and will not only prevent the drill from entering the hole, but will hold it fast and prevent its withdrawal. This not only occasions much annoyance and loss of time, but frequently causes the total loss of a hole.

With a big machine, where the power is sufficiently great, the drill is driven ahead and pulled out regardless of the slips and bends, and this difficulty is more easily surmounted; but with the smaller one, constant watch must be kept, and the instant the drill starts to slip or bind, the machine must be readjusted to follow the hole, and the stroke shortened, as in starting. To do this it is seldom necessary to stop, for a perfect understanding of the drill, and between the men working it, allows the chuck-tender to loosen the proper bolts while the machine is still in motion; and as soon as its position is changed enough to allow it to run smoothly, it is fastened again. From personal experience, I think it is not only unnecessary but unwise to attempt to drill holes too deep. This practice is usually the cause of much trouble and loss of time. From 3 to 6 feet is quite deep enough for such work, generally speaking. This is all the more the case, as the time required to move the machine from one place to another is very small indeed.

A tripod necessitates the use of a platform to work on, but as it is very easy to build one out of lagging, this is a matter of small consequence, especially as the planks may be used over and over again; and a platform once built saves time in the end, as it enables the workman to move about freely and rapidly, and with less danger of accident.

So far the economical side of the question has not been mentioned, but simply the practicability of the small machine. With regard to this new side of the question, and a most vital one, it is almost impossible to collect data of any general application, because of the small amount of work that has been done with the small drills up to within the last few years.

However, I am informed by Captain Thomas Mein, recently superintendent of the Robinson mine, in the South African gold-fields, that in that great district the use of small machines, on narrow veins, is an established fact, and is carried on with great success.

In the State of California, I find that, within the last six months, some three plants, of five small machines each, have been put in, of which that of the North Star mine, at Grass Valley, is, perhaps, the best known.

My own experience in this line of work is about as follows:

With the "baby drill," two men, my partner and myself, were able to drill about 40 feet a day in hard quartz, full of slips and seams. This work was done between the hours of 9 a.m. and 4.30 p.m. The rest of the shift was sufficient for us to do all our own timbering, to build our chutes and ladder-ways, to shovel away our broken rock, and to keep the place in ship-shape order.

Circumstances favored me with a good opportunity to compare the machine with hand-labor. During the holidays the compressor was shut down for a week or so, preventing the use of the machines, and for that period we worked in the same stope, using the hammer to drive our holes. This permitted an exceptionally fair and complete comparison. All the conditions were the same for both methods; the rock was the same throughout; the size of the vein and the nature of the working-places were the same; and, as we were situated away from the other workmen, the quantity of rock broken daily by us could be, and was, accurately measured.

The results of the comparison were all in favor of the drill. We found that, as an average of the week's work, we were able to break down by hand-labor just half the ground that we had broken before, in the same time, with the machine; or, in short, that two men are able, under similar circumstances, to do twice as much work with the machine as they can do by hand. There is also another incidental advantage attending the use of the machine, namely, that of improved ventilation. One of the greatest difficulties of the directing engineer is to keep the men properly supplied with fresh air, particularly in making up-raises; and this difficulty is entirely eliminated when machine-drills are used.

It must be evident, from these considerations, that the small machine-drill, properly employed, is practical and economical, so far as labor is concerned.

There still remains to be considered the cost of drills, compressors, power and pipe-line, etc. It is unnecessary to go into these questions in detail, because each case must be settled by itself, with a full knowledge of the situation, source of power, size of plant, etc. But with an abundance of water-power, and the practical elimination of the effects of distance and position, made possible through electric transmission, the running expense for power is very slight, and the first cost of the plant is within the reach of any stable company, financially capable of either opening or running a mine. While a certain increase of initial expense for power and plant is necessitated, the reduction in the cost of labor is one-half greater than would be required to offset this outlay.

The reduction in the number of hands needed for breaking ore resulting from the use of power-drills is one of the chief causes of the prejudice against the machines entertained by many working miners. But this prejudice is entirely unwarranted; for every cause that increases the output of the miner, and decreases the expense of mining, only tends to open new mines, and enables old ones to increase their force, thus giving plenty of work to any supposed or possible surplus of miners.

On my return to the mine, I hope to secure further and fuller data on this subject, in order to convince others of what I firmly believe myself; for I think it is only a question of time before we will have the "little machine" everywhere high up in the stopes, pounding its way into prominence and success.

