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The Mining Record.

Vol. VII.

APRIL, 1900.

No. 4.

BRITISH COLUMBIA MINING RECORD

Devoted to the Mining Interests of British Columbia.

PUBLISHED BY

The Mining Record Limited Liability.

ADVERTISING RATES ON APPLICATION.

H. MORTIMER LAMB, Managing Editor.

London Office : 24 Coleman Street, E.C
Vancouver Branch Office: Hamilton & Armour, Hastings St
Montreal : Gray's Agency.
Denver, Col. : National Advertising Co.
San Francisco : Dake's Agency.

SUBSCRIPTION TERMS:

Canada and the United States, one year - - \$2.00

Great Britain and Foreign, " " " " 2.50

All communications relating to the editorial department of the British Columbia MINING RECORD to be addressed to THE EDITOR, B.C. MINING RECORD,

P.O. Drawer 645, Victoria, B.C.

All communications relating to the business department of the British Columbia MINING RECORD to be addressed to the BUSINESS MANAGER, B.C. MINING RECORD,

P.O. Drawer 645, Victoria, B.C.

THE MONTH.

WE have much pleasure in announcing, that for the second time within a period of six months, we have found it expedient to increase the size of this publication by the addition of eight pages. Eight pages were added in October last, but since, the demands upon our advertising columns have very considerably increased and the income derived both from this source and from a constantly widening circulation enables us to give our readers still better value for their money. It is, meanwhile, very gratifying to learn in so tangible a manner that the MINING RECORD is growing both in usefulness and popularity.

It will probably be admitted by everyone that mining is the most important industry in British Columbia whether we regard its present dimensions or consider what the province hopes from it. The maintenance and growth of the industry are largely influenced by the character of the legislation by which it is affected. It would seem therefore that a legislature which would always do the best possible for the mining industry is at the present time the most important political desideratum in the province. And yet it is notorious that the interests of the industry itself are the last consideration in the choice of members to represent the mining constituencies. Of the present delegation from Kootenay and Yale in the Legislature, while they

may be men highly respected in their communities, it is safe to say that not one of them is capable of either originating legislation or criticising by a just analysis of its effect on the industry of mining such as has already been brought forward. We have had legislation hastily passed through without criticism, without comprehension, which has worked havoc in different districts and departments of the industry. Take, for instance, the law excluding aliens from placer mining. It is a pity for the province that this enactment was not as well understood on its introduction as it was after a year's experience of its effects. Again, the regulations for securing Crown grants were changed without anyone realizing that a clause had been added to the Mineral Act which would work endless damage, vexation and pecuniary loss. Another instance is a stupid amendment to the Companies' Act introduced but not passed preventing the directors of joint stock companies from borrowing money. This was aimed at an abuse no doubt. But one does not as a rule remove an obstructive boulder with a charge of dynamite sufficient to wreck the whole surrounding landscape. Of such a provision it might be safely said that where it was desired to retain the abuse the law could be evaded, while it would come down with crushing effect upon the legitimate business of companies organized in ignorance of the fact that the Legislature had reserved from them a privilege without which no individual merchant or business man could continue to exist. The functions of government in reference to any industry are both negative and positive. There is no more blighting influence upon any industry possible, and that particularly while it is in a condition of growth, than sudden change in the conditions under which it is carried on or the fear of such sudden change. It is probable that the damage done the mining industry by the eight-hours law has not been occasioned by the effects of the change of system, (for things go along very well under a custom of eight hours' labour in Western Australia) so much as by the actual fact of the change itself, and its being made in so hasty and inconsiderate a manner. The negative functions of government in this respect are in most countries conserved by the existence of a second chamber. In British Columbia there is no check save the individual intelligence of the members of the Legislature and the expression of public opinion. Of late years the individual intelligence of the members has been monstrously ineffectual, and possessed of a confidence in the inverse ratio of their ability, they have seldom given public opinion the time and opportunity to declare itself. It is therefore of the first importance that the personnel of the mining members of the House should be carefully considered and that a consensus of opinion should be available before

changes affecting the mining industry are finally decided upon. As Lord Bacon puts it very admirably: "I knew a wise man that had it for a by-word, when he saw men hasten to a conclusion, 'Stay a little that we may make an end the sooner.'" It is possible for any set of men tolerably well informed, and above all gifted with a proper appreciation of their own limitations to discharge the negative functions of government satisfactorily, but the positive functions of government require organization genius peculiar and special where the upbuilding of a country or an industry is concerned. Hallam, one of the driest of our political moralists, remarks that there is no reason for the non-appearance of great men at any particular epoch except that nature does not see fit to produce them. South Africa has Rhodes, British Columbia has Mr. Joseph Martin. The difference is well illustrated by the fact that the omission of "Mister" before the latter's name would be an evidence of contempt, while in reference to the former it is the due prerogative of his genius. But lest we lay too much blame upon nature it must also be confessed that the circumstances of the province are not favourable for the evolution of commanding men. The population is widely scattered; the interests of the different centres are diverse; and each of these centres is animated by an intense parochialism as humiliating as it is natural. To unify these warring elements and bend them to the great industrial destiny of the province would require the genius of a Pitt, the audacity of Napoleon and the patience of Job. And yet there exists at the present time in British Columbia a magnificent opportunity. The progress of half a century could be compressed into a decade were the genius of imitation and direction procurable. The main hope at present is that in the general flux of affairs political some one with a policy adapted to these ends may emerge. The time is ripe.

The reason for the stoppage of work in the Le Roi, War Eagle and Centre Star mines is now made abundantly clear. These companies have long been subject to dictation on the part of union labour. So long as this was only manifested in petty details it was vexatious and disagreeable but nothing more. But when an issue was taken which affected the whole

mechanism of the mines it became necessary either to submit for good and all or to resist. The history of the question is interesting and a striking commentary upon the futility of labour legislation to accomplish its intended objects. The mine owners looked to a system of contract labour or piece work to mitigate the worst effects of the eight-hour law. It need not be supposed that under contract they expected more work to be done or cheaper work to be done than could properly be accomplished in eight hours. But when men are working on time the parings come out of the employers' pockets; when on contract out of their own. And there is a continual tendency in time work for these parings to become longer and longer. Under a ten-hours system they did not matter so much, there was plenty of time to accomplish a day's honest work, which, after all, is practically an invariable amount, whether it be compressed into eight hours or spread over ten. But under an eight-hours system this paring of time makes a material difference and a very sensible diminution of the actual amount of work done

in a day. On the contract basis the time thus lost is the men's, not the employers'. It may be noted in passing that if the assertion made by the supporters of the eight-hours law, that a day's work could be compressed into eight hours' labour, were true, no possible exception could be taken to the contract system at similar rates of payment to those paid before the law came into force. The truth is that the real, if unavowed, perhaps unconscious or subconscious, intention of the unions is to diminish the actual amount of work done in a day and at the same time to retain the same rate of pay. On no other basis could the objection to the contract system be understood. It must be remembered that the contract system can only be applied successfully upon the dead work of a mine. It has been the custom even in the extraction of ore for centuries in the copper and tin mines of Cornwall but it could not be economically applied to stoping in mines worked under modern conditions and with modern machinery. It is precisely in dead work that the greatest economy of time and labour is necessary. So that while the eight-hours law may be a boon to working miners the application of the contract system would only be a particular, a partial exemption; where such an exemption is most required in economical mining. The union in Rosslund, however, finding that the mine owners wished to mitigate the effects of the law by a general application of the contract system to the dead work in the mines, determined to combat the contract system root and branch. It is upon that issue that the fight has been brought on. First the men engaged in stoping ore were dismissed, then the mines were entirely closed for short periods. Finally the men were given the option of returning to work on the contract system or not at all. For the present they have chosen the latter alternative. The action of the mine owners has been carefully planned and is entirely reasonable. Further, it will be successful. The Miners' Union of Rosslund has set itself against a custom which is as old as mining itself, and in its practical workings is eminently satisfactory. It was done so for a purely arbitrary reason. It is said that when a man tells a lie, in order to make it successful he must envelop his whole subsequent life in falsehood. It is equally true when legislation interferes with natural conditions, that further action, at each stage becoming more and more arbitrary, is necessary to postpone the re-assertion of the natural laws violated. Finally the whole edifice tumbles to the ground. In order to make the eight-hours law as valid as it was intended to be beneficent another law should have been passed for the Slocan to make it illegal to diminish wages and a third for Rosslund making it illegal to offer and work on contracts, and so on, until the finale was reached in the measure openly advocated by the present Minister of Mines, in his capacity of agitator, vote-hunter and panderer to the delusions of the many, to wit, an act to compel mine owners to work their mines under penalty of the control being reft from them by the State. There is yet another reason why the union will be badly beaten. It is not denied that under the contract system a miner can make top wages without working harder than he is willing and accustomed to work. But the struggle may occupy a much longer time than those who are optimistic are willing to allow. The direct dependence of this lamentable condition of affairs of the violent transition from the ten to the eight-hours system should be carefully borne in mind. The enormous loss

to the miners themselves, to holders of property, investors and merchants should bring home to any thoughtful mind the extreme danger and delicacy of interfering with the social mechanism by hasty and ill-considered legislation.

We have before us the annual report of the Van Anda Copper and Gold Company, and while it has been our privilege to peruse many very remarkable productions in the way of joint stock company literature, the present document is without question entitled to pre-eminence as the strangest and most unbusinesslike report ever sent out from the office of a presumably

responsible concern. The statement, or so-called balance sheet, covers a period from April, 1896 to December 31st, 1899, and consequently includes the receipts and expenditures as set out in the balance sheet previously published by the company to March 1st, 1899. Referring, for the present, to two items under the heading of assets and liabilities in the statement of March, 1899, we find mineral lands, land and townsite stands at a cost of \$5,000,000. One would imagine that this was sufficient; but seemingly the directors were not satisfied with this amount for they added (under a second heading) \$525,000 for "ore exposed" on part of the same property. Now, in the present report we find a memorandum to the effect that the management of the company "misled themselves" at any rate as regards the estimate of ore exposed in one of the properties. It is to be hoped that the public were not also "misled" by the publication of figures which were obviously and admittedly "misleading." Such mistakes are sometimes likely to prove costly, and we would refer the directors of the Van Anda Company to section 156 of the Companies' Act, 1897. In the present report the error is again committed of valuing the "exposed ore," which on this occasion is estimated to be worth \$450,000, and described as an asset. It should surely be clear to any board of directors that until the ore has been raised to the surface and is "at grass" it cannot be treated in the form of an asset in the accounts. The amount of ore blocked out in a mine should be mentioned only in the manager's report and the only way in which the company may incorporate in their accounts an asset relative to "ore blocked out" would be the cost of (say) a shaft through which the ore would have to pass out of the mine. Even with an asset of this nature provision would have to be made for each ton of ore extracted to pay its proportion of the cost of such shaft or permanent work in order that when all the ore is extracted the asset will have disappeared.

Another misleading item set down as an asset is the townsite valued at \$50,000. This land is also included in the company's chief asset valued at \$5,000,000. Again another doubtful asset is that under the heading of bonds, value \$180,000. This raises the question "when is a bond a bond?" Surely not until value has passed for it. The correct way in which this item should have been stated in the liabilities, surely is:

Bonds authorized	225,000
unissued	180,000
	<hr/>
10-year bonds issued	\$45,000

Thus the company would not have shown as an asset the item \$180,000 to which we object. Another asset, that of timber, valued at \$2,000, is certainly stretching a point, as the tenure is simply for one year from the issuance of a special license, and it is hardly likely that the company requires forty million feet of timber in that period. Meanwhile we print the following extracts from the balance sheets of March and December, 1899, in parallel columns:

BALANCE SHEET.

Receipts.	March 1, 1899.	Dec. 31, 1899
Stock sales	\$51,846 08	\$54,667 18
Commission	415 80	409 17
Teaming	81 27	.....
Cash loan, H. W. Treat.	5,026 05	57,007 05
Disbursements.	March 1, 1899.	Dec. 31, 1899
Assay office and assaying	\$2,181 32	.....
Labour and salaries	70,872 26	.....
Labour . . . . .	.....	\$162,038 97
Bills receivable	405 00	3,057 14
Wharf	781 00	.....
Raven Copper & Gold Co.	1,634 52	.....
Due on lots and buildings	.....	17,645 06
Due on lots and advances	.....	.....
on buildings	1,592 58	.....
Discount on bond sales . . . . .	.....	9,670 00

The first item refers to stock sales, which shows that shares to the value of \$2,803.10 have been disposed of for the benefit of the company during the period from March 1st to December 31st, 1899. There is no mention in any of the accounts that the company had any unissued stock to sell, nor is it stated that any shares in the nature of treasury stock are held by trustees, the proceeds from the sale of which would belong to the company. The item of \$54,667.18 entered as a receipt from stock sales in the December balance sheet must therefore be regarded as a gift from the promoters or others; and shareholders in lieu of information to the contrary can only assume that the enormous capital of five millions has been issued and paid for by the transfer of the "mineral lands and lands" appearing in the general statement at the same amount as the authorized, issued and fully paid up stock of the concern. On the other hand it is generally understood that a very large proportion of the stock remains the property of the company; but if this is true the accounts should undoubtedly show that this is the case, otherwise the proceeds of future sales from this source would be at the disposal of those in whose name the stock is entered, the company having no control of what should be an asset of value to be utilized for the purpose of working capital. Under the head of commissions we find a difference between the amounts entered in the respective balance sheets of \$6.63, and this would appear to show that the company earned in commissions between March 1st and December, 1899, this amount more than it paid out for commissions. Several curious omissions are noticeable in the present statement. The March balance sheet shows that the sum of \$81.27 had been earned on teaming work, but the balance sheet of December—which is supposed to be a repetition of the March statement as well as a statement of the company's accounts for the nine months following—contains no such entry. In the March statement \$2,181.32 appeared under the head of disbursements against "assay

office and assaying;" there is no corresponding account in the December balance sheet. Again the March statement showed that the wharf had cost up to that date \$781. Has this property since been sold or disposed of? It does not figure in the December accounts. Between the dates we have under review Mr. H. W. Treat, the president, treasurer and general manager of the Van Anda company, is stated to have advanced the company the sum of \$51,981 in cash. It would be interesting for the shareholders to ascertain why there is no item in the accounts for salaries in the present report, while in last year's statement this important account was erroneously incorporated with that of labour; how much, if any, of this \$51,981 is represented in the amount paid for labour (or salaries) which in the last ten months of 1899 amounted to \$91,166.71? Again, how much of the \$51,981 (if any) represented directors' fees?

There are several other items in this so-called balance sheet deserving of comment, but which, however space limitations compel us to allude to but briefly. From April, 1896, to March, 1899, "bills receivable" had cost the company \$405 only. At the end of December the amount had increased to \$3,057.14. According to the first balance sheet (March, 1899) the Raven Copper and Gold Company cost or owed the Van Anda Company \$1,644.52. Has this sum been refunded or has the amount been placed under another heading or incorporated into another account as appears to have been done with other entries? In December \$17,645.06 was due on lots and buildings, but in March under a slightly different heading the entry was \$1,592.58. Does this mean that the company is financially speculative builders, and if so, on what basis are the loans made? In March, 1899, after forty-two thousand five hundred dollars' worth of 6 per cent. bonds (of the authorized issue of 150 at \$500) had been sold; no "discount on bond sales" was paid. In the December balance sheet a disbursement of \$9,670 is shown under this account. Hence it evidently cost \$9,670 to sell the balance of the bonds, the par value of which was \$32,500.

In conclusion we can only express the opinion that the manner in which these accounts are presented calls for very strong criticism on the grounds that they do not concisely state the company's position. Take, for instance, the placing of unpaid accounts amongst the receipts of the company. The receipts show the sum of \$430,952.92, whereas nine items represent unpaid accounts which are clearly not receipts, and which should have been deducted from the expenditure. Moreover this so-called balance sheet is not certified to by an auditor. Such a statement emanating from one individual only can hardly be satisfactory from the point of view of a shareholder. But this general looseness crops up even in the designation of the company, as printed on the report itself. The Van Anda Copper and Gold Company is, we imagine, one of limited liability, but it is not so stated, although an omission of this kind is illegal.

The decision of the umpire on the arbitration concerning the rule of the Coal Mines Regulation Act requiring all underground workers in collieries to read and understand the somewhat elaborate safety rules printed in English, is in the nature of a compromise on this as also in reference to the question of the danger or otherwise of general Oriental employment in the British Columbia coal mines. The two arbitrators

were unable to agree and Mr. McCrady, as umpire, holds that the rule was too drastic and therefore cannot be upheld. He, however, suggests the drafting of a new regulation, providing that mine workers in colliery levels underground shall be able to understand instructions given in English. He also holds that while not all Chinese and Japanese labour engaged in colliery work is dangerous, a percentage of it is and this percentage should be eliminated by careful personal tests. The result of the reference will therefore probably be the establishment under a new rule of certain tests that will eliminate a moderate percentage of Mongolian labour from British Columbia collieries on the ground of incompetency. Any changes made in colliery management as the outline of the decision will not be very far-reaching. As a correspondent from Fernie sensibly points out, if the only objection to Oriental labour in coal mines is the inability of Chinese or Japanese miners to read rules in English, it would be easy enough to print the rules in the Oriental languages.

At the meeting of the Crow's Nest Coal Company in Toronto this month, some exceedingly satisfactory information was afforded shareholders. During the year the mines produced 116,200 tons of coal, on which a net profit of \$47,308.17 was made. At first sight this profit appears inconsiderable as the result of a full year's operations, but the explanation is given that owing to the small amount of development work performed up to the end of the first six or seven months of last year, the Coal Creek mine was until recently operated at a loss. Thus while in January, 1899, this mine produced coal at a loss of \$5,000, in January of this year a net profit of \$12,000 over and above operating expenses is shown. The company is now opening up a second series of mines at Michel, about 30 miles from Fernie, so that there will be alternate sources of supply. It is understood that a dividend will be declared this year. The enormous value of the coal properties may be gathered from a statement made by the newly-elected managing director that basing his figures on geological reports and then halving them, there exists within the area owned by the company over 10,000,000,000 tons of coal.

We look for the very best results from the mediation of Mr. R. C. Clute, Q.C., in settling the matters in dispute between mine owners and men in the Rossland and other districts. In an interview published in the *Nelson Tribune*, Mr. Clute stated that his visit on this occasion was in consequence of the request of leading representatives of the Mine Owners' Association and prominent officials of the Miners' Union with the object of exerting his good offices toward securing an adjustment of the questions in controversy between them. The government has acquiesced in Mr. Clute's mission, feeling that the prosperity of the Province and of the Dominion, inasmuch as what affects the Province influences the entire country, depends on the permanent settlement of the labour troubles, and is most anxious to promote an amicable feeling between owners and men.

Speaking of the dredging prospects of the North Thompson River, which has recently been explored by dredging experts from New Zealand, "who claim that as the result of their tests, dredging in the future will quite eclipse lode mining in the Kamloops dis-

trict," our Kamloops correspondent writes: "About 30 miles of the river have been staked and several parties are prospecting further up the river. While one company has got good returns from apparently careful examination of the ground I do not think the tests made have been sufficiently extensive and thorough to prove that the gold exists to any depth, and old placer miners all agree that it is confined to the top ten or twelve inches."

Mr. E. Nelson Fell is to be congratulated on the excellent showing of the Athabasca for the past year. Considering all things, the amount of development work done, the condition of the labour market, among others, a profit of over thirty thousand dollars is not at all bad as a beginning. If all the English mining companies had as careful and as good a man in charge of mines on this side there would be fewer failures.

The directors of the Bend 'Or Mines are to be congratulated upon the eminently satisfactory report and financial statement of the year's operations, which they have been able to present to the shareholders. The company's affairs appear to be in a flourishing condition and there is every prospect of respectable and regular dividends in the near future. The success of the Bend 'Or will go far towards restoring confidence in the Bridge River district, which was so rudely shaken by the Golden Cache collapse. Not only is the Bend 'Or an exceedingly promising property but, as the accounts which we publish elsewhere show, it is being managed on very careful and economical lines.

A correspondent, a mining engineer, writes to the MINING RECORD from Montreal expressing strong approval of the article published last month and commenting on the close-down of the War Eagle. As some of our correspondent's remarks are of public interest we quote as follows from his letter:—

"I much congratulate you on the more than able article in your last issue on War Eagle affairs. The issue arrived whilst our annual meeting of the Canadian Mining Institute was in session and met with unanimous approval. Apart altogether from the personal aspect of the case and the unfair treatment of both the public and the shareholders there is more than sufficient justification for the severest criticism on account of the prejudicial effect of their action on B. C. investments generally. Only those who have tried to place B. C. properties on the London market know the lack of confidence felt there which is enhanced by such tactics as we are now condemning. The graveness of the charge against Messrs. Gooderham and Blackstock lies in the fact that they were told, I understand, in September last by Mr. Kirby as soon as he went there that the mine was exhausted so far as profitable recoveries were concerned and yet after that, in fact as late as November 15th Mr. Gooderham gave a most optimistic 'interview, talked of a prodigious output, increased value of shares and increased dividend.' Your estimates are perfectly sound and will not be falsified by results. War Eagle at \$1.00 is not more than a 7½ per cent. investment if that. There is reason to believe that the smelter returns for the last six months show a gross value of less than \$12, which would not leave more than \$2.00 to \$3.00 profit, but they will not even to their shareholders produce the returns."

The Vancouver *News-Advertiser* recently quoted Mr. Robert Murray, provincial timber inspector, as having stated that "In the Boundary country, half a dozen new stamp-mills have been put in since he was there last and the smelters under construction are going ahead rapidly." It is true that the erection of two smelters is being proceeded with, but so far as stamp mills are concerned, not one has yet been put in throughout the district generally known as "the Boundary country—that is the district lying between Rock Creek on the west and Christina Lake on the east. A lack of knowledge of Boundary mining matters on the part of whoever is responsible for that department of its news occasionally results in the *News-Advertiser*, like other Coast newspapers, publishing statements relating to the Boundary district that are unreliable and misleading. Anyone at all familiar with the ores of the Boundary country knows that stamp mills will play a very small part in their reduction.

The off-hand way in which local mining companies are managed has been well illustrated in the case of the Winnipeg mine in the Boundary Creek district. Without consulting the shareholders, the managing director, Mr. Duncan McIntosh, one day took it into his head to announce that he was negotiating a consolidation with the Brandon and Golden Crown company, whose property adjoins the Winnipeg. Meanwhile the mine, for no known reason, was closed down, which was followed by a fall in the stock from 32 to 13. The Winnipeg mine was originally owned by Mr. McIntosh, but since he has allowed it to be acquired by a joint stock company, he should be taught that he has no longer the right to do just what his fancy pleases with it.

One of the Greenwood papers recently remarked that Mr. Paul Johnson makes a capital advertising agent. He is certainly an adept at the art of booming. But one trade at a time should be enough for any man and would it not be as well if Mr. Johnson stuck to his work of superintending the construction of the smelter at Greenwood and talked a little less freely? Our Boundary Creek correspondent draws attention to one of this gentleman's statements as recently published in the Rossland and Spokane newspapers, that "the following mines will contribute ore to the Mother Lode smelter, namely, the Ah There, the Buckhorn, Morrison, St. Lawrence, Butcher Boy and Sunset." Most of the mines enumerated are as yet not developed much beyond the prospect stage. Our correspondent writes: "The Ah There is installing a small boiler and steam hoist. Its shaft is down seventy feet and it has also a cross-cut, but from what I can gather the mine could not produce at present five tons of ore a day. The Butcher Boy and St. Lawrence are, so far as I can ascertain, no further advanced as regards development. The Sunset has put in a good plant, but nothing definite is heard of its ore bodies. The Buckhorn is doing good prospecting work down to the 200-foot level, but up to a week ago had encountered nothing but good indications and small stringers of ore carrying fair values. My summing up of the position is that all these "mines" together if systematically developed from now on for six months would not at the end of that period be able to maintain a regular total output of a hundred tons per day, so that there does not appear to be much to justify Mr. Johnson's somewhat extravagant statements."

The *Greenwood Times*, in a recent issue, announces the sale by the sheriff of the Granite and Banner claims in Camp McKinney. The properties fetched \$300. Last September the following paragraph appearing on page 15 of that month's issue of the *MINING RECORD* was severely criticised in certain quarters: "The Camp McKinney Mines, Ltd., is a Vancouver promotion, concerning whose properties, the Granite and Banner, many boom statements have of late appeared in the Vancouver papers. One of the promoters has, moreover, publicly and with a proper show of virtuous indignation, referred in scathing terms to the Golden Cache fiasco, as having largely deterred Vancouver investors from speculating in legitimate mining ventures, such, for instance, perhaps, as the Camp McKinney Mines, Ltd.?" Our Camp McKinney correspondent, however, in response to a request for information, does not appear to hold a very high opinion regarding the value, as at present determined, of the properties of the Camp McKinney Mines, Ltd., *i.e.*, the Granite and Banner claims, the much-heralded production of a couple of gold-bricks therefrom, worth each a few hundred dollars, notwithstanding."

Just previous to the publication of this comment, a very glowing account of the Granite and Banner claims was published in the *Vancouver World* at the instance, it was stated, of Mr. Banfield, a stock-broker of that town. Mr. Banfield, who was financially interested in the promotion, was quoted as having stated that there was then "\$200,000 worth of ore in sight in the claims and 2,000 tons of ore on the dumps." Yet the other day the properties only realized at public auction a beggarly three hundred dollars!

It is fortunate that the profits made by the British America Corporation out of its British Columbia and other ventures more than compensate for the company's losses on its Yukon trading. This has, it seems, resulted in a present loss of over £29,474 with an expected further depreciation of stock against which another sum of £20,000 has been set aside. The corporation has, however, been able to declare a ten per cent. dividend. So far as we know, no purely British concern has made anything like a substantial profit by Yukon trading, the great American Alaskan organizations having too strong a hold on the field and too large and complete a knowledge of the northern country for successful competition on the part of less experienced rivals. It is understood that the British America Corporation's trading operations in the Yukon were in the main due to resolves made in London, local advisers in British Columbia rather dissuading than counselling such a course.

As our Shoal Bay correspondent mentioned last month there is every reason to believe that a very valuable discovery of workable marble has been made in this district. The deposit of which an almost unlimited quantity is exposed, is known as Doolmite marble, and is found in both the pure white and streaked varieties. The marble takes an excellent polish and we are given to understand can be placed on the local market at an extremely moderate cost.

The restriction of the ownership of Atlin placer claims to British subjects is serving as an excuse for American prospectors at Cape Nome to threaten to drive Canadian miners from the Alaskan benches. The

aggressive element will in any case, though doubtless prevented by military control from taking such extreme measures, make things very uncomfortable for British subjects in and about Cape Nome, from which there being other good reasons against going, most will do well to stop away.

Another Klondike company—the Klondike, Yukon & Stewart Pioneers, Limited—has joined the great majority. At a meeting of shareholders last month, before the motion was carried approving the voluntary liquidation, the chairman explained that the failure of the company was due to the incompetency of their Canadian manager, Col. Domville, who had acted contrary to instructions, and made a mess of things generally. That somebody blundered is quite certain, for there is no earthly reason why the concern should not have been a success under ordinarily good business management. But this is the rock upon which more than one English company has split in this country.

The *Engineering and Mining Journal* of New York commenting on the alleged discovery of workable coal in the Yukon remarks very pertinently that the presence of coal, even of comparatively poor quality, ought to result in a considerable reduction in the cost and difficulty of mining and living in the country. In the Yukon fuel is almost the first essential to maintaining life at all, and a large quantity of it is needed in mining operations in ground which is frozen all the year round. The supply of wood in the region is not sufficient to last very long at the present rate of consumption, and the cost of transportation will prevent the bringing of any quantities of coal from the coast. Coal mining in the Yukon ought to be very profitable.