Acadia Coal Co. Limited.

Among our illustrations this month we reproduce some recent photos of the surface works at the collieries of the Acadia Coal Co., Limited, in Pictou County, Nova Scotia. The following details of the company's organization and equipment are taken from the *Canadian Mining Manual.*

Incorporated by Act of the Legislature of Nova Scotia. Authorized capital, $4,000,000; $3,846,100 issued unassessable No bonds or mortgages.

Directors: H. Montagu Allan, president, Montreal; Bryce J. Allan, H. Montagu Allan, Hugh Andrew Allan, Thomas H. Hubbard, Johnston Livingston, J. Pierpont Morgan, jr., Edwards S. Sandford, George G. Ward.

Head office: Henry S. Poole, A.R.S.M., F.G.S., general manager, Stellarton, N.S. J. George Rutherford, M.E, asst. general manager.

Formed to acquire and work coal areas in Pictou county and elsewhere in the Province of Nova Scotia.

Acadia Colliery, at Westville, 3 miles from Stellarton. Mine manager, James Maxwell; overman, J. Patton.

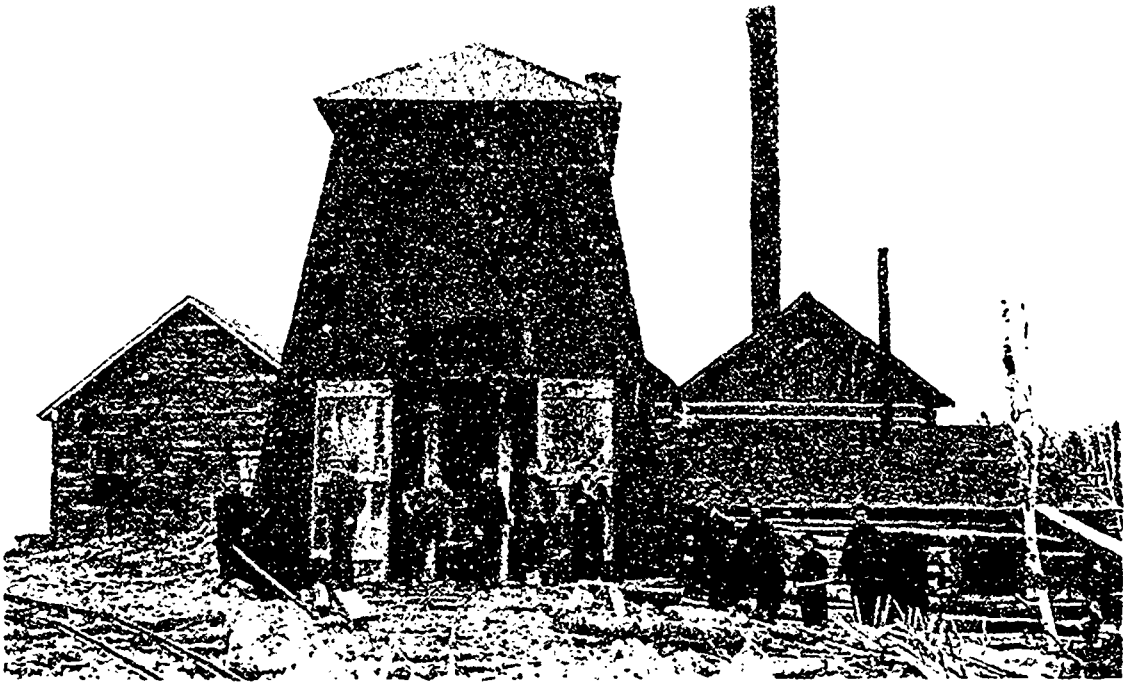
Seam of 10 ft. worked: dip averages 27 degrees; slope, 4,200 ft.; extreme vertical depth, 1,800 ft.

System of working: in lifts of 300 ft., longwall with timber packs 5 ft. square.

Ventilation by fan, 24 ft. by 8 ft., iron casing; engine 20 in. by 20 in. cut off; 3 in. water-gauge, barometer, etc.; Liveing's gas indicator.