Mr. James de Lamare and his French associates evidently recognize the value of keeping their Klondike and Atlin interests before the public by direct and indirect advertising. The syndicate own 22 placer claims in the Yukon and 1,200 acres of hydraulic ground in the Atlin country. The possibilities of these are well advertised in France by a neatly printed and well got up monthly paper published in Paris. It is distinctly a "boom" issue, copying closely Western American methods. And now Mr. de Lamare is further advertising the properties of his syndicate by taking a French made automobile to the far north. By this means he hopes to make a speedy journey over the ice from Bennett to Dawson. Almost every paper in the province and many beyond it naturally chronicle this novel experiment.

The Dawson Board of Trade, which certainly should know something of the subject, strongly urges the reduction of the Yukon gold royalty to 2 per cent. It is possible, of course, that the Board, not being wholly disinterested, suggests rather too large a reduction of the impost. But it can hardly be denied that as it stands, the royalty, allowing for all deduction, representing a levy of at least nine per cent. net, should be lowered to a rate far nearer two than nine per cent., and unless some considerable reduction is made, only the very best claims can long continue to be worked with profit. The average hydraulic claim will not stand the present royalty on output, in addition to what are necessarily large working expenses.

In comparison with the Yukon royalty the provincial tax on the yield of the gold and silver mines of less than one per cent. net on the value of output, is exceedingly moderate. The revenue from this source is at present only about \$60,000 a year, which is spent in improving the means of communication and on other necessary public works in the mining districts. Some would have the province's levy assessed on net profits or dividends, but this would operate too unequally and uncertainly, while such a levy would be too easily evaded by the less scrupulous.

THE MINERAL PRODUCTION OF CANADA FOR 1899.

(From the Report of the Geological Survey.)

Product.	Quantity. (a)	Value. (a) \$
Metallic—		
Copper (fine in ore &c) (b) lbs	15,078,475	2,655,319
Gold, Yukon dist. \$16,000,000		
" all other... 5,049,730		
		21,049,730
Iron ore tons	77,158	248,372
Lead (fine in ore &c) (c) lbs	21,862,436	977,250
Nickel (fine in ore &c) (d) lbs	5,744,000	2,067,840
Platinum oz	55	835
Silver (fine in ore &c) (e) . . lbs	3,078,837	1,834,371
Total metallic		28,833,717
Non-Metallic—		
Arsenic lbs	114,637	4,872
Asbestus and asbestic . . tons	25,285	483,299
Chromite "	1,980	23,760
Coal "	4,565,993	9,040,058
Coke (f) "	100,820	350,022
Felspar "	3,000	6,000
Fire-clay "	599	1,295
Graphite "	1,220	16,179
Grindstones "	4,511	43,265
Gypsum "	244,566	257,329
Limestone for flux "	53,202	45,662
*Manganese ore "	308	3,960
Mica "		163,000
Mineral pigments—		
Baryta tons	720	4,402
Ochres "	3,919	19,900
Mineral water "		100,000
Moulding sand tons	13,724	27,430
Natural gas (g) "		387,271
Petroleum (h) Bbbls	808,570	1,202,020
Phosphate (apatite) tons	3,000	18,000
Pyrites "	27,687	110,748
Salt "	57,095	234,520
Soapstone "	450	1,960

*Returns incomplete.

(a) Quantity or value of product marketed. The ton used that of 2,000 lbs.

(b) Copper contents of ore, matte, etc., at 17.61 cents per lb.

(c) Lead contents of ores, etc., at 4.47 cents per lb.

(d) Nickel contents of ore, matte, etc., at 36 cents per lb.

(e) Silver contents of ore at 59.58 cents per oz.

(f) Oven coke, all the production of Nova Scotia and British Columbia.

(g) Gross return from sale of gas.

(h) Calculated from inspection returns at 100 galls. crude to 42 refined oil, and computed at \$1.48 $\frac{3}{4}$ per bbl. of 35 imp. galls. The barrel of refined oil is assumed to contain 42 imp. galls.

Product.	Quantity. (a)	Value. (a) \$
Structural Materials and Clay Products.		
Cements, natural rock bbbls	131,387	119,508
" Portland "	255,366	513,983
Flagstones "		7,600
Granite "		90,542
Pottery "		200,000
Sewer pipe "		161,546
Slate "		33,406
Terra-cotta "		220,258
Building material including bricks, building stone, lime, sands and gravels, and tiles		4,250,000
Total structural materials and clay products		5,596,843
Total all other non-metallic		12,544,952
Total non-metallic		18,141,795
Total metallic		28,833,717
Estimated value of mineral products not returned		300,000
Total, 1899		47,275,512

1898, Total	38,661,010
1897 "	28,661,430
1896 "	22,584,513
1895 "	20,639,964
1894 "	19,931,158
1893 "	20,035,082
1892 "	16,628,417
1891 "	18,976,616
1890 "	16,763,353
1889 "	14,013,913
1888 "	12,518,894
1887 "	11,321,331
1886 "	10,221,255

(a) Quantity or value of product marketed. The ton used is that of 2,000 lbs.

The increase in the value of the mineral production of Canada which has been so noticeable a feature in the figures for the previous four years is continued during 1899. Compared with the corrected total for 1898, the preliminary figures for 1899 show an increase of over 22.2 per cent., the increases for 1898 and 1897 having been nearly 35 per cent. and nearly 27 per cent. respectively.

Of the above mentioned 22.28 per cent., 15.52 per cent. is to be credited to the increased output of gold from the Yukon placers, 2.92 per cent. to the increases in the other metallic products, and 3.84 per cent. to the growth of the non-metallic mineral industries.

The value of the mineral production of the country per capita for 1899 would be about \$8.90, having increased almost four-fold in the fourteen years since 1886, when the first figures are available.

A study of the figures given in the table following, shows that the metallic products contribute some 61 per cent. to the value of the whole, and these, together with coal, petroleum and building material, account for all but about 9 per cent. of the grand total.

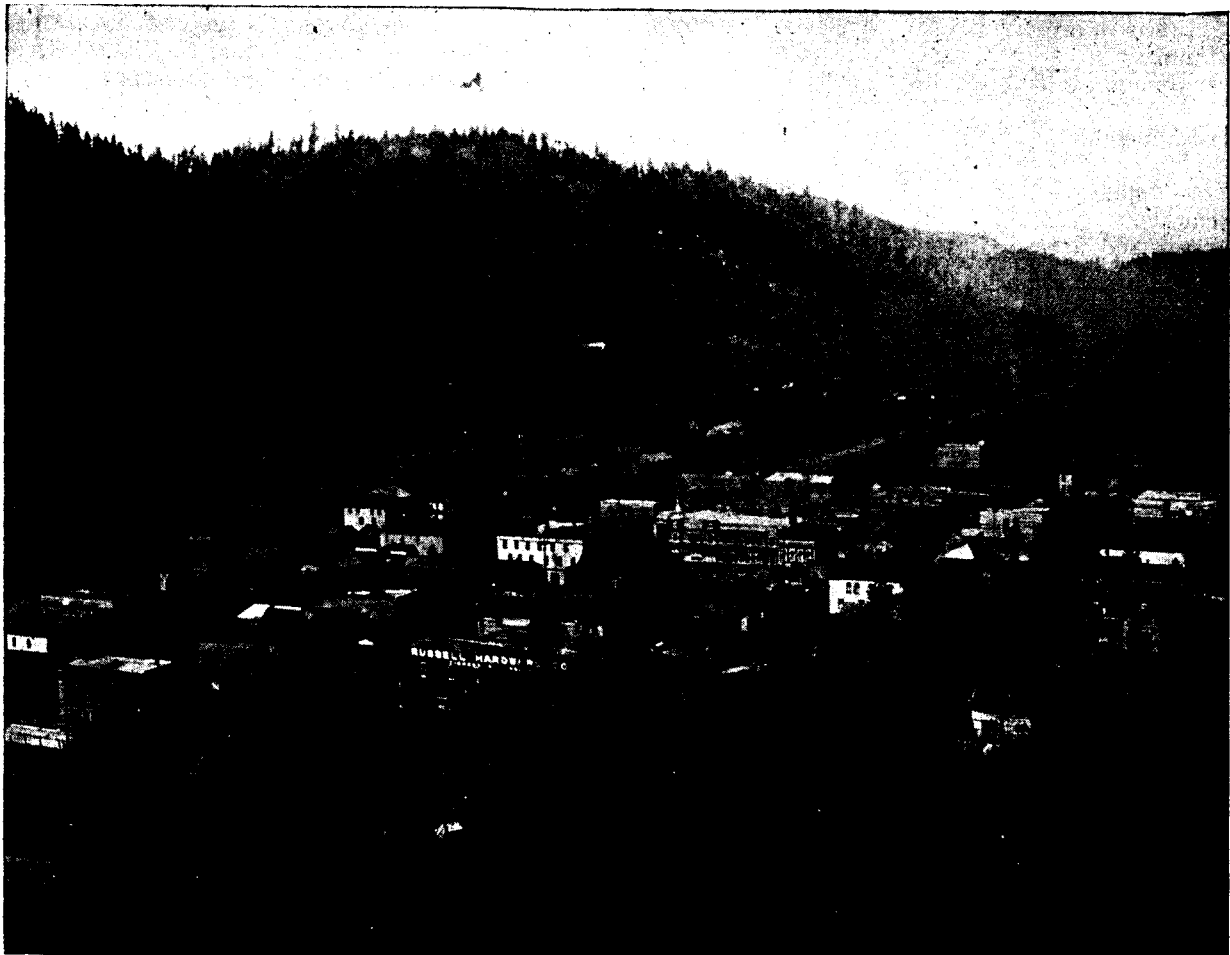
The proportional contributions of the various products for 1898 and 1899, are shown below.

1898.		1899.	
Product.	Per cent of Total Production.	Product.	Per cent of Total Production.
Gold	35.63	Gold.. . . .	44.53
Coal	21.27	Coal.. . . .	19.12
Build'g material.	10.77	Build'g material..	8.99
Silver.. . . .	6.71	Copper	5.62
Copper.	5.52	Nickel.	4.37
Nickel.	4.71	Silver.	3.88
Lead.. . . .	3.12	Petroleum	2.54
Petroleum	2.75	Lead...	2.07
Asbestos.. . . .	1.27	Cement...	1.34
Cement	1.03	Asbestos.. . . .	1.02
Natural gas.. . .	.83	Natural gas.. . .	.82
Coke.. . . .	.74	Coke.. . . .	.74
Salt .. . . .	.64	Gypsum .. . . .	.54
Gypsum.. . . .	.60	Iron ore .. . . .	.53
Pottery .. . . .	.55	Salt... . . . .	.50

Product.	Quantity.		Value.	
	Inc. %	Dec. %	Inc. %	Dec. %
Metallic:—				
Copper. . . . .	.....	15.04	24.84	.....
Gold .. . . .	.....	.....	52.81	.....
Iron ore	32.25	.....	62.56	.....
Lead... . . . .	.....	31.50	.....	18.99
Nickel	4.10	.....	13.50	.....
Silver.. . . .	.....	30.85	.....	29.28
Non-Metallic:—				
Asbestos	6.30	.....	.....	1.61
Coal	9.43	.....	9.94	.....
Coke	15.09	.....	22.38	.....
Cement.	54.57	.....	59.34	.....
Gypsum	11.54	.....	10.67	.....
Natural gas .. . .	.....	.....	20.22	.....
Petroleum.	6.62	.....	13.21	.....

In copper, owing to the large advance in prices, there was a marked increase in value notwithstanding the decrease in the output.

The value of the gold production shows a large percentage increase, in the Yukon and Ontario especi-



The town of Greenwood; the chief trade centre of the Kettle River Mining Division.

The chief points of interest brought out by the above figures lie in the much greater prominence assumed by gold, and the falling off in the silver and lead, which now occupy the sixth and eighth places, as compared with the fourth and seventh positions formerly occupied by these materials.

The progress, etc., of the several mineral industries in comparison with 1898, is shown below.

ally, the former having grown 60 per cent. and the latter over 58 per cent. In the case of iron ore, the chief contributors to the total mineral production of the country, lead and silver are the only two showing a considerable falling off, and that notwithstanding more favourable prices. This is due to local causes in British Columbia, not dependent on the value of the deposits but which have led to the restriction of operations there.

THE DETERMINATION OF HIGH TEMPERATURES.

(By A. A. Watson, B. Sc., Vernon, B.C.)

THE determination of high temperatures is a subject of great interest in smelting operations and in the numerous experiments carried out by scientists upon blast furnace smelting and upon the use of various kinds of fuel a good method of accurately estimating high temperatures has been eagerly sought after. Various methods have been used to this end, and to describe some of these, together with the scientific principles involved is the object of this article. One of the first methods to be applied, and one which would naturally occur to anybody, was that of measuring the expansion of a bar of some metal, difficult to fuse, when placed in the furnace with one end passing through one side. The principle involved is the same as that of the ordinary mercury thermometer. We measure ordinary atmospheric temperatures by the expansion of a thread of mercury, reading off the degrees on an arbitrary scale; applying the same principle, only using a bar of iron instead of a thread of mercury, the temperature of any furnace could be obtained up to the melting point of iron, in terms of the centigrade or Fahrenheit thermometer. The iron bar was carefully measured at a temperature of zero centigrade and placed in that part of the furnace where the temperature of zero was desired to be determined. One end of the bar projected through the wall of the furnace. The increase in length was measured and the temperature calculated from this. Theoretically this instrument should have been satisfactory, but the difference of temperature of that part of the bar which was in the wall of the furnace gave rise to inaccuracies. The temperature was obtained by considering the equation for determining the coefficient of lineal expansion of iron, that is to say the fraction of itself which iron expands for every degree of rise in temperature. This fraction is .000012.

For example let L be the length of an iron bar at a given temperature. Let M be its length at 0° centigrade. Let T be the temperature. Let the coefficient of expansion of iron be .000012, then its length at any given temperature will be the multiple of its length at 0°, and unity plus the coefficient of expansion multiplied by the given temperature.

$$L = M (1 + .000012 T).$$

Suppose an iron bar measured 100 inches at 0° c. and when placed in the furnace increased to 101.107 inches, we obtain the temperature of the furnace as follows:

$$101.107 = 100 (1 + .000012 T).$$

$$T = 922^{\circ} \text{ c.}$$

The barometer of the furnace then is 922° c.

A more accurate method was found by placing an iron and a platinum bar side by side in the furnace with the ends projecting and measuring the difference in the expansion of the two bars. Iron expands about half as much again as platinum for every increase per degree centigrade. The coefficient of expansion of platinum is .0000086. The greater the temperature therefore the greater difference will there be in the length of the rods and so by using the same equation as before first applied to iron and then applied to platinum we can easily obtain the temperature of our furnace. Suppose our rods each measure 100 inches at zero and the difference in their lengths in the furnace is .314 inch.

$$\text{For iron } L = M (1 + .0000120 T) = 100 (1 + .000012 T).$$

$$\text{Platinum } P = M (1 + .0000086 T) = 100 (1 + .0000086 T).$$

$$\text{By measurement } L - P = .314 \text{ inch.}$$

$$.314 \text{ inch} = 100 (1 + .000012 T) - 100 (1 + .0000086 T).$$

$$.0012 T - .00086 T = .314.$$

$$T = 923^{\circ}.$$

The temperature is found to be 923° c.

Another method which has met with considerable success is the calorimetric method. A platinum ball of known weight is suspended in that portion of the furnace of which it is desired to know the temperature and is then quickly ejected and placed in a water calorimeter. The rise in the temperature of the water is then noted. But first it will be necessary to explain to the lay reader what a calorimeter is and for what purpose it is used. A calorimeter is, as its name implies, a heat measure, that is to say, an instrument used for the purpose of estimating quantities of heat. The quantity of heat required to be put into a gramme of any substance in order to raise its temperature one degree, is called the specific heat of that substance. The specific heat of water is that quantity of heat required to raise a gramme of water one degree centigrade and this quantity of heat being taken as unity the specific heats of other substances are always taken in terms of the specific heat of water. Thus the specific heat of iron is 0.114, because the quantity of heat required to raise the temperature of a gramme of iron one degree centigrade is 114-1000 of the heat required to raise a gramme of water one degree. It is in measuring the specific heats of metals that the water calorimeter is used. It consists of a small breaker-shaped copper or brass vessel of known weight packed inside another brass vessel, the space between the two being lined with asbestos or more often non-conducting material to prevent the escape of heat from the inner vessel.

Suppose, for example, it is desired to measure the specific heat of brass. A piece of brass is weighed and placed in boiling water to bring it to a temperature of 110° c. In the meantime, the calorimeter is filled with water and weighed so as to obtain the weight of water, and the temperature of the water is registered. The piece of brass is next quickly removed to the calorimeter which is kept stirred and the rise in temperature of the water noted. We now have all the data for determining the specific heat of brass.

Supposing the weight of the brass to be 177.6 grammes, the initial temperature of the brass to be 100° c., the final temperature 18.6 c. The fall in temperature of the brass is 81.4 c. The quantity of heat evolved by the brass in cooling is (177.6 × 81.4 × specific heat of brass) heat units and is by natural law equal to the heat taken up by the calorimeter and water.

Now the weight of water in the calorimeter was 657 grammes and the amount of water equal to the instrument itself by previous determinations was 11 grammes, therefore the amount of water the whole calorimeter was equal to was 668 grammes. The initial temperature of the water was 16.6 and the final 18.6°. The water therefore was raised through 2° c. The heat taken up by the water was therefore 2 × 668 or 1336 units.

Now the amount of heat taken up by the calorimeter must be equal to the amount of heat given out by the brass, for energy is never lost, therefore 177.6 × 81.4 × specific heat of brass = 1336.

$$\text{Specific heat of brass} = .094 \text{ heat units.}$$

It will be readily seen that, applying the same prin-

iple of quantity of heat, if we know the specific heat of the metal, all we have to do, to discover the initial temperature of the metal, is to fill in the specific heat in the same equation and this time leave the initial temperature as the unknown value. Suppose the weight of the platinum ball suspended in the furnace to be 177.6 grammes. Call the initial temperature of the ball fresh from the furnace T . The final temperature of the calorimeter was 23.95° c. The specific heat of platinum is .0324. The heat evolved by the platinum ball is $177.6 (T - 23.95) (.0324)$ or $5.75424 T - 137.814$.

Supposing the heat taken up by the calorimeter to be the product of the weight of water into the rise of temperature, and suppose the weight of water to be 679 grammes and the factor of the calorimeter or grammes of water the instrument is equal to in the quantity of heat it will absorb is 11, then the amount of heat absorbed by the calorimeter will be 690 multiplied by the rise in temperature. The initial temperature of the water was 16.6° . The final temperature was 23.95 . The rise in temperature of the water was 7.35 . The heat taken up by water was $690 \times 7.35 = 5071.5$. Therefore the quantities of heat given out and absorbed being equal we have—

$$5.75424 T - 137.814 = 5071.5$$

$$T = 905^{\circ} \text{ c.}$$

The advantage of the calorimetric method over the preceding ones is that the melting point of platinum is exceedingly high and at temperatures at which iron would instantly fuse, the platinum ball pyrometer can be used and is found to give satisfactory results.

A rough and ready method frequently used is to make alloys of various metals and of definite composition so that the melting point of each is known, and place the alloy in a muffle in the furnace. Some of them will melt and others remain solid. The lowest melting point of those remaining solid will be approximately the temperature of the furnace.

Siemen's electrical pyrometer has been used with much success. The principle of the instrument is based upon the fact that the electrical resistance of a wire is increased by an elevation of temperature. The increase in resistance is directly proportional to the increase in temperature. If, therefore, we take a wire of known resistance connected with a battery and pass it through a liquid of known temperature, say boiling water, and measure the increased resistance for the higher temperature, we can easily calculate an unknown temperature of the wire when a further increase of resistance is indicated. For example, suppose the increased resistance of a wire is 2 Ohms at 100° c., if the same wire passed through a furnace shows a resistance of 20 Ohms, then the temperature is 1000° c. The instrument is constructed as follows: A double thread is cut upon a cylinder of hard pipe-clay and in this are coiled two platinum wires united at the lower end. The wire has a diameter of .01 inch and a resistance of about 3.6 units per yard. The clay cylinder occupies the lower end of a platinum case fitted with a handle. Connections are made with leading wires at the upper end of the case. Voltmeter tubes are used to measure the resistance. A voltmeter is simply a tube employed to collect the gas given off from an acid solution when an electric current is passed through. The stronger the current the greater the quantity of gas given off in a given time, and the greater the resistance of the wire to the current the less the quantity of gas given off. It can thus be seen that if we have two wires of precisely similar resistance one passing directly through a bath of sul-

phuric acid and the other through the furnace and then through another bath of sulphuric acid a comparison between the volumes of gases given off will be a direct measure of the increased resistance of the wire passing through the furnace and consequently of the temperature of the furnace.

For example, suppose the amount of gas given off in the one voltmeter is 100 c. Cms. per hour for a resistance of 4 Ohms, if the volume of gas given off in the voltmeter connected with the heated wire is only 10 c. Cms., then the resistance of the wire is 40 Ohms or ten times as much and the rise in temperature is ten times as much as the rise in temperature of the normal wire previously experimented with. The subject of pyrometers could be enlarged upon indefinitely so numerous have been the methods used. The foregoing methods are merely an outline of what has been done in this direction.

NICKEL AND COBALT ASSAYING.

By M. E. D. Merry, Rosslund.

A METHOD for nickel and cobalt assaying of which I propose to give an account was invented—if I may use the term—by my father, Mr. A. S. Merry, many years ago, and although in constant use for upwards of fifty years has never to my knowledge been published, and only those chemists who have at one time or another been connected with my family in business have heard of this particular method, which though old, is, I believe, as speedy and accurate as any yet published. And I may add that even the electrolytic method so much in use at the present day is no more accurate, if as much so.

In the first place nickel and cobalt metals are usually associated with copper, especially when found in the ore as sulphide, and arsenide, the only other form of ore found on a commercial scale being the carbonate silicate of nickel, which is generally free from copper and carries, as does the Sudbury ore, only traces to one-half per cent. of cobalt. Iron is always present.

With regard to preliminary preparation of the ore, your readers will be well acquainted, so we will proceed from the time the ore is dissolved and all nickel and cobalt in solution, except perhaps in the case of a sulphide ore low grade, say 1 or 2 per cent. nickel and trace of cobalt, when the value of the cobalt is not taken into consideration, in which case 500 grains—or the equivalent in grams—is taken and melted with 10 per cent. of charcoal or finely pulverized coal dust, and 500 grains of borax glass, and as soon as melted, well covered with additional borax glass without taking out of the fire, allowed to remain in fire with a fire-clay cover over the crucible until fluid, poured into iron mould, allow to cool, resulting button of matte can all be dissolved, or weighed and proportionate amount taken for assay. Time, about 10 to 15 minutes.

Having nickel and cobalt in solution, it is well to evaporate nearly to dryness, all excess of hydrochloric acid to dispel nitric acid, dilute with tepid or cold water and pass a current of sulphuretted hydrogen through solution, which will precipitate copper, most of the arsenic, tin, antimony, etc., etc., adding a few spots (according to quantity of arsenic present) of hyposulphite of soda which assists the precipitation of the arsenic in a very great degree. If much arsenic is present this gas should be kept on for about fifteen minutes or until solution is saturated, which can be determined by smelling the solution, and well stirring; if thoroughly gassed precipitate will settle quickly and

solution appear clear. It is well to shake or stir solution more than once and warm before filtering, as there is a point in temperature of solution, and also quantity of H. S. at which arsenic is more readily precipitated, and if over gassed this point is more easily obtained by allowing solution to stand on a hot slab for some time before filtering. Even with great care, however, if arsenic is present in excess of copper some arsenic is likely to remain in solution, but this is gotten rid of by next operation. Filter on rapid brown or white paper, leaving precipitated sulphides on paper and wash thoroughly with five or six waters—hot water hastens the operation—allowing waters to pass into large greaser or flask with filtrate which will contain all the nickel and cobalt and iron, together with zinc and manganese if any present. As these two latter metals are rarely met with in association with nickel ores of commercial value. Although manganese is often found associated with with cobalt, we will act as though they were not present and treat with them later on, and proceed to separate the iron.

Boil filtrate until all Hy. S. is driven off, adding a little chlorate of potash to bring iron to a state of per oxide. If arsenic be not all precipitated by the last treatment, some will be seen to precipitate on boiling, and the balance will be precipitated with the iron as arsenate of iron. Proceed as follows:

Add slight excess of ammonium hydrate, precipitating all the iron, then add hydrochloric acid at first rapidly and then drop until nearly all the iron is re-dissolved, leaving solution nearly neutral with just a trace of iron still precipitated, then add acetate of soda in excess and bring to a boil when all iron will be precipitated; filter into large breaker, wash once and re-dissolve iron, placing filter paper and contents in flask with Hcl., dilute according to amount of iron present, and re-precipitate in same manner; filter on another paper. Test second filtrate with ammonium sulphide, and if containing any nickel add to first filtrate (washing thoroughly), if not it can be discarded. Where a large percentage of iron is present it is usual to find a little nickel and cobalt in first precipitate.

Warm filtrate, which by this time has become rather bulky, add one or two spots of ammonium hydrate, and pass strong current of Hy. S. through solution, which will precipitate nickel and cobalt as sulphide in a very short space of time, care being taken not to have a large excess of Hy. S. or ammonium sulphide, which will retain some of the nickel and cobalt in solution; allow precipitate to settle, and filter on white Swedish paper while hot, wash with water through which Hy. S. has been passed. This operation should be carried on quickly, keeping the nickel sulphide covered with solution, or gassed water until operation is finished, otherwise if precipitate is allowed to stand and become nearly dry before operation is finished some will pass through filter paper on adding remainder.

We have now on the filter paper nickel and cobalt sulphide together with zinc and manganese if any present; dry thoroughly; remove the filter from the funnel, and burn in platinum dish, thoroughly removing all organic matter from the paper. Brush the oxides now formed into a small breaker, add Hcl. and one or two spots of H₂S. (to dissolve any sulphide still remaining) cleaning out the platinum dish by heating with Hcl., which add to the main bulk—cover with watch glass and heat gently when all

nickel and cobalt will be in solution. Precipitate the whole with caustic potash, add excess of acetic acid and then nitrate of potash; stir occasionally with glass rod and allow to stand for eight or ten hours covered with watch glass, when cobalt will be seen to precipitate and on addition of potassium nitrate will settle to the bottom. Decant the major portion of nickel off the precipitate cobalt, and filter on washed white paper, washing with two waters as gently as possible. Add excess caustic potash to nickel solution precipitating on the nickel, filter wash well. Now we have the two metals as precipitates, the nickel as oxide, the cobalt as double nitrate of cobalt and potash.

Although up to this point Fresenius and others employ practically the same method as the foregoing, the next operation I have never seen in print. It is as follows:

For Nickel.—Dissolve precipitate with dilute Hcl., dilute slightly, add slight excess of ammonia, which will precipitate any iron carried through mechanically or gathered during different operations; filter and wash thoroughly, care being taken to avoid bulky solution as concentrated as possible; add Hcl. to filtrate drop by drop until litmus paper is very slowly turned from blue to red (care being taken not to have an excess of acid which would render the next operation dangerous) and titrate with a standard solution of cyanide of potassium about one per cent strength, that is 1 c.c. of Kcy solution—one per cent nickel, at first quickly until solution shows alkaline on testing with litmus paper, when a precipitate will be formed and then slowly until all the precipitate is dissolved, which finishes the operation.

Treat cobalt precipitate in the same manner.

The standard Kcy. solution used for titrating copper will do for the nickel and cobalt, the ratio being as follows: Ni. 100, Co. 0. 1053, Cu. 92.3, but it is well to check by standardizing solution with pure electro deposited metallic nickel; and for cobalt using chemically "prepared" oxide of cobalt (Co. 0) not the "black" oxide (Co. 2, O. 3).

This method of titrating is more accurate if properly manipulated than estimating the precipitated nickel as oxide, and check samples should not very more than 0.01 per cent. 1-100 per cent. By this method nickel can be made in the absence of cobalt or if estimating together as nickel, in one day; if separately, requires a day and a-half, as cobalt must have time to settle.

In the event of zinc being present treat by one of the following methods:—

First—For alloy, volatilize zinc in charcoal lined crucible until constant.

Second—If an ore of nickel containing zinc in any quantity let the two proceed together, and a precipitating nickel with caustic potash a great deal of the zinc will be re-dissolved and thus got rid of; wash the nickel oxide well, dry, ignite reduce with carbon, and melt to metallic nickel, and the remaining zinc will be volatilized.

Third—In cases of small traces of zinc, titrate in the usual manner as hereinbefore described, add excess of cyanide of potassium and little ammonia, then add sulphide of sodium or ammonium and boil. Any zinc will be precipitated, as well as manganese.

A rich zinc ore is very unlikely to contain nickel, and if it does the nickel contained would be of practically no commercial value, unless recovered from retort residues after treatment of the ore for zinc.

DIRECTORS' REPORT FOR 1899.

The Consolidated Cariboo Hydraulic Mining Company, Ltd.

THE company's property is located in the Quesnelle River mining region, famous for its rich shallow placers, its extensive system of ancient river channels, and its immense deposits of high grade auriferous gravels.

It is situated at Bullion, Cariboo District, British Columbia, on the southerly side of the South Fork of the Quesnelle River, four miles westerly from the outlet of the great Quesnelle Lake, about one hundred and ninety miles via the One Hundred and Fifty Mile House and Beaver lake, and about one hundred and seventy miles via the One Hundred and Eight-Mile House and Horsefly by waggon road from Ashcroft, on the line of the Canadian Pacific Railway.

The property comprises thirty-four placer mining leases aggregating two thousand five hundred and eighty-four acres of land, and a block of pasture land containing three hundred and twenty acres. The min-

of this great channel can be attacked and successfully exploited at two points, viz: First, at Blackjack Gulch, by the extension of the main sluice tunnel that will eventually be driven to work the bottom gravel of Pit No. 2; second, by opening and exploiting an hydraulic pit in the channel outlet at the confluence of Morehead Creek with the main Quesnelle River.

The deposits included in the company's property vary from four hundred to six hundred feet in depth from surface to bottom of channel. The quantity is estimated at five hundred millions of cubic yards of high grade auriferous gravel that is available for future washing by hydraulic process. The average gold tenure is moderately estimated at twenty cents per cubic yards and the total gold contents at one hundred millions of dollars.

The South Fork and main Quesnelle Rivers are torrential streams of great volume, and afford an ample dump for the debris from the entire working of the company's property.

The quantity of auriferous gravel under the com-



View showing Canal and recently installed Pipe Line.

ing leases cover, for a distance of about ten miles, the auriferous deposits of a system of ancient rivers.

The ancient river now being exploited lies parallel to the course of the South Fork of the Quesnelle River for a distance of about two miles, and has its outlet at Dancing Bill Gulch. This channel can also be opened and successfully exploited at Blackjack Gulch, about one mile east, and Drop Gulch about one and a half miles easterly from Dancing Bill Gulch.

The second ancient river covered by the company's leases is one of stupendous proportions. It apparently had its source east of the company's mines in the Quesnelle Lake region, passed westerly down the depression of the Little Lake Valley towards Morehead Creek, and has its outlet at the confluence of said Morehead Creek, with the main Quesnelle River, about seven miles below Quesnelle Forks (see map accompanying the first annual report). The deposits

pany's control represents about one-quarter of the whole of the auriferous gravel remaining and available for working by the hydraulic process in the hydraulic mining region of Central California. (See report of Secretary of War U. S. Engineers, 1891, Vol. II., Part V., page 3080).

	Cubic Yards.
"The total quantity of auriferous gravel remaining and available for working by hydraulic process on the Yuba and American Rivers, is	1,508,875,000
to which is added the quantity remaining available for washing by hydraulic process on the Feather River, Upper Sacramento and Southern Rivers tributary to the San Joaquin.	600,000,000
Total quantity	2,108,875,000"

The value of this quantity of auriferous gravel is estimated by the U. S. Engineers, and others employed by the Government for making such estimates, at five hundred and fifty-two million six hundred and sixty-five thousand dollars. The capital invested in the Central California hydraulic region above referred to, including the purchase cost of mining properties, water supply systems, hydraulic plant and other equipments, amounts to one hundred millions of dollars. (See report of Secretary of War U. S. Engineers, 1891, Vol. II., Part V., page 2990).

If the eight and seven-tenths cent gravel in the North Bloomfield mine, in California, produced a net profit of four hundred and eleven thousand five hundred and eighty-nine dollars and twenty-seven cents out of a gross product of one million four hundred and thirty-five thousand six hundred and eighty dollars and forty-seven cents (see page 134, ninth annual report California State Mineralogist), it is certainly safe to assume (the cost of mining being about the same), that the twenty-seven and three-tenths cent gravel in the Consolidated Cariboo Hydraulic Mining

age reservoirs by the construction of substantial dams across their outlets. These reservoirs have an aggregate capacity for storing one billion and sixteen million cubic feet of water, which is equal to four hundred and seventy thousand three hundred and seventy miners' inches of water. This storage supply is greatly augmented by the waters of Dancing Bill Gulch and other streams tributary to the main canals between the storage reservoirs and the mines, and ensures a supply, varying with the precipitation, of from three to five thousand miners' inches of water throughout the mining season of six to seven months.

The water supply system also includes two pooling reservoirs, located on Blackjack Gulch. One of these reservoirs is at the delivery end of the main South Fork canal from Polleys Lake, and the other at the delivery end of the Morehead Canal. They are utilized for pooling the early spring freshet water required for use in the hydraulic pits at the opening of the season, and assist materially in the economical use of water at the mine.

The camp equipment of the water supply system



Giants on Floor of Pit No. 1.

Company's property can be relied upon to yield profits equal to about seventy per cent. of the gross product.

The Consolidated Cariboo Hydraulic Mining Company's water supply system, as now completed, consists of thirty-three miles of well constructed canals, having a capacity for delivering at the mine five thousand miners' inches of water under a head of four hundred and twenty feet. (A miner's inch is 2,160 cubic feet, the quantity of water discharged in twenty-four hours, under a head of seven inches, through an opening one-half inch wide by two inches high, made in a board two inches thick). The sources of supply are at Bootjack Lake and Polleys Lake, about nineteen miles distant, and Morehead Lake, ten miles distant from the company's mines at Bullion. All the above-named lakes have been converted into efficient stor-

age reservoirs by the construction of substantial dams across their outlets. These reservoirs have an aggregate capacity for storing one billion and sixteen million cubic feet of water, which is equal to four hundred and seventy thousand three hundred and seventy miners' inches of water. This storage supply is greatly augmented by the waters of Dancing Bill Gulch and other streams tributary to the main canals between the storage reservoirs and the mines, and ensures a supply, varying with the precipitation, of from three to five thousand miners' inches of water throughout the mining season of six to seven months.

The company's water supply can be increased two thousand miners' inches when desired, by utilizing the waters of Little Lake and Long Lake, for opening and exploiting an hydraulic pit at the outlet of the Little Lake channel near the mouth of Morehead Creek, and can be increased by ten thousand inches or more, if desired, by the extension of the main canals to control additional available watershed.

The mine equipment consists of a portable hydraulic plant of four lines of thirty inch and twenty-two inch riveted steel pipes, aggregating six thousand feet; six No. 8 hydraulic giants, with deflecting nozzles; varying from six to ten inches in diameter; one steam power hoisting and pumping engine for sink-

ing shafts for bank blasting; one fire-proof magazine for dynamite; one magazine for bank blasting powder; one dynamite thawing house; one fuse-cutting and detonator-priming house in each of the hydraulic pits; one general blacksmithing shop for general forging, waggon work and horseshoeing; one pipe making shop, fitted with rolls and other appliances for making and repairing hydraulic pipes; one steam-power saw mill, having a capacity for cutting daily about four thousand feet of lumber. This mill is also supplied with a planing and matching machine, boring and framing machines, also emery wheel and grindstones operated by steam power, the use of which appliances result in a great saving of labour and a material reduction in the cost of all wooden structures, as well as the cost of sharpening edged tools.

The gold saving appliances consist of a double extended system of sluices seven feet wide by four feet deep, aggregating two thousand three hundred and eighty feet in length. This system of sluices is paved partially with end-wood sluice blocks one foot thick, and partially with improved longitudinal steel riffles. Fixtures and longitudinal riffles are on hand for the installation of two improved undercurrents intended for the recovery of flour quicksilver, fine gold, platinum, and osmiridium that cannot be recovered in the ordinary sluice.

The melting plant consists of three retorts fitted

with iron Liebig condensers for distillation of quicksilver, having a capacity for treating twelve thousand ounces of amalgamated gold at a single charge; two furnaces for melting, and other appliances necessary for handling ingots of gold weighing up to twelve thousand ounces; also a complete assay outfit for determining the value of bullion.

The mine is also supplied with a complete outfit of

mechanics' and mining tools and implements of all kinds, sufficient for one hundred and fifty men.

The mine lighting plant consists of six Wells lights of three thousand candle power each.

The telephone system includes three lines, aggregating thirty-five miles, with fifteen instruments, that place the storekeeper and manager in direct communication with the reservoir tenders, canal tenders, saw-mill foreman, general blacksmith and foreman of the hydraulic pits.



Giant on bank in Dancing Bill Gulch. Stream at work making a cut for Pipe Line.

The company's equipment consists of one store building for general mining supplies; one tool storehouse; one oil storehouse; one frost-proof provision storehouse; two frost-proof storehouses; one slaughter house; one meat house; one general office building; one manager's office building; one manager's residence; one residence for surgeon; one hospital building; one dining house; one barn for company's horses, hay and feed; two stables for accommodating freighters' teams; one waggon shed; one storehouse for miscellaneous hydraulic plant and fixtures; one charcoal storehouse; one surfaced lumber shed; one foreman's cabin; one house for shift bosses, and ten camp buildings for one hundred and twenty miners and labourers.

There are also five work horses, two saddle horses, together with the necessary waggons, sleighs, harness and saddles.

This makes the equipment of the property as complete and efficient as that of any hydraulic mining property on the Pacific Coast.

The company's property is probably the largest, and the high grade of its deposits entitles it to a place among the richest hydraulic mines in the world.

SECOND ANNUAL REPORT.

DIRECTORS' REPORT.

Gentlemen,—Your directors beg to submit their report at the second annual meeting of the shareholders, together with the manager's report, balance sheet and auditors' report for the year ending December 31st, 1899.

W. D. MATTHEWS,
President.

ASSETS.

Mines, mining leases, water rights, etc., as per balance sheet, Dec. 31st, 1898	\$3,914,558 38	
Morehead dam and ditch—cost as per statement, Dec. 31st, 1898...	118,458 68	
Equipment of lower bench, as per statement, Dec. 31st, 1898....	7,424 01	
Lands and leases, per statement, Dec. 31st, 1898.....	1,322 00	
Portable hydraulic plant	9,998 56	
Mine lights and hoisting engine..	1,526 70	
	<u>\$4,053,288 33</u>	
Inventory. (As per Manager's Report).—		
Provisions, mining supplies and explosives	\$ 26,128 25	
Lumber, saw logs and sluice blocks	4,230 39	
Tools and implements	10,337 60	
Blacksmith's stores	1,783 71	
Horses and mules	875 00	
Wagons and harness	1,788 00	
Quicksilver	2,804 65	
	<u>\$ 47,947 60</u>	
Cash on hand, mine office	70 20	
Personal accounts receivable ..	4,680 81	
Permanent Improvements 1898—		
Drain tunnel, per balance sheet, Dec. 31st, 1898	\$ 3,533 42	
Less 20% depreciation, season 1899.	706 68	
	<u>2,826 74</u>	
Rifle account per balance sheet, Dec. 31st, 1898	\$11,600 01	
Less 10% depreciation, season 1899.	1,160 00	
	<u>\$ 10,440 01</u>	
	<u>\$ 13,266 75</u>	
Permanent Improvements, Season 1899—		
Morehead pooling reservoir dam	\$ 6,422 23	
Morehead ditch, new flumes and additional works	18,346 00	
Equipment South Fork pit....	8,679 84	
Melting plant—new retort house	3,617 30	
Dancing Bill Gulch—permanent pipe ladder	1,165 96	
Permanent flumes and sluices in mine	7,096 10	
Dancing Bill Gulch—permanent waste water chute	462 75	
Installation steel riffles	\$6,307 64	
Less 10% depreciation	630 76	
	<u>5,676 88</u>	
Buildings—(See Manager's report).....	3,293 29	
Reservoir gate Polleys Lake..	355 50	
	<u>\$ 55,115 85</u>	
Balance from operating account season 1898	2,527 17	
Balance from operating account season, 1899	46,682 04	
	<u>\$4,223,578 75</u>	
LIABILITIES.		
Capital authorized	\$5,000,000	
Capital issued	\$4,000,000 00	
Accounts payable	23,389 68	
Bills payable	50,000 00	
Bank of Montreal	150,189 07	
	<u>\$4,223,578 75</u>	

Examined and found correct.
W. S. ANDREWS, Auditor.

February 12th, 1900.

GENERAL OPERATING ACCOUNT.

Season, 1899.

To operating expenses for season, as per statement from mines ..	\$ 131,178 34	
To drain tunnel account, 20% written off for depreciation	706 68	
To riffle account, 1898, 10% written off for depreciation	1,160 00	
To head office expenses	980 80	
To interest account	8,634 09	
	<u>Cr.</u>	
By bullion received	\$ 92,678 93	
By stores account—Profit for season on sales to outside parties	3,298 94	
By balance, loss on season's operations	46,682 04	
	<u>142,659 91</u>	

STATEMENT OF MINES' EXPENDITURES, SEASON 1899.

Permanent Improvements.—		
Morehead pooling reservoir dam	\$ 6,422 23	
Morehead ditch repairs. New flumes, etc., to repair damage by slides	18,346 00	
Equipment of South Fork pit....	8,679 84	
Melting plant—New retort house.	3,617 30	
Permanent waste water flume at Bill Gulch	462 75	
Permanent sluices in mine	7,096 10	
Installation of steel riffles	\$6,307 64	
Less 10% depreciation... ..	630 76	
	<u>5,676 88</u>	
Reservoir gate at Polleys Lake..	355 50	
Buildings	\$ 3,293 29	
Total cost permanent improvements		\$55,115 85
Public Account—		
Portable hydraulic plant, pipe giants, etc., out of stores....	\$ 9,998 56	
Mine lights and hoisting engine, out of stores	1,526 70	
Total cost of plant		11,525 26
Total cost of permanent improvements and plant		<u>\$66,641 11</u>

MINES' OPERATING EXPENSES

Lands and leases—Rentals	\$ 2,002 75	
Mining—		
Explosives	\$38,837 02	
Labour	39,068 42	
	<u>77,905 44</u>	
South Fork ditch maintenance.....	7,339 50	
Morehead ditch	4,834 55	
Sluices	6,422 11	
Port. hyd. plant	6,461 38	
Mine light	1,037 60	
Camp	3,115 22	
Buildings	1,652 44	
Melting plant	3 35	
Wagons and harness	240 51	
Telephone	190 41	
Roads and trails	99 70	
Fire Ins. account	412 50	
Transportation of miners, etc.....	4,649 26	
Bullion expenses—Government tax and transportation	2,418 42	
Postage and telegraph	134 33	
Mine office expenses	2,762 07	
Incidental expenses	35 50	
Stationery and printing	202 90	
Legal expenses	73 82	
Management	6,436 40	
Company's license	183 40	
Wagons and harness account—Loss for season...	173 00	
Horses and mules account	535 00	
Tools and implements—Depreciation for season..	1,009 33	
Quicksilver account—Loss, etc	847 45	
Total cost operating accounts for season, as per Mines' books	\$131,178 34	
Deduct profit on stores for season	3,298 94	
	<u>\$127,879 40</u>	

MANAGER'S REPORT.

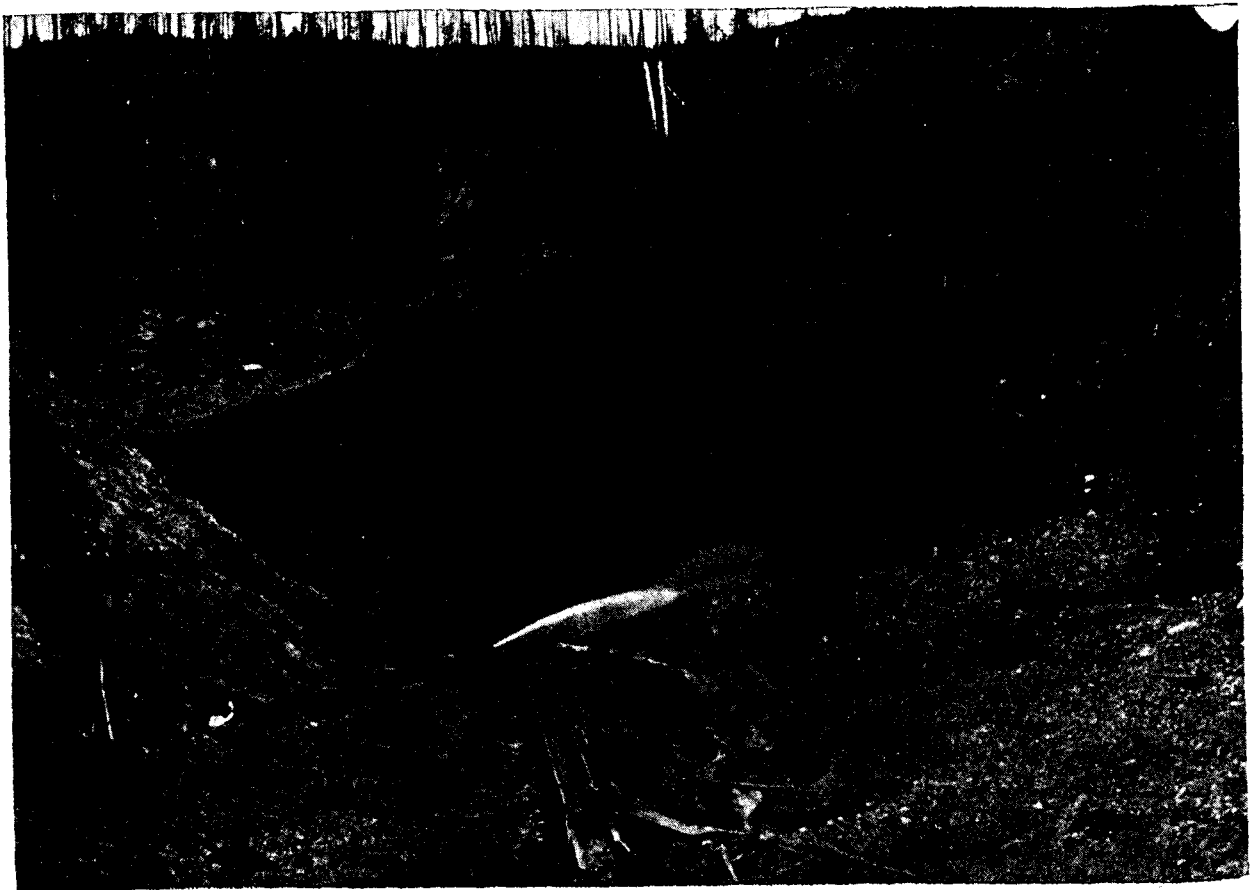
Bullion, B. C., December 31st, 1899.

To the President and Directors of the Consolidated Cariboo Hydraulic Mining Company, Limited Liability, Toronto, Canada:

Gentlemen,—In handing you this, my annual report for the season of 1899, I am pleased to inform you that the past season's operations resulted in completing the equipment and opening the property, so that expense in that direction is at an end; that the mine is now fully opened for the continuous use of the increased water supply for washing gravel of high grade from the main bank, and is on a basis for large and profitable production.

The season's operations were confined mainly to the removal of the remainder of the accumulations of tailings, boulders and sliderock left in the old Chinese workings; the removal of the boulderclay, low grade

Construction of crib and stone dam for Morehead pooling reservoir	6,422 23
Completion of retorting furnace and melting plant	3,617 30
Installation of hydraulic plant and gold saving appliances in South Fork pit	8,679 84
Installation of permanent sluices in pit No. 1	7,096 10
Installation of permanent, and additions to portable hydraulic plant, pipes, giants, etc.	\$9,998 56
Construction of pipe ladder on bluff at Dancing Bill Gulch	1,165 96
Construct'n waste water flume down bluff at Dancing Bill Gulch	462 75
	—————\$ 11,627 27
Reservoir gate at Pooleys Lake.....	355 50
Additions to mining plant, hoisting engine and well lights	1,526 70



View looking South towards Bank Blast. Stream on Floor of Pit No. 1, cutting Slope for second Pipe Line. Giant on Lower Bench washing Gravel through newly installed Sluices.

gravel and sliderock that laid on the rims of the channel south and west of the old Chinese workings; to the permanent installation of the hydraulic plant, gold saving appliances and other plant required to complete the equipment of the property; and to repair the extensive breaks that occurred on the line of the Morehead Canal.

The expenditure for the season's operations is distributed as shewn by the following statement:—

Clearing the hydraulic pits of 1,952,535 cubic yards of boulderclay, low grade gravel, tailings, boulders and sliderock, to make room for the permanent installation of the hydraulic plant and gold saving appliances\$127,879 40

Installation of steel riffles for sluices and fixtures for two undercurrents..	5,676 88
Construction of necessary camp buildings	3,293 29
Construction of flumes around slides on Morehead Canal	18,346 00

Total expenditure for the season\$194,520 51

Fig. 1 represents a plan of the hydraulic excavations made by the early Chinese miners and the Consolidated Cariboo Hydraulic Mining Company.

Fig. 2 represents a plan of hydraulic pit No. 1 at the close of the past season.

Fig. 3 represents a longitudinal section running up the channel from the bed of the Quesnelle River to

the main hydraulic bank, showing the relative positions of the two systems of sluices and the bedrock sluice cuts being extended from the lower system of sluices.

The condition of hydraulic pit No. 1 at the opening of the season made it impossible to wash more than a small portion of the high-grade gravel from the main bank until such time as the sluices intended for the removal of that body of gravel to the dumps were laid down permanently on the bedrock near the east rim and carried around the big bend of the channel, as shewn on the plan of the workings, Fig. 2; neither could the bottom gravel be worked to any great extent until the sluice cuts were extended and lowered to make grade for its removal to the lower system of sluices and the dumps. This condition made it necessary to remove immediately the remainder of the accumulations of tailings, boulders and sliderock from the old Chinese workings (see Fig 1, Block 1); also

SUMMARY OF THE SEASON'S HYDRAULIC WORK.

Total time run	144 days, 8 hours
Total quantity of water used	353,056 miners' inches
Total quantity of gravel, sand, clay, tailings, boulders and slide-rock removed from both pits during the season	1,952,535 cubic yards
Value of gold recovered during progress of the season's work	\$92,678.93
The following stores are on hand at the Mine, as per inventory taken November 17th, 1899:	
Provisions, mining supplies and explosives	\$26,128 25
Lumber, sawlogs and sluice blocks	4,230 39
Tools and implements	10,337 60
Blacksmiths' stores	1,783 71
Horses and mules	875 00
Wagons and harness	1,788 00
Quicksilver	2,804 65
	\$47,947 60

Many unexpected difficulties were encountered during the progress of the season's work, which



Giants at work in Dancing Bill Gulch.

the remainder of the low-grade gravel, boulderclay, boulders and sliderock from the Block 3-A on the north rim, and the Block 3-B on the west rim, to make room for the safe and permanent installation of the sluices and the extension of the bedrock cuts, as shown on Fig. 2, and the cross-section, Fig. 3. The whole of the boulderclay, sand and low-grade gravel lying on the southwest rim, in the Block 3-C, had to be removed to make possible the changing of the hydraulic plant from the bed of Dancing Bill Gulch, and to provide a safe place on the bedrock rim for its permanent installation and extension up the channel.

During the progress of the work 297,088 miners' inches of water were used 116 days, 8½ hours to wash 1,600,000 cubic yards of the waste and low-grade material above referred to from Pit No. 1; 55,958 miners' inches of spring freshet and waste water were used 27 days, 32½ hours to wash 352,535 cubic yards of top clay and sand from pit No. 2 (the South Fork pit).

added materially to the cost thereof. The time consumed in the removal of these difficulties made it impossible to wash in pit No. 1 more than 116 days, 8½ hours, out of a possible 180 days. This explains briefly why the 110,000 miners' inches of water remaining in the reservoirs at the close of the season could not be utilized to wash about 500,000 cubic yards of high-grade gravel from the main bank, and the season's product could not be brought up to what was expected.

REVIEW OF THE HYDRAULIC WORK DONE IN PIT NO. 1 BY THE CONSOLIDATED CARIBOO HYDRAULIC MINING COMPANY AND ITS PREDECESSORS.

The accompanying plan (Fig. 1) represents the exterior boundaries of the hydraulic excavations made by the Consolidated Cariboo Hydraulic Mining Company and its predecessors, including the Chinese min-

ers from whom the property was originally purchased. Block No. 1 represents the ground worked up the channel a distance of about 1,000 feet by the Chinese companies. This block of gravel, estimated to con-

and tailings that were left piled up in the old workings by the several Chinese companies. All this enormous quantity of waste had to be removed, at heavy cost, before the permanent gold saving appliances could possibly be installed.