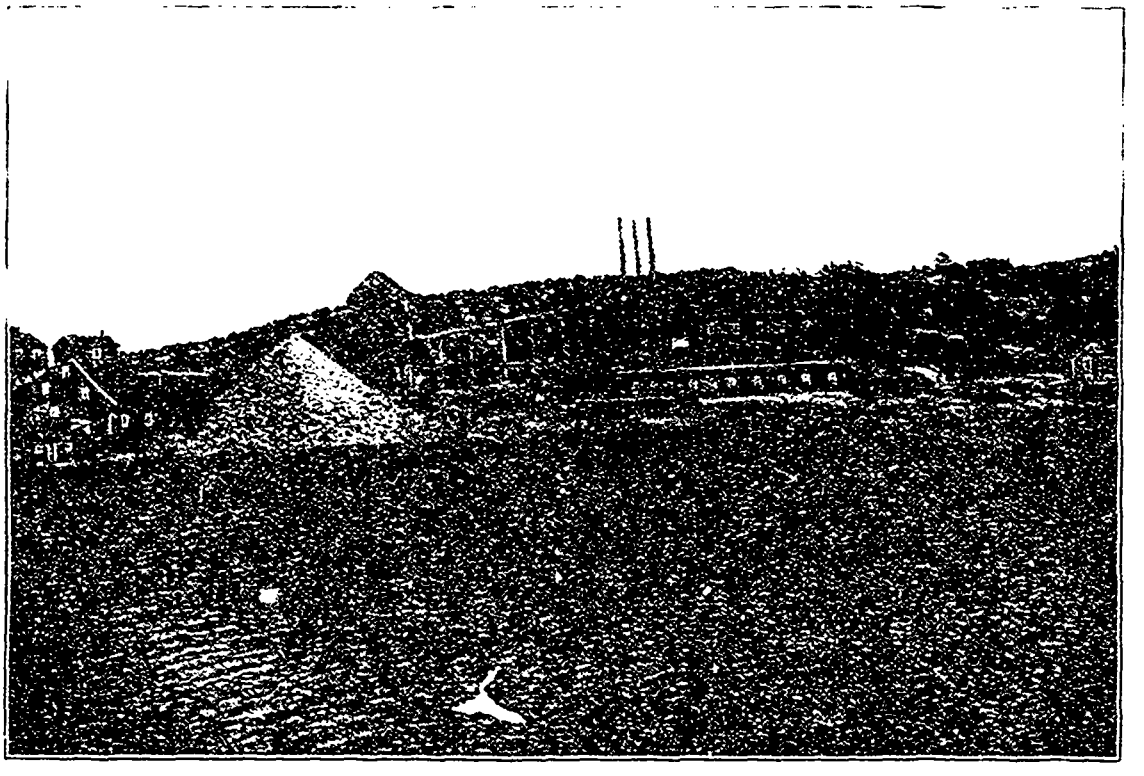
Lamps—Mueseler and Marsaut.

THE BAG BAY GOLD DISTRICT, ONTARIO.