Blocks 3-A and 3-B represent the bodies of boulder-clay, low-grade gravel and sliderock lying to the west of the Chinese workings, that had to be removed by the Cariboo companies before the hydraulic plant and

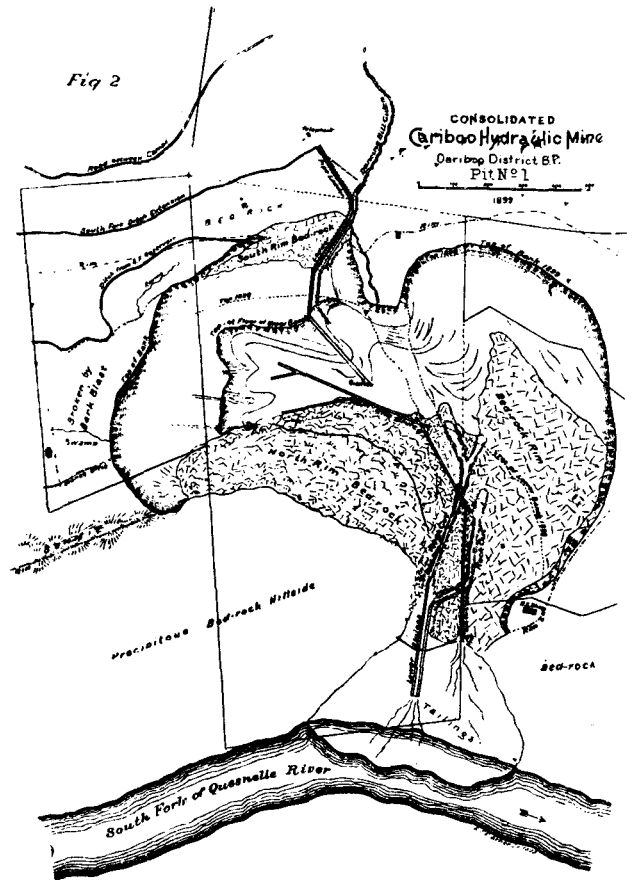
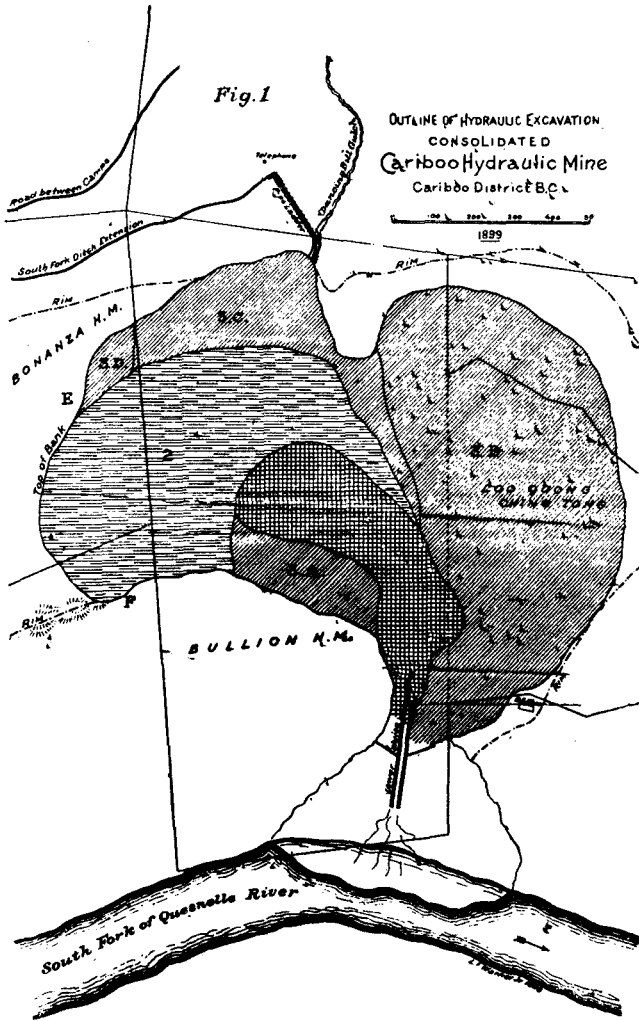
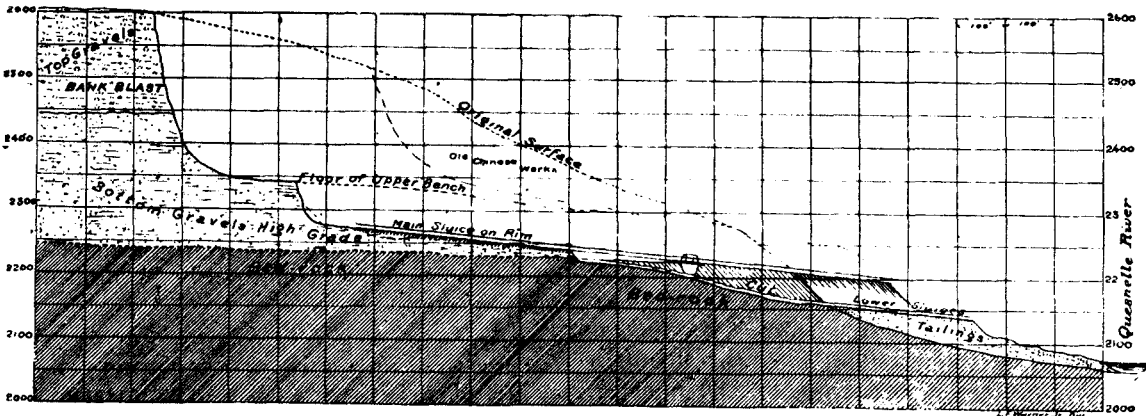


Fig. 3. Consolidated Cariboo Hydraulic Mine. Longitudinal Section 1899



tain 705,759 cubic yards, produced, according to the Chinese companies' books, about \$900,000. It was in this worked out block of ground that we encountered such enormous quantities of large boulders, sliderock

gold saving appliances could be safely and permanently installed, or the bedrock cuts could be advanced and lowered to afford grade for the removal of the bottom gravel.

The boulderclay and low-grade gravel lying on the southwest rim and underlying Dancing Bill Gulch, included in the block marked 3-C, had to be entirely removed to make possible the changing of the hydraulic pipes from the bed of Dancing Bill Gulch to a safe and permanent place on the bedrock rim.

The block of ground 3-D forms a part of the average cross section of the main bank. This block of ground was washed near the close of the first run during the past season, and produced about \$15,000 as the result of nine days' washing; the gravel that shingled off the main bank with the frost during the previous winter, between the points E and F, was washed at the end of the same run and produced \$15,000 as the result of about sixty hours' washing, making a total of about \$300,000, that formed the greater part of the gold recovered during the first run.

The quantity of gravel, boulderclay, boulders, tailings, siderock and other waste material washed from blocks No. 1, 3-A, 3-B, 3-C and 3-D, amounted to 3,580,668 cubic yards, and produced about \$128,000, an average of about 3½ cents per cubic yard, a figure considerably below the cost of its removal to the dumps.

Block No. 2 represents the ground washed from the main bank of the Cariboo companies, commencing at the face of the bank in the Chinese excavation as it was

found in 1894, and extending up the channel in new ground a distance of about 400 feet. This block of ground contained 1,463,572 cubic yards of top boulderclay and high-grade gravel that produced about \$400,000, an average yield of about 273.10 cents per cubic yard. This makes the total quantity of gold recovered by the Cariboo Hydraulic Mining Companies amount to about \$528,000.

By reference to the company's books, it will be seen

that the total expenses up to and including the season of 1899, is \$439,026.12, which, deducted from the \$528,000, leaves a net profit of about \$88,973.88, that was produced while doing deadwork in the way of clearing out the old workings, installing the hydraulic plant and gold saving appliances and opening up the hydraulic pit for continuous operation and profitable production.

The total quantity of clay, gravel, boulders, etc., washed from the hydraulic excavation of pit No. 1,

by the Cariboo and Consolidated Cariboo Hydraulic Mining Companies and their Chinese predecessors, amounts to about 5,750,000 cubic yards; this quantity of gravel produced, so far as known, about \$1,428,000, an average of about 284-10 cents per cubic yard. This average will be materially increased by the product of the high-grade gravel in the lower bench, and that of the rich gravel on the bedrock in the bed of the channel.

The high-grade character of the gravel in the main bank has been proven beyond a reasonable doubt by the practical tests made by washing 1,463,575 cubic yards of gravel from the block No. 2, which extended up the channel beyond the Chinese workings a distance of about 400 feet. The high-grade character of the lower bench and bedrock strata in the deep channel has also been proven by the practical working tests made in 1898



Flume on Morehead Canal, replacing Ditch destroyed by slides. See portion of destroyed Ditch on the right of Photograph.

and during the past season. The small quantity of gravel washed from the lower strata of the bottom bench in the deep channel produced the greater part of the gold recovered during the past season's operations.

It is true that we encountered a large body of low-grade gravel in the upper strata of the lower bench, while carrying the hydraulic excavation around the big bend of the channel, but this is a condition that is

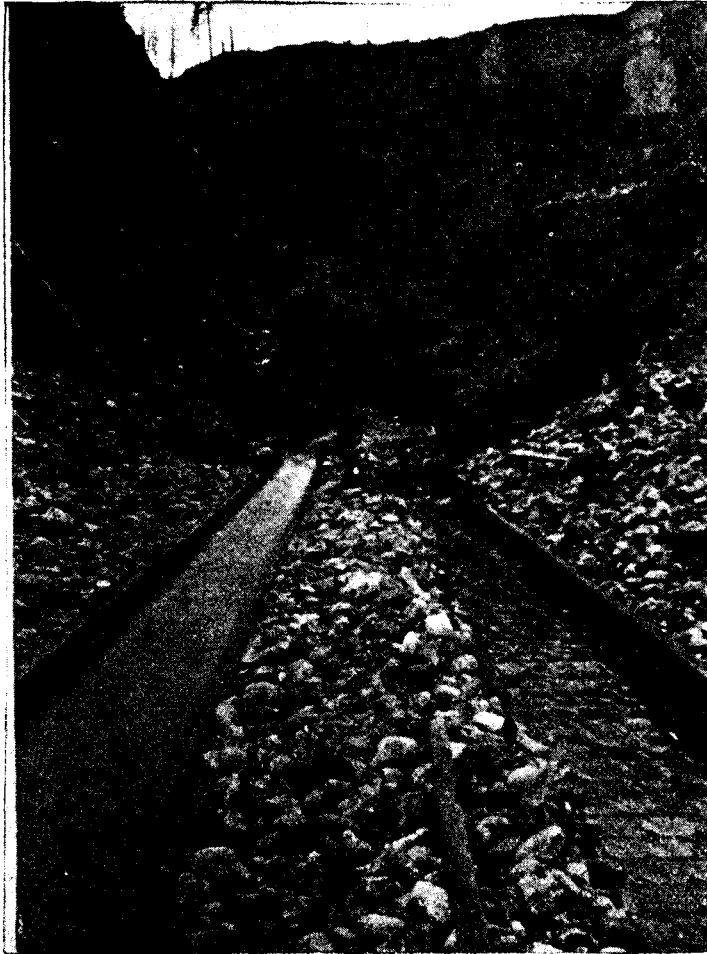
usually encountered in the big bends of either ancient or modern torrential rivers, where the current crosses from one rim of the channel to the other. This body of low-grade gravel, however, together with all other waste and low-grade material that interfered with profitable operations heretofore, has been entirely removed, leaving the working wholly in virgin ground of high grade.

WATER SUPPLY.

The quantity of water available during the season of 1899 was in excess of the previous year, on account of the additional supply afforded by the Morehead system.

The precipitation for 1898 was 28 57-100 inches. The precipitation for 1899 was 28 65-100 inches. And exceeded that of 1898 by only 8-100 of an inch.

The snow fell deep in the winter, upon hard, frozen ground, and melted in the early part of the spring under very favourable weather conditions of warm days and nights, which resulted in filling the Polleys Lake and Bootjack Lake reservoirs, and raised the water in Morehead Lake reservoir to a height of 28 feet 10 1/4 inches. Sufficient snow remained on the ground to fill the Morehead reservoir to its holding capacity, providing the warm weather continued, but cold weather set in, checked the melting of the snow, and continued until late in the spring, so that the remaining snow on the watershed disappeared entirely by evaporation.



Rock Cuts on Line of Morehead Canal.

	Miners' Inches.
Quantity of water used in 1898.....	264,880 9-10
Quantity of water remaining in Polleys Lake reservoir at close of the season	10,000
Quantity of water remaining in Morehead Lake reservoir at close of the season	100,000
Total quantity of water available for use during season of 1899	463,056
Quantity of water afforded in excess of 1898.....	198,175 1-10

The time consumed in constructing 5,167 feet of flume and crib work to repair the extensive breaks on the upper section of the Morehead Canal, together with the time consumed in dealing with the difficulties encountered at the mine, made it impossible to open the gates of the Morehead Lake reservoir until late in the season, rendered the exhaustion of the reservoirs impossible, and explains why the season closed with a

total of 110,000 miners' inches of water remaining in the reservoirs. This water will be added to the supply afforded by the coming season.

WATER SUPPLY SYSTEM.

The Morehead pooling reservoir has been completed by the construction of a dam 20 feet high above solid foundation, and 4.10 feet long on the crest. The dam is a cedar log crib, filled with rock and sheathed on the inside with double two-inch plank, joints covered with one-inch batons, bottom sheathing well banked with earth and clay. This reservoir is situated at the head of Blackjack Gulch, above the South Fork reservoir, only a short distance from the hydraulic pits, and will be of great value in collecting and pooling the early spring water required for washing in the hydraulic pits at the opening of the season, and will materially assist in the economical use of water at the mine by giving an increased supply for short intervals when required to remove large boulders or heavy material from the workings to the dumps, or pooling the water during short intervals when necessary to lubricate the hydraulic giants or to repair the hydraulic appliances without closing the main reservoir gate.

The great depth of frost in the ground caused more slides from the inner slopes of the old canals than in any previous season since their construction. On the Morehead Canal a number of heavy slides occurred along the line of the upper section below the reservoir dam, practically obliterating the canal and leaving the ground in such shape as to make it impossible to re-excavate or maintain another canal. The flume constructed in places along the damaged section remained intact. To repair the break 900 feet of the canal was cleared out and cribbed with heavy timbers. A flume 8 feet wide, 4 feet deep and 4,172 feet long, was constructed around the breaks, making the first section 1 1/2 miles below the Morehead dam practically continuous in flume, crib and rock cuts that are likely to remain permanent for many years to come. Many small slides occurred on the line of the canal where the contractors used powder to assist in excavating cuts and heavy slopes in hardpan ground. Settlement also occurred in the Jawbone pipe line and some of the smaller sections of flume that were con-

struction. On the Morehead Canal a number of heavy slides occurred along the line of the upper section below the reservoir dam, practically obliterating the canal and leaving the ground in such shape as to make it impossible to re-excavate or maintain another canal. The flume constructed in places along the damaged section remained intact. To repair the break 900 feet of the canal was cleared out and cribbed with heavy timbers. A flume 8 feet wide, 4 feet deep and 4,172 feet long, was constructed around the breaks, making the first section 1 1/2 miles below the Morehead dam practically continuous in flume, crib and rock cuts that are likely to remain permanent for many years to come. Many small slides occurred on the line of the canal where the contractors used powder to assist in excavating cuts and heavy slopes in hardpan ground. Settlement also occurred in the Jawbone pipe line and some of the smaller sections of flume that were con-

structed in the fall after the ground became frozen hard. Three hundred and twenty-nine thousand four hundred and seventy-six M. B. M. feet of sawed lumber, and seven thousand running feet of eight-inch barked cedar timber were consumed in constructing flumes, crib-work, and making other repairs to the wooden structures on the line of the canal. After completing the repairs, the reservoir gates were opened, the water turned through the canal and was successfully delivered at the mine on August 1st. The Morehead dam, at the outlet of Morehead Lake, showed no signs of settlement, and has proven watertight, safe and efficient. It is believed that the repairs have been so substantially made that no more trouble of a serious nature need be anticipated, and that both the main canals will hereafter deliver the water to the mine at a greatly reduced and moderate cost for maintenance.

CONDITION OF THE MINE.

Since the equipment of the property is complete, hydraulic pit No. 1 cleared of all waste and low-grade material and fully opened for the continuous use of the water supply for washing gravel of high grade, it may be considered in first class condition to produce large and profitable results hereafter.

The hydraulic plant and gold saving appliances have been installed in pit No. 2 (the South Fork pit), placing this pit in good condition for the use of the spring freshet and surplus water to strip off the low-grade deposits to bedrock, which is necessary to place this pit on a basis for profitable production. The time required to complete the opening of this pit to bedrock will depend on the quantity of spring freshet and surplus water afforded annually. The opening, however, can be accomplished at moderate cost, for the reason that it is expected the gold during the progress of the work will pay a part, and perhaps the whole, of the cost of opening this pit for profitable production.

The past season's operations demonstrated that it was possible, under difficulties, to wash in 144 days and eight hours, with 353,056 miners' inches of water, 1,952,535 cubic yards of gravel, boulders, broken rock, etc., at a cost of about 6.54 cents per cubic yard; it is, therefore, safe to assume that a full season's water supply of say 470,000, miners' inches of water, used during a period of 180 days, will wash, under the favorable conditions now existing, fully 2,000,000 cubic yards of high-grade gravel from pit No. 1, at a cost of about 6.05 cents per cubic yard.

By reference to previous reports, it will be noted that the lowest result obtained from gravel washed from the main bank, included in Block No. 2, averaged 21 cents per cubic yard. The average obtained from the washing of 1,463,575 cubic yards of gravel from the main bank, included in said block marked 2, on Fig. 1, was 27 3-10 cents per cubic yard. Higher results than this have been obtained from single runs made on virgin ground from both top and bottom of pit No. 1.

The operating expenses will vary with the quantity of gravel washed during the season, but assuming that the water supply will be sufficient to wash 2,000,000 cubic yards of gravel, at a cost of 6.05 cents per cubic yard, it is estimated that the operating expenses for the ensuing year will not exceed \$121,000.00.

The washing of about 2,000,000 cubic yards of gravel of such high grade as that now exposed in the

main bank and bottom bench, cannot fail to produce large and profitable results for the ensuing season.

This report deals with the revenue and expenditures attending the equipment, opening and physical operation of the mine, and does not include head office expenses.

Very respectfully yours,

J. B. HOBSON,
Manager.

VERBATIM EVIDENCE IN THE IRON MASK-CENTRE STAR LITIGATION.

HAVING been requested by many of our readers throughout the Province to publish in these columns a verbatim report of the evidence in the Iron Mask-Centre Star litigation, Mr. H. F. Evans, our Rossland correspondent, was enabled through the kindness of Mr. J. B. Hastings to carry out our instructions to copy the official report of the proceedings and evidence taken, and which are in consequence enabled to publish in serial form.

(Continuation of Counsel's Argument, from last month's issue.)

Rossland, B.C., April 18, 1899.

The Court met at 11 o'clock a.m. pursuant to adjournment of yesterday, whereupon the following proceedings were heard in the foregoing entitled cause:

Mr. Bodwell—My Lord, before your Lordship begins, I would like to mention to your Lordship, as it seems there might possibly be a misunderstanding, if your Lordship proposes to give judgment on the main question.

The Court—No, I am going to confine myself to the issue presented yesterday. I think this is settled by the Full Court, and so settled that I have no control over it, Mr. Davis. On page 365, this is the language of Mr. Justice Drake, in which the Chief Justice concurs. After reciting the different points at issue, and what has been proved by the plaintiffs, he says:

"In the meantime every step is disputed and every statement denied. I therefore—that means, we do not consider that the Centre Star are entitled to the order asked for."

The way I view that is this: In view of the language he uses afterward where he says:

"I think it should be left to the Judge at the trial to say whether or not actual work should be done for the purpose of elucidating any particular point with regard to the issues raised."

In view of his words afterwards, I regard what he says in this light: He says in the first place, the Iron Mask denies the right of the Centre Star in every possible shape. He says in the next place, that the Centre Star has no apex in the ground. And in view of the pleadings as amended yesterday, and the sweeping amendment made yesterday, I do not see that I can do anything else but follow the judgment of the Full Court by passing upon the motion as I shall do. I will not dismiss it until I find out whether the Iron Mask is right or wrong in its contention; that is to say, whether the Centre Star has a claim or not. That is what it amounts to owing to the points raised yesterday, and I would like that question first disposed of.

Mr. Davis—What question, my Lord?

The Court—Mr. Bodwell's amendment of yesterday.

Mr. Davis—Well, that would only be disposed of by the evidence put in at the trial and argued.

The Court—I cannot help you, sir.

Mr. Davis—But your Lordship does not mean that we should apply for leave to do this work after the trial is closed.

The Court—Oh, no, no; during the time the trial is going on. This will be the first point.

Mr. Davis—As I understand, we have here to renew this application after evidence has gone in.

The Court—Yes; I think that is the spirit of this judgment. Mr. MacNeill will recollect, and so will Mr. Duff, that on the first hearing of this case when Mr. Daly was in the case, I constantly said: "If I am allowed to do so I shall follow the American judgments in the case. And I shall follow the American judgments as far as possible now. That case of Enner vs. Barwell almost, I thought, concluded me, but the Full Court have thought otherwise. This recent case of Lumb vs. Beaumont has taken a different view of it. There are some points in the judgment that may be discussed by and by in the judgment of one of the Judges of the Full Court. I think it will be open for discussion, because they almost decided the question, but on a renewal of this question as to whether there shall be leave to do any more work or not, I think I better say nothing more. With regard to the judgment, with great respect, I do not agree with all the Judges on the judgment.

Mr. Davis—So that, as I understand, after we have put in evidence which we think will entitle us to the order, then we are at liberty to renew it again.

The Court—Yes, after you show, or they fail to show—because it is their duty to show it—after they fail to show what they have set out, that you have not an apex.

Mr. Davis—But, my Lord, that can only be shown after all the evidence is in. There are four or five issues upon which this suit is being fought. None of them can be decided until the trial is over. Some evidence will go in on all of them as soon as the first witness is put in the box.

The Court—It strikes me with all due deference, Mr. Davis, that with respect to the amendment on Mr. Bodwell's behalf that were allowed yesterday, if that point comes up first, I shall be able to give a decision on it piecemeal.

Mr. Davis—But your Lordship surely do not propose that you will try only that part of the case and not try the more serious—as it seems to us, the more serious—part at all.

The Court—Really, what other course are you to pursue?

Mr. Davis—That your Lordship will try all the issues in the case—that is only one of them—so that the whole case will be on the record, and all the evidence will be on the record. There are a dozen different points and your Lordship surely will not try the case piecemeal.

The Court—No, but with regard to that one point, it is, of course, a very serious point, and a portion of the case which I should not cut out of the other, but how are you going to do otherwise?

Mr. Davis—Well, my Lord, I fail to see how you can do it that way, unless your Lordship takes upon yourself the responsibility—which you stated yesterday you would not do—of defending that point finally.

The Court—Well, what do you propose?

Mr. Davis—My proposition is this, that the case shall be tried as every other case is on all the issues, that the evidence will be put in subject on that particular point to any objections we have to make, on all the issues, so that when it comes up on appeal, as it unquestionably will on one side or the other, everything will be before the various Courts of Appeal to which it goes.

The Court—I understand that very well, but I am placed in a very awkward position by the decision. They leave something for me; they looked at the state of the case as it was then, and the state of the case was such as I had to consider and as it left me. They decided practically that in that state of the case I was right in refusing the order, and they say the order should not be made.

Mr. Davis—At that time.

The Court—No, now.

Mr. Davis—And in the shape asked for.

The Court—Has there been any change? There have been no new developments. You are going to trial. And then the two Judges say practically: "The Judge at the trial may order any work to be done to elucidate any point that he may require."

Mr. Davis—Yes, my Lord. What significance does your Lordship attach to that language?

The Court—What I take it to mean is this, that if I see fit I can make this order.

Mr. Davis—Yes; that is what I merely stated a moment ago.

The Court—Then that is not trying the case piecemeal.

Mr. Davis—Oh, no; I understand the case to be this: That after we have put in some evidence we are then at liberty to renew this application, and your Lordship will deal with it as you see fit.

The Court—Yes; you can renew it at such time as you think I can deal with it. You know, Mr. Bodwell, the absurdity of the thing appears to me to be this: that I shall have to depend upon gentlemen's opinions one way or the other, when a little work done there would clear up the whole difficulty. As is stated by Judge Baldwin in one of the American cases, he thinks it monstrously unjust to refuse an order of this kind. I thought that the English case bound me. The Full Court think the English case did not bind me, but that I was right in refusing the order at that stage of the case.

Mr. Bodwell—I shall have something to say to your Lordship when that question comes up, but I cannot discuss it now very well.

The Court—I did not want to express myself so far now; only perhaps Mr. Davis did not understand me, or I did not make myself understood. My strongest inclination, Mr. Davis, has been all through, you were not in the case—at first to allow this. That was my inclination. Mr. MacNeill knows it, because I asked them to consent to it. You will see in the notes of the case that I quoted the case of Queen vs. Bradlaugh, using American decisions, and I dare say that is where one of the Judges got it. I think it is Chief Justice Cockburn. But if I evade the order now which you ask for, Mr. Davis, I would be practically disregarding a judgment of the Full Court, and I am bound by that judgment. I will only adjourn the application sine die until such time as you choose to renew it. Is there anything else?

Mr. Bodwell—This case then, stands adjourned

until Thursday morning, as I understand, at eleven o'clock.

The Court—Yes; whatever you gentlemen agree to.

Whereupon the Court adjourned until Thursday morning at eleven o'clock, April 20, 1899.

THIRD DAY.

Rossland, B.C., April 20, 1899.

Trial resumed at eleven o'clock a.m. Present the Court, the same counsel as before, and also Mr. Duff for plaintiffs.

Thereupon the following proceedings were had, to wit:

Mr. Bodwell—Before we begin, my Lord, it will be necessary, I think, for the stenographers to be sworn.

The Court—Yes.

Thereupon C. H. Sholes, C. B. Eaton and E. J. Lake were severally duly sworn to act as stenographers in the trial of the case.

Mr. Davis—It might be well, your Lordship, to have it understood that the proceedings already taken down shall have the same effect as if the stenographers had been sworn at the commencement of the trial.

The Court—If you agree to it.

Mr. Bodwell—We agree to it, your Lordship.

Mr. Davis—We also.

The Court—I spoke to both gentlemen, Mr. Bodwell and Mr. Davis, about copies or extracts from the stenographers notes. I meant them to be extracts from the notes taken by the reporters, but it will cost no more to give me a full copy, and I think the Court should have a full copy.

Mr. Bodwell—That is the understanding we had, your Lordship, that the Court will be furnished with a fully copy.

The Court—I am very glad of it. No, Mr. Bodwell.

Mr. Bodwell—The pleadings were read the other day, my Lord, so I will not take any time to offer. I tender a certified copy of the record of the Iron Mask mineral claim, dated the 23rd of July, 1890, showing that the claim was recorded by E. S. Topping. I suppose, Mr. Registrar, these exhibits will be numbered.

The Court—I would number the exhibits.

The Registrar—This will be exhibit No. 1, put in by plaintiffs.

Mr. Bodwell—I tender next a Crown grant of the Iron Mask mineral claim from the Crown to Patrick Clark dated the 18th of March, 1896.

(Paper writing referred to marked by Registrar as exhibit No. 2.)

Mr. Bodwell—I tender next certificate of the incorporation of the Iron Mask Gold Mining Company (foreign), registered the 8th day of February, 1896. Exhibit No. 3.

(Marked as exhibit No. 3 by the Registrar.)

Mr. Bodwell—Deed from Patrick Clark to the Iron Mask Gold Mining Company (foreign) of the Iron Mask mineral claim, dated the 5th of May, 1896. Exhibit No. 4.

(Marked as exhibit No. 4 by the Registrar.)

Mr. Bodwell—Certificate of title of the Iron Mask mineral claim, registered as Lot No. 688, group 1, Kootenay District, dated the 29th of May, 1896, showing the title to be the Iron Mask Gold Mining Company (foreign); as exhibit No. 5.

(Marked by the Registrar as exhibit No. 5.)

Mr. Bodwell—I now read the examination of Peter Joyce, taken before the Registrar at Rossland on the 1st day of April, 1899, pursuant to appointment, dated the 30th day of March, 1899, and subpoena issued, Mr. MacNeill appearing on behalf of the plaintiffs and Mr. Galt appearing on behalf of defendants.

Peter Joyce, sworn, examined by Mr. McNeill.

Q.—You are in the employment of the Centre Star Company, Mr. Joyce? A.—Not at present.

Q.—Since what time have you been in their employment? A.—March 30th, present year.

Q.—For what length of time prior to March 30th, 1899, were you in the employment of the Centre Star Company? A.—Three years and a half, or more; do not know the exact date.

Q.—In what capacity were you employed? A.—Foreman, I suppose.

Q.—Foreman of the mine? A.—Yes.

Q.—As such foreman, I presume you had charge of the mining operations that have been carried on in the Centre Star mine?

Mr. Galt—I would like to take an objection: This witness is Mr. MacNeill's witness—the plaintiff's witness—and not liable to cross-examination. I must object to cross-examination.

Mr. MacNeill—I can do anything I like—cross-examine him—ask him anything.

Mr. Galt—In the case of the Golden Cache Company it has been held by Mr. Justice Irving that on an examination of this kind, it is strictly an examination and not a cross examination.

Mr. MacNeill—It has been held by the other Judges contrary, but you can take whatever objection you like, any time any objectionable question is asked, it is time enough to argue that then.

Mr. Bodwell—I do not suppose you intend to press that objection, Mr. Davis.

“You know the cross-cut that was run by the Centre Star Company from the main workings in a northerly direction into the Iron Mask mineral claim?” A. Yes.

You were foreman in charge at the time that was being constructed? A. Yes.

About what time was that construction? A. It was begun in December, 1896—late in December or January, 1896. I may be off a year in that—begun as soon as the machinery was put in the Centre Star.

It was continued then from the north side line of the Centre Star up to a point that was afterwards referred to as the door at Station N? A. Yes.

Q. You know the front referred to? A. Yes.

Q. In the Iron Mask ground? A. Yes.

Q. From that front a tunnel was run westerly? A. Yes, started westerly.

Q. And run for what distance? A. 160 feet approximately.

Q. The tunnel was stopped there—you stopped work there? A. Yes, on the supposition that we were in other people's ground.

Q. As a matter of fact, you were in the Iron Mask ground then? A. We were not counting the Iron Mask.

Q. As a matter of fact, it was in the Iron Mask ground? A. Oh, yes, we knew that. We thought it was the War Eagle, that is why the tunnel was stopped.