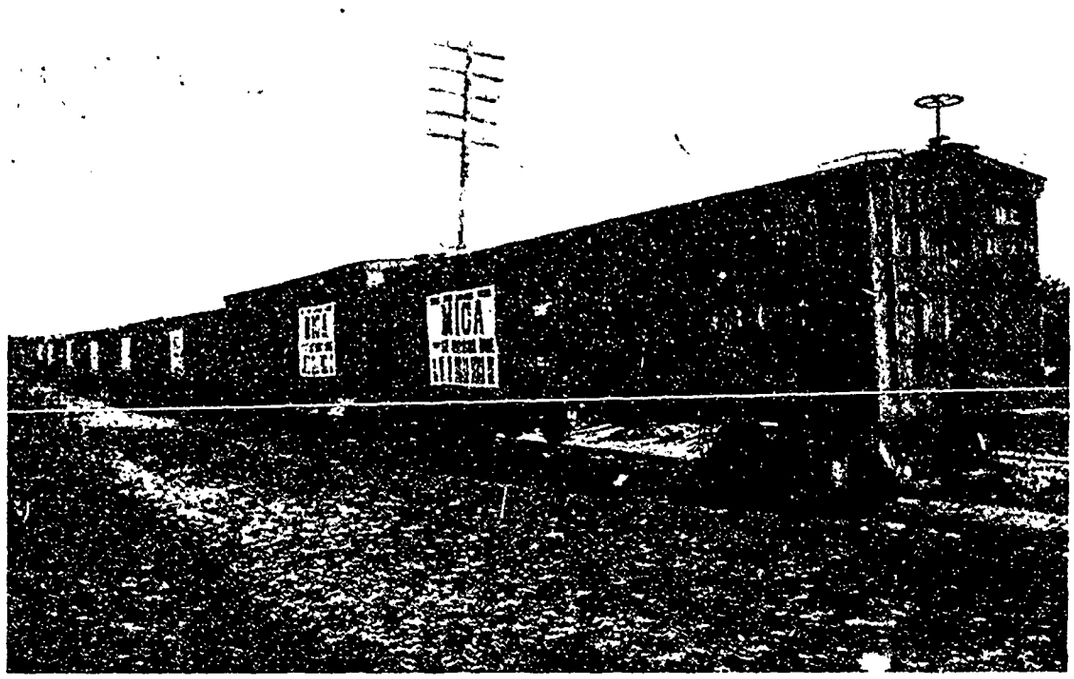
Rear View of Sudar Shaft House

LAKE OF THE WOODS, ONTARIO.



General View of the Mill, Shaft Houses etc. of the Sultana Mine of Canada Limited

MONSTER SHIPMENT OF CANADIAN MICA FROM QUEBEC MINES.



This photo shows a shipment of nine cars of mica shipped from the St. Anthony Mine, Gracefield, Que., on 9th January last over the Ottawa and Gatineau Valley Railway. The total mica carried was 398,650 lbs., probably a record in the business.

Mine Manager's Residence, Crow Point Mine, Bag Bay Gold District, Lake of the Woods, Ont.

Hoisting engines on slope, pair 32 in. cyl., 60 in stroke direct; drum 10 ft.

Pumping Duplex compound condensing, 22 by 11 in. x 24 in. rams 5.5 in; column length, 2,400 ft.; vertical head, 990 ft; wrought pipe tarred 6 in. upset ends vanishing threads, metal flanges, no leaks, steam pressure on top, 105 lbs., pipe 4 in. covered, air feeder added to air chamber. Auxiliary direct acting 11 x 12 in x 4 in. pump driven by compressed air, at bottom of pit head 600 ft

Two air compressors, 16 in. and 20 in. with receivers at bank and in pit, air pipe, 4 in., length, 4,000 ft.

Boilers Water tube; fuel, culm.

Screens, double Primary, 2 in; secondary ¾ in apart, curved; 5 sizes of coal, elevator, picking table, shaking screens.

Albion Colliery, at Stellarton on I.C. Railway, J Dunbar, manager, A. McDonald, Overman. Railway second built in America; locomotives include "Sampson," built in 1838 (since sold), main seam 38 ft thick, 148 ft. lower, deep seam, 22 ft. thick. Foord pit, vertical, 900 ft. deep, sunk to main seam; scene of explosion in 1880, loss of life, 14, workings now full of water; machinery massive, hoisting engine, 38 in. cyls. 5 ft stroke, 18 ft. dia, drum; Cornish pumps, 62 in cyl. 9 ft. stroke, beam 34 ft long, 7 ft. deep in the middle, weight 19 tons, working barrel, 18 in. dia.; pit head frame 50 feet high, independent condenser on hoisting engine. Fire has been in the old rise workings for 25 years.

Air-compressors in course of erection at time of explosion, and now not in use, steam cyls, 30 in., dia, do., 40 in., stroke 6 ft., fly wheel, 22 ft. dia.; weight, 20 tons, present workings in lower seams, capacity 1,000 tons per diem, ventilation by fans, the latter 30 ft. dia. by 10 ft wide, a new fan in course of erection at the third seam 18 ft, high speed, rope driven with compound engines, lamps, Mueseler coal used for coking purposes; 125 ovens; bee-hive, 10 ft. dia., average pitch of seam, 22 degrees.

Vale Colliery, 6 miles east of New Glasgow.

Six feet seam; slope, 2,400 ft., outcrop for 500 ft left unworked; a new winning ventilated by compression fan, 16 ft. x 6 ft.; engine, 10 in. by 16 in.

LAKE OF THE WOODS.

The Bad mine is sold at last, and to the Bullion Mining Company of Rat Portage; the consideration was $10,000.00. Mill runs of the ore that have been made by the various people who have held options on it, and by the owners, and it is said that the amount of bullion obtained exceeds $10,000 00, so that all round the owners have made a good thing of it. The shaft is over 100 feet, and the vein at present depth is five feet wide and carries good values. When the present owners took hold of it the vein was much pinched, and deteriorated in gold values as well. The Bullion Company will form a subsidiary company to work the Bad mine.

Gold Panner. The shaft is down 60 feet, and reports are very glowing as to the width of the quartz and its richness. It is now the intention to put up a 15 stamp mill instead of one of 10 stamps. The present force is 15 men; 10 more will shortly be put on. The price of shares has been put up to 50 cents. The capitalization is one million shares.

Bullion No. 2.—The shaft is down 100 feet and is in solid quartz, carrying good values in gold; drifting has begun at the 100 feet.

Trojan Shaft down 125 feet, with a crosscut 40 feet to cut two parallel veins. The small vein, 10 inches wide on surface, shows up about 3 feet in crosscut, with better values than at the surface.

Bully Boy. Shaft down 125 feet and the vein looking well.

Triggs. The shaft is now down 165 feet The work of sinking and drifting both ways along the vein from the end of the crosscut is being steadily pushed. The air shaft is down 30 feet and is showing up some fine ore. Mr. Sargent, of St. Paul, one of the largest shareholders and who put up the money for the initial work is in town on a visit and went out to the mine on the 13th. The Triggs is one property on the Lake of the Woods where a mill will not be put up ahead of the proper amount of development work.

The Treasure. One shaft is down 100 feet, but work has been suspended for some time pending the installation of more efficient hoisting apparatus. Work is progressing in a second shaft which is now down 30 feet. Captain George Tennant, of Rat Portage, is doing the work.

Captain Hamilton Proudlock of Rat Portage, recently took a gang of 12 miners down to the Manitous to work on his contract for 100 feet of sinking on the Glass Reef.

The shaft on the Gagne property on Witch Bay, of the Lake of the Woods, is down 60 feet, with the bottom entirely in quartz that pans well. On the 12th inst., Mr Gagne took out an additional crew to sink a second shaft some 250 feet distant from the first

J. M.

Rat Portage, February 14th, 1900.

Ymir Gold Mines.—The following is a cablegram dated January 26th:—"During last month 2,350 tons have been milled, producing 1,333 ounces of bullion and 135 tons of concentrates. Have shipped 135 tons of concentrates and 17 tons of smelting ore The total receipts for the month are £3,655; expenses, £1,828. Decrease owing to a breakdown at flume."

QUEBEC MINING ASSOCIATION.—The annual general meeting of the members of this Association will be held in the Windsor Hotel, Montreal, on Thursday afternoon, 8th March, at three o'clock.

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(A) Mining Engineering.
(B) Chemistry and Mineralogy.
(C) Mineralogy and Geology.

3—Post-Graduate Course for the Degree of

Doctor of Science (D.Sc.)
For further information see the calendar of Queen's University.

4—Prospectors' Course.

The School offers to Mine Foremen, Assayers, Prospectors and Mining Men generally, Special Courses of Instruction beginning January 9th, 1900, and continuing eight weeks.

Next Session begins October 2nd,
. . . 1899 . . .

The School is provided with well equipped Laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. In the Mining Laboratory the operations of Crushing, Amalgamating, Concentrating, Chlorinating, Cyaniding, etc., can be studied on a large scale.

FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO

Dr. W. L. GOODWIN,

DIRECTOR

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GOLD AND SILVER.

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

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

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

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

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

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

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

CANADIAN MINING INSTITUTE

The Annual General Meetings of the Members of
The Canadian Mining Institute will be held in the

CLUB ROOM, WINDSOR HOTEL, MONTREAL

—ON—

Wednesday, Thursday and Friday, 7th, 8th, 9th March, 1900

SESSIONS AT 10.30 A.M., 3 P.M. AND 8 P.M. DAILY

ALL MINING MEN CORDIALLY INVITED

The following, among others, will contribute to the syllabus of proceedings :—

Mr. S. S. Fowler, S B, M.E., Nelson, B.C.
Mr. Bernard McDonald, M.E., Nelson, B.C.
Dr. W. L. Goodwin, Kingston, Ont.
Mr. Gerald V. Hopkins, Silica, B.C.
Mr. J. L. Parker, M.E., Cranbrook, B.C.
Mr. J. C. Gwillim, M.E., Ottawa.
Mr. R. G. McConnell, B.A., Ottawa.
Mr. R. W. Brock, B.A., Ottawa.
Mr. J. Burley Smith, M.E, Montreal.
Mr. Charles Fergie, M.E., Westville, N S.
Mr. O. E. S. Whiteside, M.E., Anthracite, N.W.T.
Mr. Alexander Sharp, Rossland.