Q. At what time was that work stopped? A. That tunnel was run in November of the following year after we started the cross-cut you refer to. That is the only one we ran.

Q. At a front in that tunnel about some 120 feet from the door you referred to, you encountered a large body of ore? A. We encountered an ore body 126 feet.

Q. From the door? A. Yes.

Q. That is the ore body that has been subsequently referred to as the westerly ore body? A. I presume so. I do not know.

Q. You were in charge of the work at the time? A. Yes.

Q. How much ore was taken from that point—from that ore body? A. Just the seam of the drift going through it.

Q. You do not know how much ore was actually taken; how many loads? A. I do not know exactly, not that I am in a position to swear to.

Q. What was done with the ore taken from that point? A. Sent to the smelter, I believe.

Q. By whom? A. By Mr. Durant.

Q. For the Centre Star Company? A. Yes.

Q. And they got returns from it? A. Likely. I do not know.

Q. What smelter did they sent it to? A. This question I am not absolutely able to swear to.

Q. You were in charge of the work at the time? A. Yes, in a way. I was in charge of the workings but not in charge of the ore. What I know about that was told to me.

Q. Whatever ore was taken out there was taken by the Centre Star Company from that westerly ore body? A. At that time, yes.

Q. And you cannot tell us the number of car loads of ore that was taken out? A. No—cannot positively swear to them.

Q. Or what the net returns were or the gross returns? A. Cannot swear positively to that either.

Q. Mr. Durant, the manager of the Centre Star Company, is not now in British Columbia? A. I think not.

Q. The Centre Star Company have no other officers here at the present time? A. Yes, a whole crowd of them.

Q. But the old company? A. Oh, no.

Q. That is the company I am referring to, the old company that was defendant in the action—they had no other officers here? A. No, no other officers that I know of here.

Deposition of Mr. Joyce, marked by the Registrar as Exhibit No. 6.

Mr. Bodwell—We have served the other side with notice to produce the smelter returns of the ore which has been referred to in Mr. Joyce's evidence. Have you these returns?

Mr. Davis—Here is a statement.

(Paper writing produced by defendant's counsel.)

Mr. Bodwell—I understand, Mr. Davis, you have not got the smelter certificates?

Mr. Davis—No, we have not.

Mr. Bodwell—Do you expect to get them?

Mr. Davis—We are perfectly willing to produce them later on if we can get them. The trouble is in knowing what particular ones are the ore, but we will get them later on and consent to your putting them in later on as far as that goes if we can get them.

Mr. Bodwell—My friend Mr. Davis and I think we understand each other on this part of the evidence, my Lord. He has tendered me a statement now which

shows—although he has not got the smelter returns—his figures are that the gross amount of ore taken from the Iron Mask workings—

The Court—Taken from the Iron Mask?

Mr. Bodwell—Taken by the Centre Star where they trespassed upon our ground and took our ore.

The Court—That is your claim that that amount of ore was taken within your boundaries?

Mr. Bodwell—Yes, well, that is the amount of ore taken at the point in question in Mr. Joyce's evidence. This statement refers to gross value of \$6,630 and it is understood at this stage of the case that if the smelter returns or smelter certificates can be obtained during the progress of the trial my friend will produce them, and that we will have the liberty of putting them in at that time.

The Court—I have taken a memorandum of that.

Mr. Bodwell—And if these smelter certificates are not produced at any stage during the trial, and we think that we are in a position to increase their value so as to give us a greater amount of damages in case of success that that evidence is to be given and taken as of the same effect as if it were put in at this stage of the case. Is that right?

Mr. Davis—That is correct, my Lord.

The Court—That would be the rule at any event. I have taken it down as being ore out of the ground in dispute. Is that right?

Mr. Bodwell—Yes, that is right. That is our prima facie case, my Lord.

Plaintiffs rest.

Mr. Davis—It will be necessary, my Lord, for me to refer in my opening to this model very much, and therefore I think possibly it would be better to give some explanation of it to your Lordship before beginning the opening. You will see that the face of the model consists of a plan of portions of the Centre Star. In the plans the Centre Star is referred to. This is No. 1 (indicating) and the northerly one is No. 2.

The Court—Is this the one that runs in from the gulch?

Mr. Davis—They both run in from the gulch. The base of the model is a plan of a portion of the Centre Star mineral claim, a portion of the Iron Mask mineral claim, and a portion of the War Eagle mineral claim, and it shows all the portions of the Centre Star and Iron Mask mines which are in dispute in this action. These posts show the surface of the ground. The ground you will see is of very much greater altitude at the west side than at the east. This (indicating) is the top of the shaft which is on War Eagle ground, runs up to the surface, this shaft is what has been called No. 3. The inclined shaft running up to surface of the ground in the Centre Star—the 320-foot shaft. This shaft to the east of it also runs down from the surface of the ground, and is called the No. 2 shaft; it is all the way in Centre Star ground. Your Lordship will notice that this (indicating) is the side line between the Centre Star and Iron Mask. This (indicating) is the westerly slope of the Iron Mask running up nearly to the surface; this (indicating) is the easterly slope of the Iron Mask running up to the surface.

The Court—Was this stope commenced from below and worked upwards?

Mr. Davis—Yes, my Lord. Between the No. 3 and the No. 2 shafts lies the apex or a portion of the apex of the vein which is in dispute in this case, the vein we allege runs down to the Iron Mask mineral claim; it is the north fork of the War Eagle vein. This working here is brown (indicating) is the south fork of the War Eagle vein. The War Eagle vein over here (indicating) splits—the main War Eagle vein, or the War Eagle vein splits into two forks; the north fork is the one which has been called in this case the Centre Star No. 2 vein; the south fork is this brown level from the surface down to the red tunnel level which is the Iron Mask War Eagle tunnel running through here (indicating) and over to the War Eagle from the surface of these stopes down to that is about 190 feet roughly—the surveyor, of course, will give the exact figures. I am giving you these figures so you will get an idea of the different levels, my Lord.

The Court—This (indicating) is sunk from the top, then?

Mr. Davis—Yes, my Lord. The green drift, your Lordship is referring to, goes 100 feet, and then is sunk a winze. That is the drift and there is the winze (indicating).

The Court—That is about 70 or 80 feet, is it?

Mr. Davis—The main drift is about 100 feet—95 feet to be exact, I think.

The Court—You are acquainted with the old plan? I am asking this question for information. On the old model I do not recollect that coming in from the face there.

Mr. Davis—That really does not cut much figure in this action, my Lord.

The Court—Perhaps that is the reason it was not shown on the model.

Mr. Davis—Yes.

The Court—I am only asking for information. It will make it much more complicated if I do not understand it thoroughly.

Mr. Davis—You need pay no attention to that at all in this case.

The Court—This is their main tunnel (indicating). That is from the gulch that has been shown on the other plans—the Centre Star.

Mr. Davis—Yes, but your Lordship of course understands that the main workings of the Centre Star are over in this direction (indicating), but this is the tunnel that they run in called the No. 2 tunnel. Here (indicating) is what has been called the Iron Mask winze, consisting of two portions running down in the first place from the red level to the yellow level. Now, that red level is the Iron Mask's east drift.

The Court—From their main tunnel there?

Mr. Davis—No, but from here (indicating). This War Eagle Iron Mask tunnel is not run on ore, but this tunnel a little to the south of the Iron Mask-War Eagle tunnel is what is called the Iron Mask east drift. Here is the winze (indicating) they have stoped you see, from that drift right up to the surface. Then there is a cross-cut that is connected with the main War Eagle-Iron Mask tunnel by this cross-cut. This (indicating) is their main tunnel used by both mines under agreement—both the War Eagle and the Iron Mask.

The Court—I understand it now.

(To be continued.)

ABSTRACT OF OFFICIAL REPORTS.

THE CROW'S NEST PASS COAL COMPANY, LIMITED.

GENERAL MANAGER'S REPORT.

DURING the year it has been proved beyond a doubt that this property contains as high a grade of steam and cooking coal as the world produces; and it contains sufficient to meet all the possible requirements of many future generations. It also seems clear that your coal is the only first-class steam and cooking coal within a reasonable distance of the vast ore deposits of British Columbia, Montana, Idaho and Washington. Further, you will undoubtedly be able to place coke on the Pacific Coast as soon as you have a surplus to spare for that market.

Rear Admiral Palliser, of the British Navy, tested the coal, and reported as follows on April 13th, 1899: "We are happy to say it has been found most satisfactory, so much so, that I have written to the Lords Commissioners of the Admiralty recommending its use."

Smelters are being erected at Greenwood and Grand Forks, and the latter smelter should be ready to use our coke by April or May.

One special feature of the Fernie coal is, that the engines using it, throw no sparks. This is a very valuable property for the coal to possess, because prairie fires are invariably started through sparks falling on the dry grass from passing engines. This will specially commend the coal for use on the railroad, even in sections where, owing to high freight rates, other coal might be cheaper.

The timber area of your land is also most valuable, as it contains sufficient timber for all future mining requirements, and also for the requirements of the neighbouring country for building purposes.

There is also a quantity of land which will be fit for agricultural purposes, and I make this statement after close observation during the summer and fall months.

During the year the total output has been as follows: Coal total, 116,200 tons; coke total, 29,658 tons.

During the past year you have had to contend with the difficulties which are always met with in the development of a new plant. The difficulties are exceptionally great in opening up a coal mine in a region like the Rocky Mountains, where it is impossible to take borings through the strata, or to locate the position of a seam ahead of the working places. The only sure and successful method of working a mine is to keep the headings or main haulways at least one thousand feet ahead of the working places or rooms where the main body of the coal is being mined. It would be still better if these headings were at least half a mile ahead of the workings. In this way you could lay out the workings to suit the varying conditions of the vein. Until quite recently it has been absolutely impossible to do this, owing to the enormous demand for both coal and coke, which made it necessary to push every available working place to its full capacity; but as the mine opens out and enlarges, you are enabled to push these main tunnels ahead of the workings and thus locate all changes in the general condition of the coal in ample time so that the coal can be mined to the best possible advantage and at the least possible expense.

Owing to the unfortunate labour troubles in British Columbia, arising from the enforcement of the eight-hour law, all the smelters are shut down, and we are obliged to look for a new market for our coke in the United States.

During a recent visit to Montana, I succeeded in securing an order for three thousand tons of coke from the Boston & Montana Company, which is the largest consumer of coke in the State of Montana.

If we are able to sell coke at a price not exceeding 20 to 25 per cent. higher than any other Western coke, we can always secure the order, as our coke is superior by far to any Western coke, and has been proved by actual test to be 5 per cent. superior to the celebrated Pocahontas coke of West Virginia, which took the premium at the World's Fair in Chicago.

The present indications show that the labour troubles will soon be overcome, and you will have a very largely increased demand for both coal and coke throughout British Columbia, as the merits of your product are making it a standard fuel in the West.

During the present year you should build whatever additional coke ovens may be necessary to meet the British Columbia demands, and also have at least 100 ovens, with the product of which you can work up a permanent business in the adjoining States.

Arrangements are now being made with the C.P.R. to store a large supply of coal during the summer months, which will in future greatly relieve the difficulties which were experienced last fall in securing cars and transportation during the busy wheat season.

THE BEND 'OR MINES, LIMITED.

DIRECTORS' REPORT.

Your directors have much pleasure in laying before you their report covering the operations of the company from the date of incorporation to the 31st day of January, 1900.

Until the proceeds of the first clean-up supplied the necessary funds, the management overcame difficulties which at times seemed insurmountable, and may now congratulate itself upon presenting the accompanying financial statement, confident in assuring you that all indebtedness of the company will be liquidated by the proceeds of the first three months' milling of the approaching season.

Had it not been necessary to shut down on account of frost, from the night of the first of December last, there is no doubt that by this time the company would be out of debt. This, considering the amount of development done since the incorporation of the company, might well be looked upon as phenomenal. In addition to the development of the mine, which has been pursued without a single check since 1st October, 1898, a ten-stamp mill, water power, gravity tramway, etc., have been installed at a cost of approximately \$30,000, without encroaching on the treasury stock of the company except to the extent of 4,000 shares.

Referring back to the date of incorporation of the company, viz., 1st October, 1898, it is the intention of your retiring directors to, without going into details, explain the operations of the company during the period they were looking after your interests.

As you are all aware from the prospectus, the property of the company was purchased from the Bend

'Or Syndicate for the sum of three hundred and fifty thousand dollars, fifty thousand dollars in cash and the balance in shares at par. This cash payment was to be supplied by the sale of 100,000 shares (called the first issue) at 50 cents. Owing to the bad state of the local stock market, only 33,900 of these shares were disposed of and the syndicate offering to accept the remaining 66,100 shares in lieu of cash, they were handed them in full settlement of their claim. The treasury stock, viz., 100,000 shares, was placed on the English market at par, and it was confidently expected that a large number would be disposed of at once. The result, however, was disappointing, although several large sales were on the eve of consummation, they were rendered abortive in more than one instance by adverse reports from unreliable local sources.

However, the development work never ceased, and a contract was entered into with the William Hamilton Manufacturing Company, of Peterboro, Ontario, for the furnishing and installation of a modern ten-stamp mill, water power sufficient to develop 100 horse power, and gravity tramway from mine to mill, for the sum of \$26,157. The fulfilment of this contract was considered almost an impossible undertaking, owing to the fact that your property being situated in a very inaccessible district, the only communication being mountain trails. However, thanks to the indefatigable energy of the contractors this feat was accomplished without the loss or breaking of a single piece of machinery. The total weight of machinery packed a distance of about 70 miles from Lillooet was in the neighbourhood of 700,000 pounds.

The installation was completed in accordance with the contract, and the stamps were dropped for the first time on the 24th August, 1899. Everything worked smoothly, and the power developed was found to be much in excess of our present requirements; in fact, the water wheel, with quarter gate opening, developed sufficient power to operate the mill and crusher, consequently we have ample power for an additional ten-stamp and a five-drill air compressor should the occasion arise.

The first clean-up took place on the 16th September, after crushing 400 tons, which produced 383.04 ounces of gold, realizing \$6,358.00.

The second clean-up occurred on the 6th October, the result of which was, viz.: Tons crushed, 316; result, 462.84 ounces of gold, realizing \$7,692.40.

The third clean-up was on the 31st October, after crushing 366 tons, producing 433.94 ounces, value \$7,191.38.

On the 30th November the fourth clean-up was made, 455 tons having been crushed during the month, giving 271.74 ounces, value \$4,423.92.

The ore put through on this last run was taken from the large new ledge which was encountered on the 30th October, and which, owing to its size and position, admitted of easy mining. Having no appliances at the time for assaying, it was not discovered until towards the end of the month that the new ledge did not carry the high values of the old, only averaging about 12 dwts. to the ton.

This, as a test of the new reef, was very satisfactory, but as money was required, it was unfortunate, as the results could easily have been made larger than the previous outputs, had the ore been taken from the old reef.

On the night of the first of December (owing to

heavy frosts) the water in the service pipe leading from the flume to the mill froze and operations had to be discontinued. This difficulty we hope to remedy next season.

The fifth and last clean-up of the season was for a run of one day on the 1st of December before the water was frozen, when 20 tons were crushed, producing 19.74 ounces, which realized \$288.82.

RECAPITULATION.

Mill ran 79 days, 1¼ hours, crushing.....	1,557 tons
Producing gold	1,571.3 ozs.
Value	\$25,954.62
Value per ton of total crushings	16.66
Value per ton of crushings from main reef	19.54
Total cost of mining and milling per ton, after charging up 10 per cent. of the total cost of development to date.....	5.47

WATER.

The company has applied for and obtained from the Government a lease for sufficient water at an annual rental of \$7.00. This puts the cost for power per stamp per annum at 70 cents. (Steam power costs in the neighbourhood of \$700 per stamp per annum.)

PROPERTY.

In addition to the original mineral claims of the company, which have since been Crown granted, it was decided to purchase the Mabel Fraction, which you will see by reference to the plan was very advisable, owing to its proximity to the lower workings. This was acquired on the 16th October, for a consideration of \$2,550.00 cash, and a Crown grant has been applied for. At the same time it was decided to take a bond on the Alhambra group for \$20,000, one thousand dollars cash. In fact, this was one of the conditions of the purchase of the Mabel Fraction (the owners being identical). Unfortunately the survey of the Alhambra took away so much of the property that it was not considered worth while going further in the matter. We might state that the lowest price previously obtainable on the Mabel was \$3,500.00, so that the company really acquired it at its lowest market value, leaving out of consideration altogether the possibility of the Alhambra, and your directors feel justified in charging the whole amount to property account.

DEVELOPMENT WORK ON NO. 1 TUNNEL.

Work on this tunnel has been continued without interruption, and the tunnel has been driven 530 feet on the ledge. Three hundred feet in stoping was commenced. A parallel ledge was encountered 60 feet up in the stope, which after merging into the old ledge gave a width of fully five feet. An upraise from that point to the surface proves that the ledge carries its full width all the way, and furnished the company with a splendid reserve of ore. We are now opening a new stope, and the manager reports that at 20 feet up he had encountered a splendid body of ore, giving an average value of \$38.00 per ton in free gold, and has since raised an additional 25 feet, the ledge holding its width and value.

A cross-cut has been run in a westerly direction from No. 1 tunnel to strike the new ledge at that level. This was encountered at a distance of 32 feet, and some 15 feet of drifting on the ledge was done in each direction.

NO. 2 LEVEL, LOWER TUNNEL.

A cross-cut was run in to tap the ledge at a depth of 76 feet below the upper tunnel, and we are pleased to report that the reef was encountered at a distance of 236 feet in. Since then we have driven on the ledge a distance of 142 feet without encountering a break or fault of any kind, the reef at no point being less than 12 inches in width and showing free gold quite freely. Samples taken across the ledge from time to time give the following results: \$64, \$62, \$87, \$38, etc., and an average sample taken all over this drive of intervals of every five feet after all visible gold has been carefully picked out, gave the splendid average of \$20.60 per ton, and an amalgamation test made by Mr. Pellew-Harvey shows that it goes 100 per cent. free milling.

We are now raising to connect both levels at a point indicated on the plan, and no doubt this work has been completed.

The last report from your manager states that he has both levels connected all but 14 feet. This will facilitate the handling of ore from the upper level, thereby saving the company considerable time and money, which are the economical factors in managing a mine.

We now estimate that there is at the present 8,000 tons of ore blocked out in the mine (without taking into consideration the large body of ore of the lower grade shown up in the new reef) which can be safely counted on running \$20.00 to the ton.

All preliminary expenses have been written off during the period ending 31st January, 1900, and also several expenses which might have been treated either as capital and expenditure or spread over several years, but which your directors decided to write off.

ATHABASCA GOLD MINES, LIMITED.

This company assumed control of the property on April 13th, 1898, and as this is the first annual report which it has devolved upon me to make, I have included the financial statements and in the detailed engineering report the whole period from that date until January 1st, 1900.

The period (from April 13th, 1898, to January 1st, 1900) has been one of active development of the mine. At the commencement of the year the mine was not in a condition to furnish a sufficient supply of first class ore to the mill, and we were forced to be content with a mixed grade of ore which gave fairly satisfactory results, but which afforded no indication of what could be accomplished if sufficient ground had been open to enable an adequate supply of first class ore to be mined. The figures of the statistical tables show the steadily improving results which were obtained by this vigorously and persistently maintained policy of development.

These figures show that a steady improvement has been maintained, and are an encouragement to proceed along these lines with increased energy. Fortunately the completion of our air compressor will enable us to carry out this policy effectually, and I am convinced that the rapid work which two or three drills will be able to do during the next few months, will, later, result in an increase of produce.

The operations of the year have been marred by only one unfortunate feature, the scarcity of labour which was experienced after the dislocation of the labour situation by the precipitate enactment of the eight-hour law for underground workers in metalliferous mines. The introduction of this measure is a matter of history and does not come within the scope of this report; but the situation created was one which caused grave anxiety to all who were responsible for the proper conduct of the company's affairs, and called for patience and forbearance in carrying out the measures which were deemed advisable for the protection of its interests, and for the maintenance of harmonious relations with the men. As is usual under such circumstances, a compromise was arrived at; reasonable concessions were offered by the company, and equally reasonable concessions were required of the men; and the result was, that after a few weeks' hesitation, the men cheerfully recognized the justice of the company's position and work has been carried on without any further delay. The months of June and July (as will be seen in the various tables submitted herewith) reflect the situation with clearness: but the success of the policy adopted is evidenced by Table 11., which shows that the number of men employed underground never fell in any one month below an average of thirty-five per diem, and also that the month of August found matters practically re-established along normal lines.

With these facts in mind, the operations of the year may be reviewed with satisfaction: for a profit of \$31,504.55 has been realized on working expenses under conditions which may be described as unfavourable. Not only has this profit been realized on the books, but the property has experienced an improvement (not so easily shown but equally important) by the superior efficiency in which all the departments are now found. Development can be made more effective, and the production and reduction of the ore can be more effectively carried on, with the result that a better produce will follow.

MINE.

During the year 1,275 feet of development work has been done, as follows: 720 feet of drifts, 360 feet of crosscuts, 165 feet of raises, and 30 feet of winzes. 5,150 tons of ore have been mined and sent to the mill, 200,000 tons of waste have been mined and thrown over the dumps, and a further large quantity of waste has been holed in the stopes from which the ore has been removed. This work has been carried on entirely by hand labour in hard ground. Altogether about 40,000 tons of ore and waste have been handled at a total cost of \$74,824.35, including all cost of labour, material, supervision, and sundries; or at a cost of \$1.87 per ton.

The character of the vein is unusual. The strike of the vein on the surface is approximately at right angles to the strike of the vein in the main tunnel, and the explanation of this unusual feature seems to be connected in some manner not yet fully understood with the numerous faults which cause frequent displacements of the vein. If it is possible to conceive of these faults having a greater and greater throw as they proceed farther from some central point, an explanation would be obtained of the situation which seems to prevail.

The vein dips at a very shallow angle from the horizontal. The angle of dip varies from "horizontal" to 30 degrees from the horizontal. The definition of the

limits of the ore chute proper has been confused by the peculiar system of faulting, and this problem has not yet been completely solved. Having regard only to certain points of information, it appears to be dipping along the line of strike at an angle of about 10 degrees from the horizontal; but it is quite possible that this theory will require to be reconsidered when a fuller knowledge of the faulting system is attained.

It is likely that as depth is gained the character of the ground will be less broken, and indications are not wanting that below the present main tunnel this will be the case, and also that the pitch of the vein will be greater than hitherto. Improvements in these two respects will be of the greatest importance, as the cost of mining the ore and of handling the ore after mining will be materially decreased. A further decrease in mining cost can be looked for from the installation of the compressor plant, whereby the development and exploratory work can be kept well in advance.

The high values obtained from the preliminary shipments to the smelter, of sorted ore, and from the assays made during development, raised hopes of high figures being obtained in the mine, and in this respect our hopes had not been disappointed. Owing to the proper development of the mine at the commencement of the year, and the interruptions caused by the scarcity of miners during the summer, we have been able to only partially demonstrate the values of the ore in practice; but the months of November and December are indications of what can be done under more favourable conditions; during these months values of \$29.86 and \$30.25 (respectively) were recovered in the mill.

It is of the utmost importance that development work should be pushed beyond the confines of the present ore zone; indications of a special and of a general character are sufficiently encouraging to warrant extensive work of an exploratory character, both in drifting and in cross-cutting, and I urge that these should be carried out independently of the development of the ore body as already known.

It has been found necessary to use greater caution in timbering than heretofore. The formation lies in parallel bands of ground which is dry and tight and easy to hold up, and of ground which is exactly the reverse. Nothing but stulls is used, and the waste is kept filled in the stopes as close as possible to the working faces.

It is satisfactory to record the fact that the year has passed without an accident of any kind, either in or outside the mine.

GRAVITY TRAMMING.

This important factor in handling the ore has proved entirely satisfactory. Great care has been exercised in watching the details and keeping the track in proper condition, with the result that no accidents have occurred and no repairs except to running gear have been necessary.

5,350 tons have been handled on this tramway at a cost of \$1,090.40, or at the rate of 20½ cents per ton, which figures include all cost of supervision. Besides handling the ore this tramway also transports all the supplies, provisions and lumber required at the mine, the cost of which is included in the above figures.

REDUCTION.

The 10-stamp mill has worked during the year 353 days and 6 hours and has been idle during the year 11

days and 18 hours. The causes of delays were as follows.

	Days.	Hours.
For clean-ups	7	22
Owing to freezing of water supply in February	1	22
Dominion Day, holiday		12
Owing to break in flume on December 28th		08
For other causes		02

It will be seen that for causes connected with the mill there have been only two hours delay from the beginning to the end of the year and including all sources of delay, except clean-ups, only three days and twenty hours delay. This is a record for which those who are responsible for the care of the mill are entitled to credit. The figures submitted on Table I. are full, and from them the history of the year's working can be studied in detail.

From the commencement of the year a steady improvement was effected all along the line until June, when a drop took place owing to causes recited above; from this time until the end of the year there was a steady upward movement, the best results being obtained in November, when 388 tons were milled, producing \$11,592.50 or at the rate of \$29.86; if this month can be compared with December, it will be seen \$30.25 were recovered in the latter month, but only 344 tons were milled; from a consideration of these figures it will be seen that it is only necessary by development to bring a sufficient quantity of ore to the mill to ensure satisfactory results.

The average fineness of the bullion for the first five months is 696 parts fine gold in every thousand parts of bullion, and the average fineness of the bullion during the last five months is 733 in one thousand; the value of the bullion during the first named period is \$14.38 per ounce, and during the second named period is \$15.15 per ounce.

The percentage of recovery in the mill has been, on the whole, satisfactory considering the character of the ore treated, and if the ore under consideration were of a low grade character, it would not be necessary to do more than improve, where possible, the concentrating plant. When ore of forty or fifty dollars per ton, however, is under consideration, the loss of 25 per cent. of these values is serious. Preliminary steps were promptly taken with a view to ascertaining whether

the cyanide process could be adapted to our needs and the results of these were so satisfactory that a small experimental cyanide plant was erected in the mill where the process could be observed under our own care. In the meantime a substantial dam has been built in a convenient location and the tailings are being accumulated for subsequent treatment.

ASSAYS.

A convenient assay office has been furnished in which are made daily the following assays of the previous day's run:

1. Sample of ore prior to milling.
2. Sample of pulp after amalgamation.
3. Sample of tailings.
4. Sample of concentrates.

The samples are taken hourly with great care and the results harmonize closely with the results attained in practice, and the system affords much help to the successful operation of the mill.

Frequent assays are also made of samples from the mine, especially from the points of development.

Check assays are made of the shipments of ore and concentrates to the smelter, and numerous other assays which occur in the course of special work which may be undertaken from time to time.

CYANIDE TESTS.

A rough cyanide plant has been erected of a sufficient size to furnish tests on a working scale and sufficiently numerous to be conclusive in their results. These experiments have been carried on under the direction of Mr. E. A. Paterson, who has had many years' experience in the cyanide plants of the Transvaal. Reference is made to Table V., where the results of the four last experiments made as shown. Experiments VI., VII., VIII are especially satisfactory; the percentage of recovery is high and the quantity of cyanide consumed is small. In order to carry the experiments through to the end, a zinc box was arranged and the gold precipitated in it; after which a clean-up was made resulting in a recovery of bullion which corresponded closely with the assay figures. Regarding the proportion of slimes which we cannot treat with the tailings, our figures are not complete, but from an observation of the catch boxes it would appear that it will not be necessary to allow more than 10 to 15 per cent. of the slimes to escape to obtain as good results as those shown in the table. Whether the quantity of slimes thus allowed to escape will be worth catching and treating in a separate slimes plant will depend upon the quantity of ore being treated in the mill.

The conclusions to be drawn from the above remarks are that the cyanide process is especially adapted to our tailings, and that these tailings should yield a net profit over and above all expenses of not less than \$5.00 per ton.

An admirable site exists below our mill, and I strongly urge that plans should be immediately prepared for the erection of this plant, so that its completion may be insured before the capacity of the dam is exhausted.