Mr. Archibald Blue, Toronto.
Mr. F. T. Snyder, M.E., Chicago.
Mr. Eugene Coste, M.E., Toronto.
Mr. George E. Drummond, Montreal.
Dr. W. T. Gibbs, Buckingham.
Mr. E. C. Musgrave, Omenica, B.C.
Mr. J. B. Porter, Montreal.
Mr. R. E. Chambers, M.E., Bell Island, N'fl'd.
Mr. A. P. Low, B.A. Sc., Ottawa.
Mr. C. A. Meissner, M.E., Sydney, C.B.
Mr. W. F. Ferrier, Rossland.
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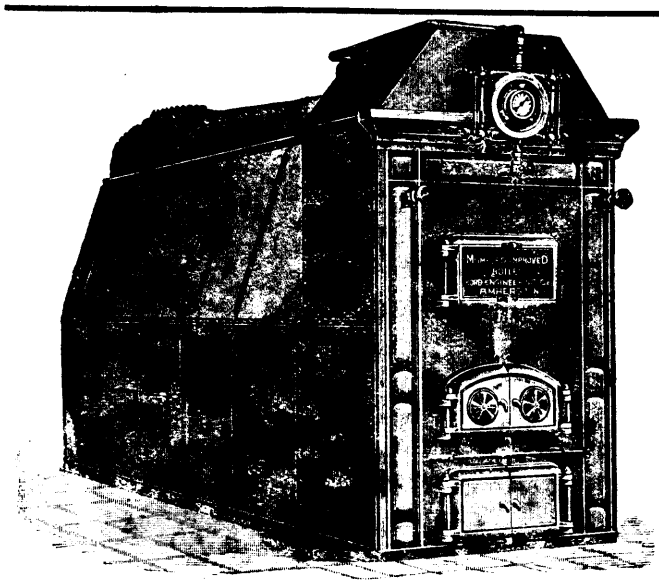

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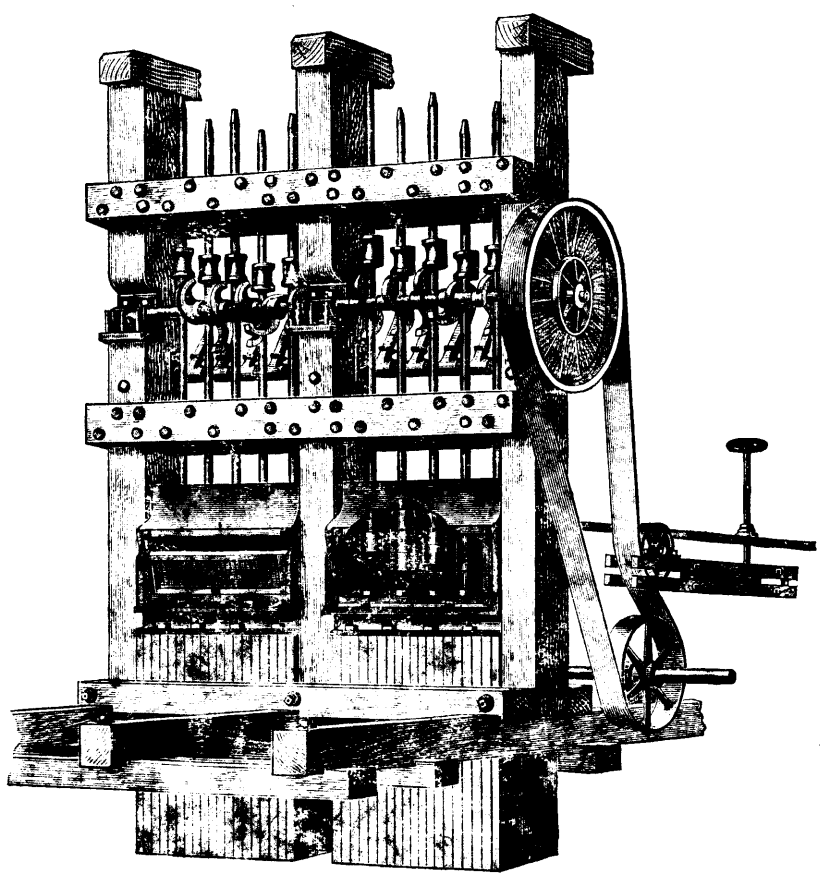

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