The treatment of the concentrates by this method is a matter for later consideration, but it is not improbable that the process can be adapted to this purpose and thereby effect an important economy.

COMPRESSOR.

The machinery for this plant arrived at the end of the year, and at this date is now running. The full description of this plant will be found in Mr. Mussen's report, and it is too soon yet to discuss the performance of the machinery. I have great hopes that the introduction of the machine drills will be the means of solving many of our difficulties, and that after they have been in operation for a few months the development of the mine will justify the addition to the mill of another battery of ten stamps.

The entire work of engineering, general management, purchase of supplies, correspondence, office and book-keeping at the mine and the mill site, is carried on by one engineer (or general manager) one assistant, and one time-keeper; when the number of men employed is considered, the varied character of the work and the area over which it is scattered, it will be seen that strong effort has been made to reduce the number of non-producers to the lowest possible limit.

The vein has fully answered our hopes in values, even if the breaks have rendered its extraction more

costly than was expected. With increased depth and with mechanical appliances for mining, the mine ought to be within six months in a condition to supply a second battery of ten stamps; under which circumstances the net recovery from the cyanide plant alone would be sufficient to pay a substantial dividend.

It is satisfactory to be able to point to results achieved as confirming the faith reposed in the mine when developments were more scanty, and these results are a justification for making such provision as may be necessary to increase the capacity and resources of the property, so that its possibilities may be fully realized.

I have referred to the erection of ten more stamps, but I do not assign that as the limit of extension. Natural conditions encourage us to believe that by exploratory development work the resources of the mine may be many times increased, and this view is held by eminent visiting geologists. This work can only be carried on, in our case, under-ground, and I strongly recommend that it be energetically undertaken.

In conclusion I wish to record my appreciation of the zeal and energy shown by all the employees of the company in executing the various duties assigned to them. The thanks of the company are especially due to Mr. H. Mussen, in the engineering department; Mr. F. Vans Agnew, in the assay office; Mr. A. Constans, in the mill and Mr. A. Hackshaw in the mine.

E. NELSON FELL, A.R.S.M.

TEN-STAMP MILL.

The ore in the bin at the foot of the three-rail gravity tramway is run into a car and weighed. It is then trammed into the mill and dumped over a 4'x10' Grizzly, with tapered section bars 2" apart. The material refused by this passes a 7"x10" Blake crusher, running at 250 revolutions, and joins the fine ore in the 50-ton bin below. From this bin it passes into the hoppers of two automatic Challenge feeders, and is delivered to the stamps at any speed desired.

The battery frame is of the front knee type with 12" x24" battery posts. The mortar blocks are constructed of 2" planks, 12' long, set on end. These are dressed and accurately fitted, and are spiked together with wire nails. They rest on a foundation of cement, and have sand rammed tightly around them to the surface.

The mortars are of the Homestake pattern, without liners and weigh 6,000 lbs each. Between the mortars and the mortar blocks is a piece of $\frac{1}{4}$ inch rubber.

The guides are of maple and are sectional. The front half of guide is separately bolted through the back, to the guide rail with two bolts held by spring steel nuts. The upper guides are 13 $\frac{3}{4}$ inches long and the lower are 15 $\frac{3}{4}$ inches long.

The stems are of steel, and weigh 395 lbs.

The tappets are three keyed, of cast steel, and weigh 95 lbs.

The bosses or stamp heads are of cast iron, and weigh 265 lbs.

The shoes are of forged steel, and weigh 175 lbs.

Crushing weight of stamps, 930 lbs.

The cams are of cast steel, and are of the Blanton pattern.

The camshaft is of hammered iron, 6 inches in diameter. It turns in open boxes, and is placed in front of the battery posts. The camshaft pulley is of wood and is belted to a friction clutch pulley, so that the rest

of the machinery in the mill may be run without turning the camshaft.

The screens used are of the diagonal slot type, of punched Russian iron.

Running over the battery on a track, is a crawl which supports a one-ton differential pulley by which means the stamps can be quickly and easily lifted for setting tappets, etc.

All the copper plates are electroplated with 1.5 oz. silver per square foot. There are two plates inside the mortars, a back plate 52 $\frac{1}{2}$ x11 inches and a chuck block plate 51x4 inches. Both these are 3-16 of an inch thick. Outside the mortars is a lip plate 51x8x3-16 of an inch thick. The front plates or aprons are 65x120x $\frac{1}{2}$ of an inch thick.

After leaving the aprons, the pulp passes through two mercury traps placed beneath the floor and thence to the Brown hydrometer sizers. There are three of these, made of vitrified clay; the product of each and the overflow from the last going to four vanners. The waterfeed for the sizers and vanners comes from an overflow tank placed outside the mill on the level of the camshaft floor.

The vanners are of the Frue type, and consist of three plain 6-foot belts for the finer grades of pulp, and a Morse corrugated 4-foot belt for the coarse material.

A 30-inch clean-up pan is placed on the main floor, and is found invaluable for grinding the sand taken from around the dies at clean-up.

The vanner room, which is the coldest part of the building, has been lined and the walls now consist of three inches of wood, one thickness of building paper, and 8 inches of sawdust. In winter the mill is heated by steam supplied by a 15 h.p upright boiler. The steam is conducted through the building in 1 inch and 1 $\frac{1}{2}$ inch pipes, with coils placed at intervals.

The mill is constructed entirely of wood, the retaining walls being of masonry.

The power is supplied by two Tutthill impact water-wheels working under a head of 398 feet.

The smaller wheel is 12 inches in diameter and, with 17 $\frac{1}{2}$ cubic feet of water per minute, is capable of developing 11 $\frac{1}{4}$ h.p., making 1,500 revolutions per minute. It runs only the vanners, thus giving them a motion independent of the rest of the mill. When the mill is shut down for clean-up this wheel runs the clean-up pan which is belted to the vanner line shaft.

The larger wheel is 24 inches in diameter and, with a consumption of 93 cubic feet per minute, can develop 58 $\frac{1}{2}$ h.p., running at the rate of 765 revolutions per minute. It runs the rest of the mill.

The water is supplied to the nozzels by offsets from a 16" receiver which forms the end of the pipe line. This pipe is 850 feet long and 10 inches in diameter. It is made of riveted sheet steel, is asphalt dipped and is put together with slip joints. The water enters it from a 6x6x12 foot pressure box which is fitted with submerged screen, overflow and sand trap.

The flume, which is 24x20 inches inside, is 2,350 feet long and is built on a 0.2 per cent. grade. Its capacity is about 725 cubic feet per minute. It is built of dressed cedar with tarred joints. The 3x4-inch cross ties rest on stringers and mudsills of split cedar. This understructure is filled with earth to the bottom boards in order to insure against cold. Two sets of waste-gates are placed along the line, one near each end.

The water enters the flume from a dam constructed of cribbing filled with rock and clay, with two thicknesses of sheet piling driven into the clay on the upper side. The distance from the lowest mudsill on the crest of the weir, which is 18 feet long, is 8 feet. The length of the dam from wing to wing is about 50 feet.

All the machinery in the mill, with the exception of the water wheels and boiler, was supplied by Messrs. Fraser & Chalmers, of Chicago. The water wheels were supplied by the Oakland Iron Works, of Oakland, California, and the boiler was supplied by the Jenckes Machine Co., of Sherbrooke, Quebec.

AIR COMPRESSOR.

In order to use for power the water running to waste from the mill wheels, the compressor was placed about 1,000 feet down the gulch.

The plant consists of one half of a Rand Duplex class D compressor, with the Dodge system of rope power-transmission from the water wheel. The compressor is mounted on a good concrete foundation, with bolts set for the other half. The cylinder is 14x22 inches, and the fly wheel, which is also the driving wheel, is 10 feet in diameter. The distance between the centres of the fly wheel and the pulley on the water wheel shaft is about 60 feet, and the difference in elevation about 20 feet. The transmission rope is 4-strand Manila, and passes eight times round the pulleys in V grooves which prevent slipping. It also passes over a winder pulley and a tightener.

The water wheel is a four-foot Pelton and works under a head of 300 feet. The water is conveyed to it from the flume in a 10-inch sheet steel spiral riveted pipe, with flanged joints. The length of the pipe is about 750 feet. The pressure box at the head of the pipe is 6x6x8 feet, and contains sand-trap, submerged screen and overflow. The flume, which extends from this point to the mill, is about 1,100 feet long. It is built on a 0.4 per cent. grade and has a capacity of about 500 cubic feet per minute. It is built of dressed cedar. The sides are held tightly against the edges of the bottom boards by wedges which can be tightened if necessary. The understructure is the same as that of the mill flume. A set of waste gates is placed in a convenient gulley near the pressure box.

At the upper end of the flume is a box 4x2x6 feet. This box receives the water from the mill wheels as well as the water from a small flume 500 feet long, which collects water from the main creek and from small streams along the way. The flume is built of rough 1 inch boards, on a 2.0 per cent. grade, and has a capacity of about 400 cubic feet per minute.

The air as it comes from the compressor, is discharged into a receiver 10 feet long and 42 inches in diameter, which is placed in the back part of the building. From this it is conveyed to the mine in 3,500 feet of 5-inch pipe of the kind known as casing. This pipe is thin steel, and has a brass thread instead of the usual standard. Its chief advantages are that it is cheaper and much lighter to haul than standard pipe, and, where it is used for a permanent line, it is quite satisfactory. The line is fitted with flanged joints at frequent intervals, and has two expansion joints along it.

The compressor and receiver are housed in a two-storey building, 20x30 feet. The upper storey has living rooms for the engineer in charge. The rope drive is well protected by a building six feet wide, and the water wheel shaft is enclosed in a building 12x16 feet.

This plant was supplied by the Canadian Rand Drill Company, of Sherbrooke, Quebec.

TRAMWAY.

The ore is brought from the mine to the mill on a three-rail gravity tramway. The cable is $\frac{3}{4}$ of an inch in diameter, and is of crucible steel, by Roebling & Sons, and has a breaking strain of 13 tons. The cars are of a nominal capacity of two tons each. The bodies are of hardwood, lined with heavy sheet steel, and reinforced outside with heavy bands of wrought iron. The wheels and axles are of the Anaconda type, and run very smoothly. At the head of the tramway is a 50-ton ore-bin. Placed directly under this is the brake which is of the usual three-wheeled type, with rubber lined sheaves and two wood shod band brakes.

The rails weigh 12 lbs. to the yard, and are spiked directly to the hewed surface of the three stringers which run from bent to bent. The bents, which are composed of a mud-sill, two posts, and a cap, average about 12 feet apart, and are of a minimum height of four feet and a maximum of about 10 feet. They are securely cross-braced and braced to one another and to stumps near by, with poles. The timbers used in the bents and stringers are of a minimum thickness of 10 inches.

At the bottom of the tram is a 150-ton bin into which the cars dump automatically. The bin at the head of the tramway is fitted with balanced gates, operated with a lever. This bin is filled by a chute into which the mine cars dump directly.

At the lower end of the tramway is about 200 feet of light snow shed, but other than this, no such protection is required.

The length of the tramway is 2,150 feet, and the difference in elevation between the top and the bottom is 1,120 feet. The grades on the line are such as to not only permit of a load of 1,000 lbs. being hauled up without any undue loading of the descending car, but also to make any speeding of the cars above the ordinary rate unnecessary at any part of the line.

The lower end of the tramway requires no attention other than to load freight. The work of maintenance is performed by the man in charge of the brake. This, however, only takes a few hours of his time per week, and consists chiefly in replacing the wooden rollers which support the rope along the line.

Judging from its performance under present conditions, we estimate that without unduly taxing its capacity, this tramway will lower 75 tons per ten-hour shift, or 150 tons per day, when running steadily. At this duty, allowing \$7.00 per diem for service and \$3.00 per diem for repairs, cost of rope and general maintenance, the cost of ore handled would be 6 $\frac{1}{2}$ cents per ton.

TAILINGS DAM.

This is situated below the mill. It consists of two parallel walls of logs about 7 feet apart, and measures 128 feet along the front and 29 feet on each wing. As originally built, the front wall had an average height of 12 feet, and at this height the capacity when levelled off, is about 1,000 tons of tailings. Several small additions have been made, however, so that the capacity is now about 1,500 tons, and others will be made as the occasion demands, until the present capacity is at least doubled.

TELEPHONES.

Three separate lines are maintained, one from the

general office to Nelson, which is owned and kept in repair by the Telephone Company, one from the general office to the office at the mine, and one from the lower ore-bin to the ore-bin at the head of the tramway. Both of these lines are the property of this company.

ROADS AND TRAILS.

A waggon road 21,000 feet long, built on a uniform 5 per cent. grade, extends from a point on the Hall Mines road, about 1½ miles from Nelson, to the mill. This road was built in the spring of 1898, according to Government specifications, and was accepted by the Government engineer.

A sleigh road on a steep grade connects the main waggon road and the mine. In the spring of 1898 this was straightened and repaired. At the present time, however, this road is little used, as all freight is taken up to the mine in the tramway.

A road about 500 feet long, built on a 10 per cent. grade, runs from the vanner room to the main road above. Over this all the concentrates are hauled away direct to the smelter.

Blacksmith shop, 22x16 feet, built of lumber.
Shaft house, 25x16 feet, built of lumber. This encloses the gallows frame and the boiler and hoist.

Powder magazine, 10x15 feet inside. It is built of logs, with earth and rock piled over walls and roof. The stores of powder are kept here.

Powder Thawer: This is a light log building, 8'x10' and is situated on the waste dump near the mouth of the main tunnel. In it is thawed the powder for immediate use.

Timber Shed: This is an open structure, about 55x25 feet, and serves the double purpose of a shed for framing timbers and a snow shed to protect the tracks and switches at the entrance to the main tunnel.

Also the following additions and improvements have been made:

To Boarding House—This was practically rebuilt, as it was double roofed and walled with lumber, and additions made as follows: At south end a 16x16 foot addition for wash room; at north a 16x12 foot addition for cook and waiter's quarters; at west side an addi-

REDUCTION REPORT FOR PERIOD, JAN. 1st, 1899, TO JAN. 1st, 1900.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
Days and hours working	30d 07h	25d 08h	30d 07h	29d 11h	30d 09h	29d 08h	29d 21h	30d 12h	29d 11h	30d 13h	29d 03h	28d 16h	353 days 6 hrs.
" idle for clean up	0d 17h	0d 18h	0d 17h	0d 13h	0d 13h	0d 16h	0d 15h	0d 12h	0d 13h	0d 11h	0d 21h	1d 00h	7 days 22 hrs.
" idle for other cause	0d 00h	1d 22h	0d 00h	0d 00h	0d 02h	0d 00h	0d 12h	0d 00h	0d 00h	0d 00h	0d 00h	1d 08h	3 days 20 hrs.
Tons milled	713	422	465	412	404	609	390	430	416	357	388	344	5350
Ozs. Amalgam recovered	1872.3	2240.7	2364.0	2364.3	2726.4	114.7	979.5	2118.2	2356.8	2303.0	2812.8	2415.3	25897.0
Ozs. melted bullion	304.70	466.80	552.70	557.90	604.10	256.50	234.30	452.00	503.40	482.00	591.51	525.81	5531.72
Fineness of bullion	709.0	713.5	698.0	656.5	707.0	692.0	698.5	738.0	713.5	746.5	750.0	729.0	712.0
Value at mint	\$4487.70	\$6909.63	\$8006.92	\$7627.42	\$8860.17	\$3690.14	\$3394.91	\$6918.47	\$7453.55	\$7460.93	\$9203.03	\$7852.66	\$81,865.53
Value of bullion per ton of ore milled	6.28	16.37	17.22	18.51	21.93	6.06	8.70	16.07	17.88	20.86	23.72	22.83	15.30
Tons of concentrates	28.25	33.50	46.75	46.00	41.25	29.25	25.00	38.50	39.75	33.25	43.00	40.00	444.50
Percent'ge of concentrates recovered per ton of ore milled	3.9	7.9	10.0	11.1	10.2	4.8	6.4	8.9	9.5	9.3	11.1	11.6	8.3
Gross value of concentrates, gold and silver only	\$1052.34	\$1545.08	\$2125.65	\$2215.52	\$2190.10	\$1468.56	\$1412.35	\$2077.33	\$2185.27	\$1905.77	\$2389.47	\$2553.89	\$23,121.33
Value of concentrates per ton of ore milled	1.47	3.66	4.57	5.37	5.42	2.41	3.62	4.82	5.24	5.82	6.14	7.42	4.32
Total values recovered	5540.04	8454.71	10132.57	9842.94	11050.27	5158.70	4807.26	8995.80	9638.82	9366.70	11592.50	10406.55	104,986.86
Total values recovered per ton of ore milled	7.76	20.03	21.79	23.89	27.35	8.47	12.32	20.89	23.17	26.18	29.86	30.25	19.62
Value of tailings	3.00	8.20	7.27	7.14	8.06	3.45	4.68	8.02	8.13	7.88	9.74	13.87	7.45
Percentage of recovery	72.0	71.0	75.0	77.0	77.2	71.0	72.5	72.3	74.0	76.8	75.4	68.5	72.5

Summary of Produce from Sept. 1, 1898, to January 1, 1900.

Bullion recovered during 1898	\$13,744.26
" " " " " " " "	81,865.53
Concentrates recovered during 1898	2,496.58
" " " " " " " "	23,121.33
Value of crude ore shipped during 1898	2,063.64
" " " " " " " "	298.61
Total value of produce from all sources	\$124,089.95

Nelson, B. C., Jan. 15, 1900.

E. NELSON FELL, A. R. S. M.

A steep "skid" road was built in the spring of 1899 from the waggon road to the compressor. This road is about 800 feet long, and was used for hauling machinery and lumber to the compressor.

MINE BUILDINGS.

The buildings at the mine on May 1st, 1898, comprised the following:

- Office, 10x15 feet, built of logs.
- Bunk house, 16x24 feet, built of logs.
- Boarding house, 16x24 feet, built of logs.
- Ore sorting house, 15x15 feet, built of logs.

Between that date and January 1st, 1900, the following have been added to the list:

- New office, 15x20 feet, built of logs.
- Foreman's house, 17x25 feet, built of logs.
- Bunk house, 62x24 feet. This building is of lumber and is situated on a flat bench a short distance below the mine. It contains 11 sleeping rooms and a sitting room. Each sleeping room accommodates four men, and has a separate entrance from the six-foot verandah which runs along both sides of the building. This enables miners coming off shift to go to their rooms without disturbing those sleeping.

tion 12x38 feet for kitchen. Close at hand, a root house 10x12 feet, was built in the side hill.

To blacksmith shop an addition 14x24 feet was built, to hold a forge for sharpening steel for machine drills, and a work bench for repairing the same.

Ore-sorting House: This was fitted up as a bunk house, and accommodates about 15 men.

Shaft House: As No. 1 vein is not being worked at the present time, part of this building, 30x16 feet, has been lined and fitted up as a clothes drying room. In it the miners change clothes on coming off shift.

MACHINERY AT MINE.

This consists of the following: One sixteen horse-power hoist; one sixteen horse-power boiler; two 3½ Rand machine drills; one 2¾ Rand machine drill.

The water used at the mine for boiler and domestic purposes is supplied by a one-inch pipe, 2,250 feet long, which runs on a 3 per cent. grade to a small creek to the west. This pipe can supply about five gallons per minute. The company owns a water right on this creek, which is ample for such purposes.

BUILDINGS AT THE MILL.

The following buildings have been erected near the mill since May 1st, 1898:

Office building, 42x38 feet, with a six foot verandah at one end. This building contains the general office, a draughting and balance room, a furnace room and a chemical laboratory, a crushing room, two sleeping rooms, and a store room.

Manager's house, 40x30 feet, containing a storey and a half.

Amalgamator's house, 22x24 feet.

Boarding house, 25x18 feet, two storeys high, with sleeping rooms in second storey. It has also a six foot verandah in front, and a 14x18 foot kitchen at the back.

State room and ore-bin shed, 30x33 feet, with freight platform.

Stable, 16x22 feet, built of logs, with feed room, 16 x17 feet, attached.

Athabasca Mine, Nelson, B.C., Jan. 15th, 1900.

H. W. MUSSEN.

its cost per foot or ton from January 20th, '97, to December 31st, '99; (e) Table of mine costs for twelve months ending September 30th, '99.

TABLE SHOWING PRODUCTION AND GRADE OF ORE FROM EACH LEVEL UP TO DECEMBER 31ST, 1899.

Portion of Ore Shoot.	From Main Ore Shoot Only.	
	Net Tonnage Produced, Tons.	Smelter's Gross Assay Value, Per Ton.
Block above level No. 1.....	19,601	\$24 52
Block above level No. 2.....	36,299	26 69
Block above level No. 3.....	31,432	16 67
Block above level No. 4.....	15,066	14 12
Block above level No. 5.....	15,004	15 68
Block above level No. 6.....	5,279	17 19
Totals	122,681	\$20 48

PRODUCT OF THE MINE FOR YEAR ENDING SEPTEMBER 30TH, 1899.

Tonnage.....	51,243
Smelter's gross assay value.....	\$834,882 92
Smelter's net value.....	508,562 03
Smelter's gross value per ton.....	16 28
Smelter's net value per ton.....	9 92

To this may be added figures showing product and values for three months—October, November and December of 1899:

Tonnage.....	22,693
Smelter's gross assay value.....	\$401,873 55
Smelter's net value.....	265,711 50
Smelter's gross value per ton.....	17 71
Smelter's net value per ton.....	11 71

DETAILS OF COST OF WAR EAGLE MINE OPERATIONS.

(FROM GENERAL MANAGER'S REPORT.)

The figures show in detail: (a) The product of the mine for year ending September 30th, '99, as well as for October, November and December of last year; (b) Table showing width of stopes and percentage of pay area in main ore shoot December 31st, '99; (c) Table showing production and grade of ore from each level up to December 31st, '99, from main ore shoot only; (d) Comparative statement of work done and

TABLE OF MINE COSTS FOR TWELVE MONTHS ENDING SEPTEMBER 30TH, 1899.

	Development Work. Cost Per Foot		Ore Extraction. Cost Per Ton		
	Sinking Main Shaft.	Sinking Small Winzes.	Raising.	Drifting.	Stoping.
Total number of feet	122½	7	417	1884½	.....
Tons of ore stoped.....					45,810
Drilling.....	\$ 52 55	\$21 00	\$14 01	\$ 8 45	\$1 53
Tramming and shovelling	4 22	5 00	4 06	3 10	53
Timbering.....	23 22	4 86	3 16	07	29
Hoisting	9 72	1 10	15	20	13
Smithing	5 18	2 11	1 88	1 21	15
Ore sorting	74	.....	14	.....	01
General labour	10 04	3 10	3 36	2 39	30
Air.....	7 32	2 44	2 76	1 55	21
Candles and illuminating oil.....	95	54	40	27	03
Lubricating oils and waste.....	75	19	22	14	02
Explosives	5 25	3 49	3 22	1 87	25
Drills and fittings	1 71	83	52	26	05
Mine supplies.....	1 61	46	49	35	04
Lumber expense	74	38	45	32	03
Stable and teaming	1 19	45	42	28	04
Assaying	54	80	40	19	05
Surveying.....	90	09	28	18	02
Electric lighting	74	.....	40	28	03
Salaries	4 07	2 35	1 76	1 21	18
Office expense	38	42	14	08	01
General expense	1 10	38	56	38	05
Totals.....	132 92	\$49 99	\$38 78	\$22 78	\$3 95

Ore stoped, 45,818 tons; met in development, 1,671 tons; from dumps, 3,762 tons; total, 51,243 tons.

A COMPARATIVE STATEMENT OF WORK DONE AND ITS COST PER FOOT OR TON TO DECEMBER 31ST, '99.

	Jan. 20, '97, to Sept. 30, '97.			Oct. 1, '97, to Sept. 30, '98.			Oct. 1, '98, to Sept. 30, '99.			Oct. 1, '99, to Dec. 31, '99.		
	Work done, Ft. or Tons.	Total Cost.	Cost per Foot or Ton.	Work done, Ft. or Tons.	Total Cost.	Cost per Foot or Ton.	Work done, Ft. or Tons.	Total Cost.	Cost per Foot or Ton.	Work done, Ft. or Tons.	Total Cost.	Cost per Foot or Ton.
DEVELOPMENT WORK.												
General work, stations, retimbering, etc.		\$ 3,770 18			\$18,249 34			\$11,830 26			\$ 1,897 27	
Drifting..... Feet.	2,303	46,313 33	20 11	3,480	74,958 25	21 54	1,884	42,927 28	22 78	837	21,850 64	26 10
Raising..... Feet.	421	12,768 93	30 33	451	13,726 95	30 33	417	16,169 89	38 77	253	8,495 12	33 51
Sinking—small shafts or winzes..... Feet.							7	349 95	49 99	42	1,826 93	43 50
Sinking—main shaft..... Feet.	175	16,150 31	92 29	185	17,808 99	96 26	122	16,283 05	132 92	70	6,897 51	98 54
Total development work..... Feet.	2,899	\$79,002 75		4,116	\$124,743 54		2,430	\$87,560 43		1,202	\$40,967 47	
ORE EXTRACTION.												
Ore from development work..... Tons.	2,596			2,316			1,670			1,894		
Ore from dumps, storage, etc..... Tons.							3,763	\$ 2,252 26	\$ 0 60	721	\$ 563 29	\$ 0 78
Ore stoped..... Tons.	4,810	\$15,634 94	\$ 3 24	26,559	\$86,070 10	\$ 3 24	46,810	\$181,224 01	3 95	20,079	\$77,074 18	3 84
Total ore sold..... Tons.	7,406	\$15,634 94	2 11	28,875	\$86,070 10	2 98	51,243	\$183,476 27	3 58	22,694	\$77,637 47	3 42
SUMMARY.												
Cost of development..... per ton of ore sold.	7,406	\$79,002 75	\$10 67	28,875	\$124,743 53	\$ 4 32	51,243	\$ 87,560 43	\$ 1 71	22,694	\$ 40,967 47	\$ 1 80
Cost of ore extraction..... per ton of ore sold	7,406	15,634 94	2 11	28,875	86,070 10	2 98	51,243	183,476 27	3 58	22,694	77,637 47	3 42
Total cost of mining..... per ton of ore sold.	7,406	94,637 69	12 78	28,875	210,813 63	7 30	51,243	217,036 70	6 29	22,694	118,604 94	5 22

TABLE SHOWING WIDTH OF STOPES AND PERCENTAGES OF PAY AREA IN MAIN ORE SHOOT DECEMBER 31ST, 1899.

Portion of Ore Shoot.	Area of Stopes Square Feet.	Stopped Area in Percentage of Shoot Area.	Average Width of Stopes, Feet.
Block above level No. 1..	37,850	78	5.2
Block above level No. 2..	45,000	66	8.1
Block above level No. 3..	38,480	56	8.3
Block above level No. 4..	17,500	42	8.9
Block above level No. 5..	12,270	37	13.2
Block above level No. 6..	9,280	19	10.0

NOTE.—On levels 5 and 6 the stopes are still being extended. The first four levels are about worked out, so the percentages given below show the total pay area. The stoped area in percentage of shoot area is an approximation.

THE VAN ANDA COPPER AND GOLD CO.

In the general statement Mr. H. W. Treat, president and general manager of the company, reports:—

It was just one year ago when our enterprise really began in earnest. Being convinced that we had the material for one or more mines, we proceeded, as far as possible, to open the ground to make it productive. We installed a machine drill at the Copper Queen, piping the air three quarters of a mile to the Cornell to operate drills there as well. We purchased and built a smelting and sampling plant complete which began operation July 15, and has run continuously except fifteen days which have been consumed from time to time in repairs.

While pushing the development work on our various mines, we have created a town which already has over one hundred buildings, housing a population of over 400 people, have constructed or established good dock and warehouses, saw-mill, logging camps and lumber yard, general store and offices, post office, school house and church, hospital, trestles, railway tracks, roads, levels and appliances for the economic

handling of ores, products and materials; permanent buildings at the mines, with machine, blacksmith and carpenter shops; a printing office with plant. The installation of these necessary expensive permanent improvements has consumed more than our available capital. The consequent floating liabilities are \$195,643.95. Our profits will begin on January 1st, 1900. Ore reserves are increasing daily and our entire enterprise is now prosperous. In the meantime, in order to prepare the company financially to withstand any possible strike or accident to the smelter or mines, or meet any demand from creditors or labourers, we recommend that stockholders make another issue of debenture bonds for the use and protection of the treasury, if necessary.

The smelter returns from July to December, 1899, are as follows:—

Total ore smelted July to December, 4,133 tons, yielding 442,005 lbs. fine copper, 9,523 oz. fine silver, 1,440 oz. gold. Total value smelter products, \$99,484.03.

Deducting contents of 595 tons of ore purchased, containing 82,563 lbs. copper, 224,682 oz. silver, 170,557 oz. gold. Value, \$13,694.33.

Shows contents of 3,538 tons of Van Anda ores, containing 359,442 lbs. copper, 7,276 oz. silver, 1,270 oz. gold. Value, \$85,789.70.

A value of \$24.24 per ton of ore, containing 6.32 per cent. copper, 2.06 oz. silver, .486 oz. of gold. This is a pretty good value for ore ordinarily, but low for our ores, because of not producing sufficient tonnage of first-class we were obliged to make up amounts by adding second-class ores which brought the average down.

At the annual meeting the shareholders voted to issue 225 \$1,000 6 per cent. 10-year gold bonds dated February 1st, interest payable annually, at the Bank of B. N. A., Vancouver. B. C. Privilege reserved to issue as few as practicable and to redeem any or all bonds issued, on the first day of any month by payment of principal and interest to date. This \$225,000 is in addition to \$75,000 bonds already in existence.

The mine development work to February 20th, 1900, consists of, on Copper Queen:

No. 1 Shaft.—Sunk on the vein to a depth of 130 feet, with 250 feet of drifting on 100-foot level and connecting with the No. 2 shaft.

No. 2 Shaft.—A double compartment vertical shaft sunk to a depth of 418 feet, with levels run off as follows:—

180-Foot Level.—Developed by a drift west 43 feet and east 20 feet. The faces of these drifts are in good ore, which, however, is not of the high value of the lower levels. Development work on this and the 200 will be continued.

200-Foot Level.—East drift has been run out 38 feet from the shaft and an upraise made to the 180-foot level above. The face of this drift is in good ore and continues in the face. The west drift has been run 30 feet on the lime and felsyte contact, an upraise has been made and this also is in good ore of a similar grade to that in the east drift. In all 103 feet of drifting has been done on this level.

300-Foot Level.—This level has been developed by a drift west 108 feet, a drift east 106 feet, a cross-cut south 81 feet and a cross-cut north 88 feet. It is also connected with the 200-foot level by a rise on the vein, from which stopes are being run. The ore on this level is a high grade bornite carrying high values in copper, silver and gold, half stoped to the 200-foot level, a distance of 75 feet.

400-Foot Level.—This level has been developed by drifts west 127 feet and east 54 feet. An upraise is being put up to the 300-foot level. The vein on the level is strong and well defined, of high grade bornite ore of great promise.

It is proposed to extend the drifts on the 200, 300 and 400-foot levels and to sink the vertical shaft to a depth of 600 feet during the coming year, thus adding to the ore in sight and at the same time taking out sufficient ore to supply the present furnace.

Ore shipments for 1899 to the smelter to January 1st, 2,020 tons.

Ore in Sight, Copper Queen.—Taking the ore chute as being 100 feet long, 5 feet wide and 300 feet deep, we have 16,600 tons at an estimated profit above all expenses of mining, treating and marketing, at present prices of copper—16,500 tons at \$15.00 per ton net, \$247,500.

The Cornell is developed with three tunnels and two shafts:—

No. 1 Tunnel.—With 475 feet of drifts, bottom of old workings in 20 feet of ore width, which will be extracted through the No. 3 tunnel which has tapped this ore body at a depth 30 feet lower.

Shaft No. 1.—Fifty-four feet deep in ore.

Tunnel No. 2.—With 400 feet of drifts in ore for 75 feet of an average width of eight feet.

Shaft No. 2.—Down 50 feet in ore, on the vein.

Tunnel No. 3.—With 468 feet of drifts; struck the ore at 100 feet where it is 10 feet wide of high grade ore, have drifted 90 feet in solid ore and upraised 40 at which point the ore is of the same grade and continuing up, an upraise has also been put through to the No. 2 shaft. This shaft will be continued down to the 200-foot level or deeper as may be deemed necessary during the year. The ore of this vein is for the most part yellow copper pyrites in a contact between felsyte and lime.

The surface improvements at the Cornell mine consist of blacksmith shop, timber shed, ore sorting sheds, ore bins, ore screens, air receiver and air pipe line, vertical boiler and pump supplying water to Cop-

per Queen and Cornell, derrick and whim at No. 2 shaft and all the workings fully equipped with ore cars and rails.

Cornell ore shipments to the smelter to January 1st, 1,618 tons.

ORE IN SIGHT, CORNELL.

Note.—In statement, March 1st, 1899, we misled ourselves because of believing that 1 and 2 workings were both on the one ore chute continuing between the shafts. Subsequent development has proved that 1 and 2 are on separate chutes not connected by ore, which cuts down this year's estimates very considerably.

Ore body exposed by No. 1 shaft and No. 3 tunnel is 30x10x100 feet, equals 3,333 tons.

(This does not include ore encountered in bottom of No. 1 shaft because not developed.)

Ore body exposed by No. 2 shaft, No. 2 tunnel and No. 3 tunnel 90x10x100 feet equals 10,000 tons.

Total exposed 13,333 tons. Figured at value net profit above cost of mining, hauling, smelting and marketing \$15.00 per ton, equals \$199,995.00 profit.

The Security property has been developed by 200 feet of open cuts, uncovering a strong magnetite iron, carrying copper and gold traceable through the Florence, Yellow Jacket and Emily, a distance of one mile into the Cornell. Also developed by a shaft 50 feet deep, sunk on the vein and a small amount of drifting. The magnetite ore from this mine has been used at the smelter for fluxing purposes. The mine is equipped with windlass, blacksmith shop, bunk house and ore sorting benches and a good road to town. Considerable surface cross-cutting is being done on this claim to locate the contracts running through this section of the property with good results.

The Emily is prospected by an open cut run in on the vein a distance of 60 feet; the ore is a galena, about one foot wide. Eighteen tons were shipped to the smelter.

The Little Billy property has been further developed during the year by the sinking of the shaft 95 feet in depth. This is a contact vein between felsyte and granite, the granite forming the foot wall. The vein at the bottom of the shaft is seven feet wide, well mineralized with copper carrying some silver and gold, of a concentrating grade. The ore occurring on the contact between the granite and felsyte is a high grade chalcopryite, but much scattered at present.

Little Billy ore shipments to smelter to January 1st, 50 tons, carrying 16 per cent. copper.

The balance sheet and accounts, to which we have referred elsewhere are appended:

BALANCE SHEET TO DECEMBER 31ST, 1899.

Receipts:—	..
Stock sales	\$54,667 18
Ore sales, previous to erection of smelter ..	13,650 79
Commission	409 17
Transfer fees, etc.	433 58
Boarding house profits	2,068 34
Rentals	226 69
Town lots sales	10,128 50
Contract	3,000 00
Bonds	75,000 00
Bills payable	33,207 61

Unpaid Accounts:—

Due for labour	9,595 52
Sundry personal credits	4,796 04

Cash advanced by H. W. Treat	57,607	95
Merchandise accounts	7,018	33
Mine supplies	4,474	89
Logs	2,259	54
Legal expense accounts	536	05
Freight	1,377	41
Insurance, etc.	371	51
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Sawmill receipts	13,916	30
Merchandise receipts	39,953	26
Advances on matte shipments	85,277	80
Profit and Loss	11,217	36
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	\$430,592	92

Disbursements:—

Furniture and fixtures	\$ 528	65
Prospecting, roads, general and office expenses, freight, postage and telegraphing, advertising, printing office, interest and exchange, damage and legal expenses	32,417	63
Labour	162,038	97
Smelter and sampling works	48,905	23
Mine supplies and explosives	18,445	48
Buildings	8,232	92
Surveying	1,874	70
Poll tax (loss)	15	00
Horses (19)	2,055	00
Harness, etc	459	15
Treatment of ore previous to erection of smelter	8,600	71
Revenue Stamps	85	35
Bills receivable	3,057	14
Timber	571	50
Due on lots and buildings	17,645	06
Due on supplies	2,355	08
Advance on ore purchases	6,064	56
Open accounts	9,405	59
Discount on bond sales	9,670	00
Mining Machinery, equipment, tools, etc.	23,995	76
Telephone	110	70
Maggie Lee mineral claim	961	93
Cordwood	2,046	31
Sawmill plant, material and logs on hand	17,918	30
Merchandise accounts and stock on hand	47,900	31
Cash on hand	5,231	89
<hr/>		
	\$430,592	92

Note.—(The above figures cover the receipts and expenditures from April 1896, to December 31st, 1899. Such of these figures as can be will be consolidated into a profit and loss account. The balance will be carried forward to separate the expenses for 1900.)

GENERAL STATEMENT, MARCH 1ST, 1900.
(Approximate.)

Liabilities:—

Capital stock	\$5,000,000	00
Bonds, 1, 2, and 3 years	75,000	00
Bonds, 10 years	225,000	00
Bills payable	40,000	00
Labour accounts	20,000	00
H. W. Treat, advanced	57,000	00
Merchandise and open accounts	10,000	00
Assets in excess of liabilities	360,500	00
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	\$5,787,500	00

Assets:—

Mineral claims and lands	\$5,000,000	00
Smelter value	50,000	00

Townsite value	50,000	00
Sawmill cost, \$5,000, deferred payment, \$2,000	3,000	00
Machinery and tools	15,000	00
Buildings	10,000	00
Horses (19), waggons (7) and harness	2,000	00
Office furniture, safes, etc.	500	00
Goods, material and stocks on hand	20,000	00
Timber, estimated, 40,000,000 feet, special license subject to Government stumpage	2,000	00
Bonds, 225 at \$1.00 each at 80	180,000	00
Net value of exposed ore in Cornell mine	200,000	00
Net value of exposed ore in the Copper Queen mine	250,000	00
Cash on hand	5,000	00
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	\$5,787,500	00

The management announce that the present production of thirty tons of ore daily is sufficient "to carry the expenses of the mines, smelter and development in advance," and that "every additional ton of ore produced up to fifty tons per day will yield the company a net profit of approximately \$20 per ton." A production of fifty tons per diem is expected to be reached within six months.

COMPANY MEETINGS.

BRITISH AMERICA CORPORATION, LIMITED.

THE first annual general meeting of the shareholders of the British America Corporation, Limited, was held on Tuesday, at Winchester House, Old Broad Street, E.C., the Most Hon. the Marquis of Dufferin and Ava, K.P., G. C. B., G.C.M.G. (the chairman) presiding.

Mr. W. B. Mitchell (secretary *pro tem*.) read the notice convening the meeting.

The Chairman said: Ladies and Gentlemen:—You are all well aware that this corporation was established as a pioneer or exploration company to operate in a recently discovered gold-bearing territory in the neighbourhood of the Western coasts of the Dominion of Canada. It is no doubt within the knowledge of all present that many successful gold mining enterprises have been for some years carried on in South Africa, Western Australia, and elsewhere by companies whose character and objects are similar to our own. When, therefore, on the formation of this corporation I was requested to act as chairman, I accepted that responsible position for two reasons—first, because from the inquiries I instituted I came to the conclusion that British Columbia offered a promising and remunerative field for the gold mining industries in which we proposed to engage, and further inducement was the hope that, at the same time that we should be inaugurating a profitable business for our shareholders, our exertions would also prove a source of prosperity, not only to the Dominion generally, but to a province to which I had become attached by peculiar and especial ties during my term of office in Canada. (Hear, hear.) Nor in alluding to Canada even on the occasion of such an unromantic meeting as the present can I refrain from adding my tribute of admiration to the spirit of loyal devotion, which has induced that great country to despatch across the Atlantic those noble battalions of gallant

soldiers who are risking their lives and shedding their blood, as some of them have already done, in the cause of their Queen and in defence of the integrity of our common Empire. (Loud applause.) Nor can I refrain from congratulating ourselves and all those present on the satisfactory news which has reached this country this morning of the surrender of General Cronje—(applause)—and all his munitions of war, his guns and his appurtenances. (Applause.) And it is a singular coincidence that this remarkable event should have occurred on the anniversary of Majuba, 19 years ago. (Applause.) To return, however, to the business immediately before us, I am happy to say that, though we are but a young company, our initial efforts have been crowned with a fair degree of success, and we have reached a dividend-paying stage in our career at an earlier date than is generally the case in pioneer companies such as ours. As I explained to you at our statutory meeting, our operations were intended to be carried on in two distinct areas—one situated in the territory of the Yukon, and the other in Rossland and its neighbourhood, in the province of British Columbia. As you will have gathered from the report, however, our trading undertakings in the Yukon have not been satisfactory. On the other hand, the result of our operations in British Columbia have proved of a very gratifying character, and more than make up for the disappointment we have experienced in the Yukon. It will be in the recollection of many of those who are now present that I impressed upon the shareholders at our statutory meeting that this corporation did not depend for its future, to any predominant degree, on the outcome of the Yukon territory, rich as it was reported to be, and that all our contracts relating to any of the Yukon mining properties which were being offered to us would be taken subject to the condition that we should have the right to examine and test them by our representatives before taking them over. Warned by the doubtful character of our initial efforts, we thought it advisable to proceed with extreme caution, and in this way we have escaped being entangled in any very considerable expenditure either by the acquisition of disappointing options or by the initiation of expensive works and establishments. The same cautious policy presided over the trading portion of our business, for we found that, owing to the nomadic character of the population, the severity of the climate and the difficulties of transport and of communication with our agents, it would be inadvisable to risk, prematurely, any considerable amount of your capital in what might prove a less promising enterprise than we had anticipated. As time went on and as opportunities were afforded us of testing—I will not say the resources of the country, for they are, undoubtedly very considerable—but the prospect of deriving any substantial benefit from their development, we began to entertain doubts as to whether the Yukon was, after all, the best field that could be selected for the employment of your capital, and when eventually these doubts resulted in the conviction that the further prosecution of the enterprise we had initiated might prove disadvantageous, we decided to abandon the Yukon as a locality for the application of our energies. As is always the case, the closing of our business in that part of the world has not been effected without a considerable loss. This, together with the estimated depreciation on our steamers and other property, has amounted to very nearly £30,000. The

whole of this sum has been written off, at the same time that a reserve of £20,000 has been set aside to provide for any further loss which may occur in such of our Yukon assets as have not yet been realized. There is, however, one redeeming feature in connection with this branch of the subject, and that is our acquisition of certain copper properties, in respect of which we have received very encouraging reports. These properties are not situated in what may be called the Yukon proper, but are much further to the south and nearer to the British Columbia boundary. Including the claims we own and those on which we have options for one year, payable in shares, the total area of this copper property is, roughly speaking, more than five square miles, or considerably over 3,000 acres, and comprises 21 concessions. Our manager on the spot considers it an undertaking of great magnitude and promise, and he reports that native copper has been found in large quantities. If his expectations are realized, the property in question should prove a source of great value to this corporation. To turn, however, to that part of the subject with which we are more particularly concerned at the present meeting—namely, our operations in British Columbia—I am happy to be able to state that the expectations we held out to you at our statutory meeting have been satisfactorily realized. We have already begun to develop, and have formed into several groups a large number of properties at Rossland, which, in the opinion of our experts, in whose scientific knowledge and experience we have every confidence, are amongst the most valuable in the whole of that neighbourhood. It would only weary you to describe the thousands of feet of development work that have been carried on in various directions, and the large amount of machinery that has been erected to operate the mines in question. Suffice it to say that these mines will soon speak for themselves in the extent of their output and profit. Since the formation of the corporation we have acquired and formed into a separate company the well-known Le Roi mine; and, as many of you are probably shareholders in that property, I may state that it is developing in a very satisfactory manner, and gives every promise of continuing to pay substantial dividends for a long time to come. Since the formation of the Le Roi Company special attention has been given to placing the mine in a sound position by retimbering, sinking new shafts, erecting powerful machinery, and generally preparing for a much larger output. This was rendered all the more necessary in consequence of its previous owners having pursued a very unscientific and reckless method of distributing and dealing with its workings. But valuable as is the Le Roi mine, you will be pleased to learn that, according to the last accounts we have received, it would appear that we own a mine which may probably prove more valuable even than the Le Roi, and a third mine of, perhaps, equal worth, and should further explorations continue to confirm the sanguine views of our representatives on the spot, none of us need, I think, regret having chosen British Columbia as a field for our exertions. (Applause.) In regard to the balance sheet, it is so clear that I do not see that the separate items require much comment at my hands. I have, however, the satisfaction of drawing your attention to the fact that the entire sum of £250,000 paid in options, concessions, etc., at the inception of the corporation, together with a sum of £16,451 3s. 2d., consti-

tuting the preliminary expenses of establishing the company, have been written off in full, instead of being spread over a term of years as is usual in companies of this character. (Applause.) But for this the profits would have assumed larger proportions. As it is, the balance to the credit of the profit and loss account is £225,994 4s. 1d., which I hope you will consider a not unsatisfactory announcement. (Applause.) Out of the available profits to be dealt with at the present time, your directors recommend that a dividend of 10 per cent., free of income tax, be declared, payable on the 27th proximo, to shareholders on the register this day. This dividend will absorb a sum of £150,000, leaving a balance of £75,994, 4s. 1d., which we propose to carry forward to the next account. In conclusion, I think I may congratulate the shareholders on the position thus far achieved; and I hope that in future we shall always be able to give an equally good account of our stewardship. I have pleasure in proposing that the report and accounts be received and adopted, and that the dividend recommended be and is hereby declared. (Applause.)

Mr. Whitaker Wright—I have much pleasure in seconding the motion, and if any shareholder desires to ask me any questions in my capacity as managing director, I shall be pleased to answer them before the chairman puts the motion to the meeting.

Mr. Lionel Harris said he would like to ask what shares were included in the sum of £1,382,503 mentioned in the balance sheet. He thought a little more information might have been vouchsafed with regard to the development of the properties in Rosslund, and also the copper properties.

Mr. Whitaker Wright—In the report you will find that there is a clause referring to the most satisfactory development of the properties in the Rosslund district, and it is quite possible that in the near future we may have to call you together again as to what we shall have to do with regard to those properties, because they are opening up beyond our most sanguine expectations. We have had one or two experts out there, and our consulting engineer recently came to London to report to us in detail and he assured us that one of our mines there exceeds the value of the Le Roi, and we have yet another, equal to the Le Roi, in addition to our copper properties and other claims. We will send to the shareholders in due course a printed report in regard to all these properties. It is not expedient to say at this moment how we propose to aggregate those mines, and if you are called together, you may expect that you will receive satisfactory profits on the par value of the shares in the company which you hold at the present moment. As to the Le Roi, the last telegram we had from the manager states that developments have taken place in an entirely new direction towards the Black Bear tunnel. On the 500-foot level, we have opened up a large body of high grade ore, all samples giving an average of one ounce of gold and upwards per ton of 2,000 lbs., and 4½ per cent. of copper. All the returns we have had from the Le Roi have been half an ounce of gold per ton, so that telegram is very satisfactory. The other properties to which we have referred are opening in the same gratifying manner, and we have good reason to be thoroughly satisfied with the soundness of our position there.

The resolution that the reports and accounts be received and adopted was carried unanimously.

The Right Hon. Lord Loch, G.C.B., G.C.M.G.—I have great pleasure in proposing the re-election of Lord Dufferin as a director of this company. (Applause.) It requires, I am sure, no words from me to ensure the unanimous voice of this meeting as to his re-election. He devotes much time, much care and ability, as we all know, to the work which you have entrusted to his charge. (Applause.)

Dr. Dugdale—It affords me equal pleasure to second this resolution. We all know that the name of the Marquis of Dufferin is a tower of strength to this important and successful organization. (Hear, hear.)

The resolution was then put and carried unanimously.

The Chairman—I am deeply sensible to the honour you have conferred upon me in allowing me still to continue a member of your board of directors, and can assure you that I shall always do my very best to promote your interests in every way in my power. I cannot sit down without thanking the seconder of the proposition for the kind and sympathetic terms in which he has alluded to the loss which has been recently sustained by Lady Dufferin and myself. (Applause.)

Mr. A. J. Harrison then proposed the re-appointment of the auditors, Messrs. Ford, Rhodes and Ford, at the same fee as before.

Mr. Hampton seconded the motion, which was agreed to, and the proceedings terminated with a vote of thanks to the chairman and directors.

“BAUXITE” OR “BEAUXITE.”

(By W. F. Best.)

THIS interesting mineral, which is used almost exclusively in the manufacture of the metal aluminum, desires its name from the town of Beaux or Baux near Arles in France. The mineral found at that point is in the form of small rounded granules, disseminated through limestone.

There are a number of other districts where this mineral is found in considerable quantity, notably in the vicinity of Toulon, France in general and in Virginia and other parts of the Southern States. It generally exists in the form of concoctionary grains about the size of “duck shot” sprinkled through limestone or clay. Sometimes Bauxite is earthy or clay like, and its color varied from grayish to yellow and sometimes brown or reddish. The light colored varieties are generally free from gran, and most suitable for the manufacture of aluminum.

The chemical composition varies from alumina 50, iesqui-oxide of gran 25, water 25, to alumina 75, and water 25.

The increasing economical importance of the metal aluminum has directed the attention of miners and others to Bauxite, and the United States deposits are being extensively developed.

Most of the Virginia Bauxite is sent to Niagara Falls, where an extensive plant for the manufacture of aluminum has been established. British Columbia miners should be on the lookout for this mineral.

A ROSSLAND PROMOTER.

ONE of the mining promoters in British Columbia who has brought to bear on his work perseverance as well as experience is Mr. S. Thornton Langley, of Rossland, whose photograph is reproduced this month. In his line of business, Mr. Langley occupies a prominent position. Born in Belfast, Ireland, in the sixties, Mr. Langley received his early education there, where he also obtained his business training, which was supplemented by subsequent business experience in Liverpool, England. Mr. Langley left the latter city in 1888 and went to San Francisco, California, to represent the interests of his Liverpool firm. There he became interested in gold mining which in the Golden State has for years occupied a large share of attention with all classes.

In March, 1895, Mr. Langley came to Rossland, since which time he has been actively engaged in promoting mining enterprises, one of his most recent undertakings being the Okanagan Free Gold Mines, which paid a dividend of five per cent on the capital stock in October last.

Mr. Langley resigned his position as director of the Okanagan in October, 1899, for the purpose of engaging more actively in the management of the Kettle River Mines, Ltd., which owns a promising property near the Pathfinder Mines in Grand Forks mining division.

Associated with him in this enterprise are Mr. Frank D. Howe, a mining engineer of ability and wide experience in the West, and some other gentlemen who are pioneers in Trail Creek.

Mr. Langley, though he entered the mining field of Trail Creek with a limited amount of capital, has done much in the promotion of legitimate enterprises in this field.

THE MONTH'S MINING.

CAMP M'KINNEY.

(From Our Own Correspondent.)

THE Cariboo, of Camp McKinney, still holds its own as the most consistent gold producer in the

province. Since April, 1894, or for nearly six years, this mine and mill have been continuously working, producing over \$100,000 a year, and to-day at the 400-foot level, is to be seen one of the finest bodies of ore

A GOOD of the management remarked, the old
OUTLOOK. Cariboo never looked better than at the present time. The work is now more particularly confined to the eastern end of the company's property, on the Okanagan claim, where the vein is over four feet wide and remarkably well mineralized.

On the Sailor claim, some 2,000 feet west of the

Cariboo on the same vein, a rich body of ore, identical with Cariboo ore, was struck in the 75-foot level, the vein being 51½ feet wide with 30 inches of pay ore. This strike has caused quite a ripple of excitement in camp, proving the value and continuity of the Cariboo vein west of that company's property, and giving assurance of future prosperity.

Like the Cariboo, the Sailor is owned principally in Toronto, and it is most gratifying that the Toronto people should meet with success in our camp, for they have invested their money freely, equipping the properties with the latest improved machinery and sparing no expense in making a thorough investigation.

The Waterloo mill is not running at the time of

writing, though the development of the mine continues, the west drift being pushed towards the Fontenoy at the 60-foot level, where some good ore has been encountered. There is a rumour in camp that the Fontenoy and Waterloo are about to consolidate, when the Waterloo mill will be increased to ten stamps and the main shaft sunk another 100 feet.

The Minne-ha-ha has temporarily suspended operations, pending an examination to determine the further development of the property.

The Gold Standard (Lemon & Co., Omaha) will have its mill running in a few days, the very fine



MR. S. THORNTON LANGLEY.

weather having permitted work to proceed uninterrupted during the winter.

The big bond on the Dayton, where the rich surface strike was made this winter, has fallen through, but the owners, nothing discouraged, have continued sinking the inclined shaft, and with the most encouraging results, so much so, that it is doubtful if the former terms would be accepted. This property is situated between the forks of Rock Creek, some four miles east of the Cariboo in a rich mineral section, and where there are quite a number of locations with good showings.

The sale by the sheriff of the Camp McKinney Gold Mining Company's properties, the Granite and Banner, should in no way affect the prosperity of the camp, as the operations of the company have been looked upon with more or less suspicion ever since the work commenced, not a dollar's worth of the stock being held in the camp. There are still conflicting opinions as to the value of the properties, but only one opinion as to the management.

Quite a building boom has started in the camp, encouraged by the bright prospects and bright weather. On Cariboo Avenue, Messrs. Rose & McAuley are erecting a very handsome and commodious hotel, a very desirable addition to the camp. On the same avenue is Dr. White's residence, a restaurant and chop house, and a billiard hall. On Sailor Avenue, in addition to Major Megraw's residence, the Sailor hotel, and several private houses, a spacious entertainment hall with club room attached has been just completed.

FAIRVIEW CAMP.

(From Our Own Correspondent.)

The Dominion Consolidated Mines, Ltd., is steadily pushing development work on the centre ledge which runs through the entire length of the company's three claims. Some time ago a six-drill compressor plant was installed on this property and is now in full working order. The ledge runs up a fairly steep mountain side and consequently gives exceptionally good facilities for economical tunnel development. The tunnel has been started

near the lower boundary of the CONSOLIDATED. Flora claim and is now in about 290 feet, giving a depth from the surface of a little more than 100 feet. As this tunnel is being run along the ledge no dead work is necessary in the development of the claims and the further the work is pushed the better the values seem to be. From the time of commencing the tunnel to the present the average value of samples taken across the face of the drift has been from six to ten dollars per ton and samples across the ledge recently taken by the representative of some prospective English investors realized the average value of \$9.28 per ton at a width of eight feet. As this is a free milling proposition susceptible of such economical development and in control of water power more than sufficient for all the mechanical requirements of the mine, it would appear that there is a splendid future before this company, at least this is your correspondent's opinion.

BOUNDARY CREEK.

(From Our Own Correspondent.)

Mining matters in the Boundary Creek district, though not nearly so active as it was anticipated they

would be following the opening of the railway, are still exhibiting progress on the whole. There is, however, a decided general dullness in business in the towns notwithstanding the assertions to the contrary of those who are whistling to keep their courage up.

There is but little ore going out of the district apart from the 1,500 to 2,000 tons the B. C. mine is reported to have shipped to date. Possibly there will be an improvement in this direction after the completion of the several spur lines to mines. On the other hand there appears to be a growing feeling that mine owners will more and more favour local treatment in preference to shipping to a distant smelter.

The Old Ironsides, Knob Hill and Victoria group are still doing most work in Phoenix Camp. The Winnipeg is idle in Wellington Camp, but its neighbour, the Golden Crown, is proceeding with development so as to later be in shape to maintain a regular output. Work is being resumed on the Athelstan, also in Wellington Camp. The B. C. and Oro Denoro are both at work in Summit Camp. The former has lately received additional plant and the stockholders in the company owning the latter are to be asked on April 5th to authorize the borrowing of \$15,000 for the purchase of more plant. The Jewel, in Long Lake Camp, has received a compressor plant and information is being sought relative to the most suitable reduction process for its gold ore. The big plant for the Sunset in Deadwood Camp, consisting of two 80-horse-power boilers, half of a 20-drill compressor, an 80-horse-power hoist, and a Northey station pump, is now in working order. The equipment also includes a full equipment of ore cars, a water heater, two large receivers and an ample supply of air fittings. The Buckhorn, in the same camp, is still prospecting its ground down to the 200-foot level. The City of Paris, in Central Camp, is now sending out ore by waggon to the Granby smelter at Grand Forks. There are numbers of other claims upon which development work is being done, but the foregoing summary takes in a majority of the most prominent mining properties now being operated in the district.

The Mother Lode, in Deadwood Camp, is again compelling attention.

On March 9th the British Columbia Copper Co. signed at its head office, New York, a contract to purchase from the Jas. Cooper Manufacturing Co., Ltd., of Montreal, Que., the largest compressor, boiler and drilling plant yet ordered for the Boundary country.

The further statement has been made that there is none larger now in operation in Canada, but whether this be true or not there is no doubt that the directors of the British Columbia Copper Co. have, in ordering this additional plant after nearly four years' systematic prospecting of their Mother Lode property, given practical proof of their conviction that the company owns a mine that is full of promise for permanent and profitable operation. It is nearly two years since the company purchased from the Jas. Cooper Manufacturing Co. the following plant and equipment: Two 60-horse-power boilers, with feed water heater, pumps, etc., one 10-drill Ingersoll-Sergeant air compressor, with complement of machine drills, hose, etc., station, and sinking pumps, and pump for water supply, an Edison electric light plant, a Lidgerwood hoisting engine, 30-inch drum, a

half mile or more of pipes, and all requisite cars, buckets, rails, machine and hand tools, etc. Later two auxiliary hoists were obtained from the Jenckes Machine Co., and quite recently a cage, supplied by the Wm. Hamilton Manufacturing Co., was received. With the foregoing plant the mine has been opened up by a two-compartment vertical shaft sunk to a depth of 325 feet and by about 2,000 feet of underground work in drifts, cross-cuts, stations, winzes and upraise. Adding the cross-cutting, etc., done prior to the purchase of the power plant, the underground work done totals about 2,710 feet.

With this much work to its credit and with results in ore bodies exposed that appear to amply warrant the preparation for operations on a much larger scale, the following Ingersoll-Sergeant condensing plant has been ordered: A cross compound Corliss condensing air compressor, with compounded air end and receiver intercooler, the high and low pressure steam cylinders to be 22-inch and 40-inch diameter respectively, the air cylinders to be of the piston inlet type, high and low pressure, 19 $\frac{1}{4}$ inch and 32 $\frac{1}{4}$ inch respectively and 48 inch stroke, the machine to have a capacity of 30 to 40 drills, and to weigh 166,000 lbs; two 66x16 horizontal return tubular boilers, each 100-horse-power for 125 lbs, working pressure, and to have horizontal smoke connection and one stack; a 54x12 air receiver; a feed water heater of sufficient capacity for 350-horse-power boilers; ten E 24 drills; two double-screw and ten single-screw columns with arm and clamp; two iron safety platform cages with safety device and shield roof; two six-foot sheave wheels; 1,500 feet of 1 $\frac{1}{4}$ inch wire rope, and six steel ore cars with McCaskell wheels and axles. Delivery of this plant is contracted to be made within three months. It may be here remarked that the compressor is to be fitted with every device known to mechanical engineering for the economical production of power.

A new hoist is also to be obtained of a capacity sufficient to work the mine down to a depth of 1,500 feet. This has not yet been ordered, but will be shortly. Meanwhile a site for it north of the shaft is being blasted out so that there need be no delay in putting it in position after it shall have been received. The site chosen for the new compressor plant is on Mother Lode Creek about 150 feet below the level of that on which the machinery now in use stands. Economic considerations have influenced the choice of this lower site, the adoption of which will render it unnecessary to so enlarge the main shaft down to the 200-foot level as to provide room for a third compartment in which to place compressed air and steam pipes. As both existing compartments will ere long be required for the two cages that are to be installed it has been decided to run a tunnel from the present 200-foot level of the mine out to the creek, a distance of about 500 feet. A cross-cut has already been driven 100 feet towards the creek, so this can be extended and be made to serve the purpose. As the rock formation will in about 150 feet farther give place to wash the tunnel will cost far less than would the work of enlarging the main shaft. Then there are additional advantages in that the tunnel will drain the mine workings down to the 200-foot level and so obviate pumping above that level, and give increased ventilation, as well as provide a passage way for compressed air and steam pipes to the 200-foot level.

As to work now in progress in the mine—the cage is now about ready for work, so with better hoisting

facilities available drifting and cross-cutting at the 200-foot level has been resumed. The face of the drift is 600 feet north of the shaft. There are several cross-cuts, the latest vein being 154 feet from end to end passing through an ore body 95 feet in width, 80 feet being good ore. Cross-cutting at intervals along this north drift, which has been in ore—much of it of good grade all the way from the shaft, will give a number of faces and stopes from which to mine ore for the Mother Lode smelter, now in course of construction. Drifting north at the 300 foot level is also to be undertaken and when this drift shall have been advanced about 300 feet an upraise to the 200-foot level will be made for ventilation. Later the main shaft will be deepened to the 400-foot level, but this work will not be undertaken until after that mentioned above shall have been got well in hand.

ROSSLAND.

(From Our Own Correspondent.)

The mining situation here during the suspension of operations is gradually undergoing the process of evolution, if not revolution. A new system of work will, in all probability, succeed the one which has not been able to prevail. A change has been asked for and it is coming along the lines of the central system.

It is much to be regretted that here as elsewhere those that are pretending to be the workingman's friend are the most indiscreet and are carrying their likes and dislikes too far. A new element has entered into politics—the Canadian populist is here posing as the friend of the workingman and the enemy to capital. In spite of this matters are shaping themselves in the direction of industrial effort and order will shortly be evolved out of chaos.

In a period of depression and gloomy forebodings it may be worth knowing that the preparations for an out-turn of ore continues to be made on an extensive scale. The new War Eagle hoist which was manufactured in Akron, Ohio, by the Webster, Camp & Lane Co. is now installed. The old electric hoist about which there has been so much trouble is discarded, and remains where it was placed until, I suppose, the litigation concerning it is settled. The new hoist is to be worked by steam.

It is 200 h. p. with a double drum, latest post brakes and bond friction and is so constructed that if the skip were to break away it would be stopped by automatic brakes which would be put into action by the unusual speed of the skip. The new ore cars have a capacity of two and a-half tons each and the hoist running for the full twenty-four hours a day could give a daily output of 720 tons, but this quantity represents the maximum. No doubt 500 tons per day can be easily obtained. In other directions there are many evidences of what is to be done in the near future. A mine may be compared with a great ocean steamer that must occasionally be overhauled for repairs.

On the surface of the War Eagle and Centre Star the preparations for the future best indicates what is coming. Thus the folly of expecting a long discontinuance of work is made apparent.

So far the output of the mines, say for the first three months of the present year amount to about 32,000 tons, valued at about \$575,000 gross.

The other morning at the 460-foot level while cutting out a station a body of high grade ore was en-

countered which is said on good authority to assay $1\frac{1}{2}$ unces of gold to the ton and about 7 per cent. copper. Some large pieces of this ore have been brought up from the mine, and altogether about ten tons have been placed on the dump. The ore is evidently from one of the main veins of the camp, a vein which runs southeast and northwest. This is evident enough judging from the size and quantity of the pieces abstracted from the ledge. So far there have been cut two and a-half feet of this solid ore and I am credibly informed that the point where this was cut is the lowest in the camp measured from the surface. Mr. William S. Harkens is the superintendent, and there is much satisfaction in the division on this account. Mr. Harkens is one of the best liked, and most efficient superintendents in the country. The strike itself is the best ever made in the Nickel Plate, which is the property of the British America Corporation.

The Le Roi so far has shipped about 12,400 tons, the War Eagle 10,600, Centre Star 7,000, Iron Mask 1,434, Evening Star 189, I. X. L. 273 and Monte Cristo 40.

The announcement of a further dividend of \$750,000 by the Le Roi management in England has come opportunely. Spring is now here and the present mining situation has begun to show material improvement, so that when my next report is made I hope to be able to show the facts and figures of a general and substantial advance.

SLOCAN.

(From Our Own Correspondent.)

The one item of the month which naturally overshadows all else is the joyous and far-reaching statement that the labour difficulty is at an end—permanently we venture to hope—and that a general resumption of work underground has taken place. Little remains to be said on this score that cannot readily be conjectured by the intelligent reader, for unfailing signs of coming prosperity are everywhere commencing to put in an appearance. Mines long deserted and idle are resuming their wonted attitude of energy and bustle, and buildings which have lain silent and unoccupied for many moons resound once more to the unharmonious clanging of the blacksmith's hammer and the welcome noise of ore-sorters at their work. Altogether the old French proverb "après la pluie, le beau temps" bids fair to be exemplified once more. True, the minds of the populace have been occupied to some extent with the news of the "relief of Ladysmith," the gallant doings of Canadian contingents and other items from the seat of war, and incidentally we have indulged in a mild excitement of our own derived from a more or less exaggerated small-pox scare, but to the professional, business and working man alike these—notwithstanding their evident importance—appear as mere side issues, absolutely nothing sufficing to ruffle the complacency with which he has learned in the last few weeks to view the world, save perhaps the ominous clouds on the political horizon. In the lightness of his heart even these are not taken seriously, and the fact that minor (no joke intended) troubles of a like nature are being experienced in the district around Nelson, Rossland and Boundary serves only to increase his thankfulness for the period of activity attained at last. I voice the unanimous sentiment of the

miners, mine operators and business men generally in expressing the hope that a lasting and final settlement has been reached which will allow the district to progress at its worth, and that it will be long ere a disaster of this character again threatens. The effect of mutual forbearance and concession is seen in the fact that no ill-feeling has been engendered, each of the contestants recognizing that the other necessarily had rights as well as wrongs in the matter of a struggle thus thrust upon them. Like two nations who have expended their resources in the futile art of war, we in the Slocan long now, one and all, for peace accompanied by its glorious economic and industrial conquests. That the strike is at an end would be self-evident to the most casual visitor, but it is perhaps more markedly displayed in a statistical way as shown in the columns of the newspapers. While the ore shipments in the latter half of 1899 totalled only 4,300 tons, over half of that amount has left the district in the first month of the resumption of operations. This might in some quarters be regarded as the result of accumulation, but there is evidence to show that shipments in the ensuing months will likely exceed this figure to a considerable extent. The majority of the mines were not in condition to employ forces on the start, and in addition, the season when the roads are breaking up is obviously very unfavourable for getting down ore. The list of shippers so far includes only fifteen names and several of these figure almost for the first time, so that many of the best known mines are yet to be heard from. The Payne, apparently unwilling to relinquish its hold to the title of the richest mine in the district has started off well, being credited with over half the production to date, consequently we are not surprised to see the stock of this company in the ascendant. None of the other mines have made any conspicuous move as yet, and are hardly expected to, of course, until the roads are in better condition. On account of the early spring we are anticipating a good season for prospectors, the annual exodus this year being billed in advance for the Kettle River district situate between Arrow Lake and Vernon. Reports of rich finds, though conflicting and subject to a liberal discount, are still good enough to warrant investigation at least, and many are waiting only for the snow to vanish before venturing there on business.

Lists of casualties are not confined to South Africa by any means, the yearly recurrence of snow and mud slides attended with fatal consequences reminding us of the precarious nature of the miners' calling. It would appear also from the accident which occurred at Sandon through part of the bank above the town giving way, that the danger is shared to some extent by all who live in the mountains. Two men killed by the Noble Five slide, and one killed and several injured as a result of the Sandon catastrophe is the record for the past week, added to which a solitary worker at the Silver Bell, Kaslo Creek, lost his life through a fall of rock doubtless occasioned by the thaw, and a miner from the Enterprise lies dead from the effects of an unexpected explosion.

It is gratifying to record that most of the ore leaving the Slocan is now consigned to Trail in place of the American smelters. So long as the management continues to give satisfaction it is matter for mutual congratulation, for at present they certainly appear to have the advantage over their competitors in being able to pay on the London price with certain deductions, thereby netting more for the shippers on the

lead contents of the ore than could be done on the hitherto existing arrangement.

Zinc ore comparatively free from lead, mined at the Bosun, continues to find a profitable market in Belgium, and so well known has this become that other mine owners are contemplating following suit. The new concentrator at the Wakefield which was run successfully for a few days not long since and will soon be in continuous operation is especially adapted for saving this product which will no doubt prove a source of considerable revenue.

The signs of an all-round revival in interest in this section are numerous and varied. But few vacant houses are now to be seen, and judging from the number of applications for naturalization papers which are being received, many evidently find it to their advantage to settle here permanently. Bonds and options are again spoken of, in whispers, of course, the Mollie Hughes, Lost Tiger, Monitor and Mountain Chief being each in receipt of attention from prospective purchasers. That old familiar cry of waggon roads, as indicating the necessity for their construction is again being heard with respect to the properties on Silver Mountain, and there is every likelihood of its being constructed during the coming summer.

PRODUCING MINES.

TEXADA ISLAND.

THE following returns of smelter operations are published in the annual report of the Van Anda Copper and Gold Company:—

JANUARY.

Receipts—	
Matte sales	\$18,637 61
Store	5,904 17
Lot	230 00
Wharf	55 00
Rentals	102 75
Total	\$24,929 53
Disbursements—	
Labour	\$12,874 75
Material and Repairs	4,980 99
Freights	2,500 00
Interest and discount	550 00
Total	\$20,905 74
Profit for month	4,023 79
January ore hauled to smelter . . . . .	.619 tons

FEBRUARY (ROUGHLY.)

Receipts—	
Matte sales	\$17,285 64
Store	5,241 93
Lots	200 00
Wharf	50 00
Rentals	102 75
Total	\$22,880 32
Disbursements—	
Labour	\$12,375 36
Materials and repairs	4,841 85
Freights	2,100 00
Interest and discount	700 00
Total	\$20,017 21
Profit for month	2,863 11
February ore hauled to the smelter . . . . .	.749 tons

Note—March will get credit for a ton of bullion accumulated during January and February and really belonging to the credits of those months although shipped in March, value about \$2,500.00.

NELSON.

The following are the results of the operations of the Hall Mines smelter during January:

Copper smelting 8 days 11 hours, 1,803 tons of Silver King ore from the company's mine and 700 tons of purchased ore were smelted, containing (approximately)—Silver King ore, 30 tons copper, 17,403 ounces silver; purchased ore, 9 tons copper, 5,770 ounces silver, 34 ounces gold. Lead smelting, 29 days 1 hour, 741 tons of purchased ore were smelted, together with 128 tons of Silver King ore from the company's mine, from which were produced 164 tons of bullion, containing (approximately) from Silver King ore, 1,700 ounces silver; from purchased ore, etc., 159 tons lead, 25,820 oz. silver and 146 oz. gold.

The returns of the Athabasca mill for February are appended:

Mill run, 27 days and 14 hours.
Number of tons crushed, 347.
Value of bullion recovered, \$9,544.59.
Gross value of concentrates recovered, \$1,767.50.
Total values recovered, \$11,312.09.
• Total values recovered per ton of ore crushed, \$32.60.

The mine exports for the month of February from the port of Nelson were as follows: Lead bullion, \$20,304; gold bullion, \$39,776; other exports, \$1,160; making a total of \$61,240.

ROSSLAND.

Our Rossland correspondent telegraphs that the mines are preparing for the early resumption of operations. The production this month has been insignificant. The total shipments to the end of February are given at 31,972 tons, as shown in the annexed table:

Le Roi	9,198	3,245.5	12,443.5
War Eagle	8,221.5	2,381.5	10,603
Centre Star	5,638.5	1,379	7,017.5
Iron Mask	976.5	363.5	1,340
I. X. L.	48	105.5	153.5
Evening Star	30	69.5	99.5
Monte Christo	273	.....	273
Giant	42	.....	42
Total tons	24,427.5	7,544.5	31,972

SLOCAN.

During the month of February 794,000 pounds of ore was produced in this district.

COAL EXPORTATIONS.

FOREIGN SHIPMENTS.

February.	Tons.
New Vancouver Coal Co.	38,832
Union	17,811
Oyster Harbour (Extension)	18,897

MARCH.

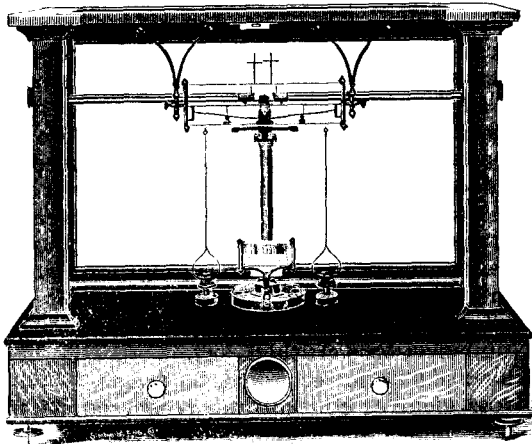
The New Vancouver Coal Company's shipments for the three weeks ending March 20th were as follows:

Date.	Vessel.	Destination.	Tons.
1st—	SS. New England	Alaska	52
5th—	SS. San Mateo	Port Los Angeles	4,321
6th—	SS. R. Adamson	San Francisco	4,431
8th—	SS. Mineola	San Francisco	3,196
10th—	SS. Manauense	Mahukona, H. I.	1,446
11th—	SS. New England	Alaska	54
14th—	SS. Titania	Port Los Angeles	5,781
18th—	SS. New England	Alaska	62

Total 19,343

A NEW BALANCE.

THE accompanying illustration is of a new precision balance with five-inch beam recently placed upon the market by Wm. Ainsworth & Sons, balance makers, of Denver, Colo., U.S.A.



The counterpoised sliding door has been removed to better illustrate the instrument.

This balance is of the latest approved construction, with "fall away" pan rests and yokes, having agate contacts throughout there being no metal contact points with the beam or hangers.

A plate glass sub-base covers the entire base and all metal work is gold plated. The case is of mahogany, French polished, with two drawers in base and counterpoised sliding door.

The beam, which is made of a new palladium alloy having a tensile strength of from 80,000 to 90,000 pounds, is divided into fifty parts each side of the centre for the use of half a milligramme or one milligramme rider and there being no obstruction on the top, the rider may be placed at any point from the centre to the last division on either end.

Cylindrical reading glasses are provided for reading the beam and the index and the latest improved rider apparatus with rod locks is furnished.

This balance has been designed for especially accurate weighings such as "control" and "umpire" assays and for the most accurate work in scientific and chemical laboratories, balances of this general construction having been furnished sensitive to 1.1000 milligramme.

The Simplest, Most Economical and Most Effective Concentrator Known.

The Wilfley Ore Concentrator Syndicate, Limited.

32 OLD JEWRY, E.C. LONDON.

Beg to call the attention of Mining Engineers, Mine Superintendents and Managers, Machinery Dealers, and all connected with the Mining Industry to

THE "WILFLEY" TABLE

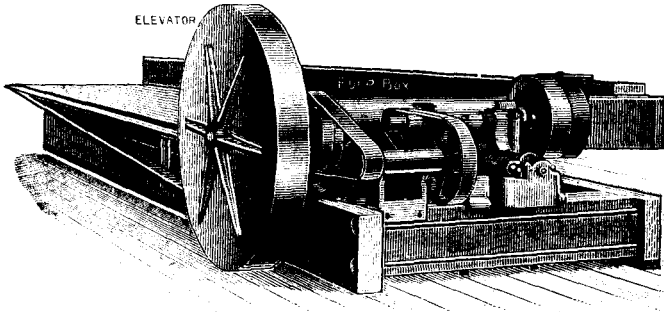
The following strong claims are put forward for the "WILFLEY," and will be found more than fully substantiated in actual working:

1. Simplicity of construction. No expensive wearing parts. No belt renewals. Nothing to get out of order. Practically no repairs.
2. Facility of adjustment to all ores treated. Once adjusted it needs but a minimum of attention.
3. Its wonderful capacity. Will handle three to five times as much material as any belt table made.
4. Reduction of maintenance charges. No skilled labour required. Reduction in initial outlay, as smaller number of tables are needed.
5. The ore particles being separated into distinct streaks a complete separation of the different minerals contained is effected.

The "WILFLEY" has only been on the market some eighteen months, yet in that time nearly 800 have been sold, and are in use in 200 mines, which speaks volumes for the rapid and favorable recognition it has been accorded.

The most flattering Testimonials have been received. The "WILFLEY" can be seen in operation by appointment at the offices of the Syndicate, 32 Old Jewry, London, E.C.

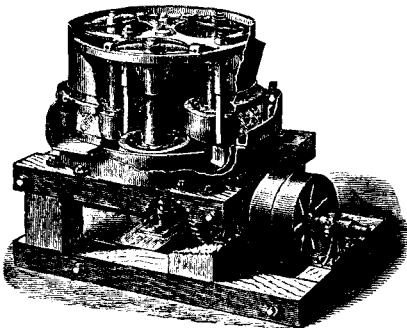
Samples of Ore, 50 lb. to 1 cwt., tested free of charge. Correspondence invited.



Descriptive Catalogue sent post free on application.

TELEGRAPHIC ADDRESSES. - "Wrathless, London."

The Huntington Centrifugal Roller Quartz Mill.



The Huntington Mill is so well and favorably known among mining men throughout the world that any description of it would seem superfluous. They are in use in the United States, Canada, Mexico, Central and South America, Australia, China, Japan, and South Africa. In fact, wherever mines exist, and have given the best satisfaction of all quartz crushing mills.

The construction of this mill has lately been much improved and we claim it to be the

Cheapest, Most Efficient, Simplest and Most Durable Mill upon the Market.

F. A. HUNTINGTON, MANUFACTURER OF Centrifugal Roller Quartz Mills.

Mining Machinery of Every Description. Steam Engines. Shingle Machines.

Room 1, 3rd Floor, Mills Building,

SAN FRANCISCO, CAL.

THE METAL MARKET—MARCH.

THE market has been generally steady and very few changes are reported. Silver has advanced slightly, the price during the month ranging from 59½ to 60c. The average price of this metal last month was 59.76. Copper is firm and active in view of an increased demand. Manufacturers are exceedingly

busy and refiners experience difficulty in meeting their obligations. The latest quotations are Lake, 16½; electrolytic in cakes wirebars and ingots, 16¼ to 16¾c., in cathodes at 16 to 16¼c., and casting copper at 16¼c. There is little change in lead, which is quoted at 4.56 to 4.70. Spelter is fairly active, but at unchanged prices, 4.60 to 4.62½ being quoted from New York and 4.45 St. Louis.

WHITE, ROGERS & COMPANY,

Constructing Engineers and Millwrights

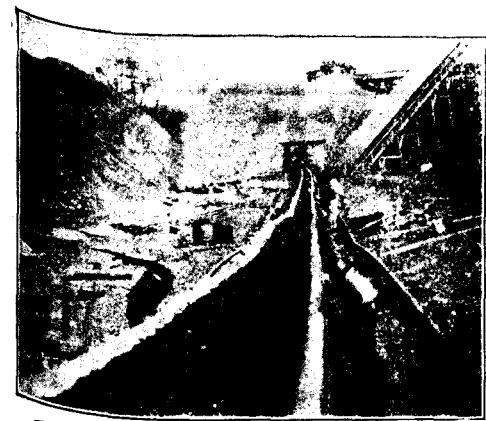
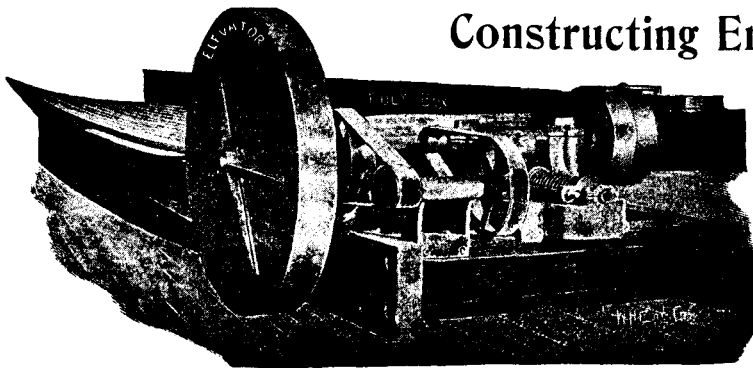
306 Pine St., San Francisco, Cal.

Sole Pacific Coast Agents and Builders of the Celebrated **Wiffley Concentrator**, Price \$450 f.o.b. San Francisco. One of these machines will take the place of Two or Three Belt concentrators of any make and do very much better work.

We furnish superior Machinery and erect Stamp Mills, Hoisting and Pumping Works operated by Steam or Water Motors. Complete Concentrating and Smelting Plants for the concentration and recovery of gold, silver, copper and lead. Improved Power Drills and Air Compressors. Wire Rope Tramways, etc.

The Wiffley Table is covered by U.S. Patents Nos. 580,338 and 590,675. Infringements will be prosecuted to the full extent of the law.

These Machines are Kept in Stock ready for immediate shipment.



ROBINS BELT CONVEYORS

Handle Ore and Tailings.

Most economical and

Insure Against Shutdowns.

Cut shows Belt Conveyor handling 250 tons culm per hour at Pittston, Pa.

For illustrated catalogue address

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Park Row Building, New York.

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MACHINERY, MINING AND INVESTMENT BROKERS.

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WANTED.

Position as Superintendent (or assistant to) of an electric railway, mining or lighting plant by a graduate of a leading American technical college, who is also a practical mechanic. Ten years very practical experience with various electrical systems for lighting and power, including three years in charge of a plant for the leading steel manufacturing company of America and three years in charge of a 3-phase plant for a representative Colorado mine. Thoroughly reliable. Address "Engineer," care of British Columbia Mining Record.

WANTED.

An experienced miner to join party going into the Cariboo country. Must have practical experience in hydraulic mining. Apply by letter to D. H. M. office this paper.

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BULLOCK

DIAMOND DRILLS MINING MACHINERY

M. C. BULLOCK MANFG CO. CHICAGO, U.S.A.

Mining Stocks.

Prepared by A. W. More & Co., Stock Brokers, Victoria, B.C., Mar. 28, 1900.

Company.	Capital.	Par Value.	Price.
TRAIL CREEK.			
Alberta.....	\$1,000,000	\$1	\$ 4½
Big Three.....	3,500,000	1	8
Bruce.....	1,000,000	1	10
Butte.....	1,000,000	1	02
Caledonia Con.....	1,000,000	1	5½
Centre Star.....	3,500,000	1	1 40
Commander.....	500,000	1	10
Deer Park.....	1,000,000	1	2
Enterprise.....	1,000,000	1	20
Evening Star.....	1,000,000	1	9
Georgia.....	1,000,000	1	5
Gertrude.....	500,000	1	9
Golden Drip.....	500,000	1	15
Gopher.....	1,000,000	1	08½
Hattie Brown.....	1,000,000	1	08
High Ore.....	500,000	1	05
Homestake.....	1,000,000	1	04½
Iron Horse.....	1,000,000	1	6½
Iron Mask.....	500,000	1	37
L.X.L.....	1,000,000	5	13
Iron Colt.....	1,000,000	1	10½
Jumbo.....	500,000	1	25
Le Roi.....	£1,000,000	£5	£5 5s.
Lilly May.....	\$1,000,000	1	\$0 20
Mabel.....	1,000,000	1	15
Mayflower.....	1,000,000	1	10
Monita.....	750,000	1	10
Monte Cristo.....	2,500,000	1	4
Nest Egg-Firefly.....	1,000,000	1	02
Northern Belle.....	1,000,000	1	4
Novelty.....	1,000,000	1	4
Palo Alto.....	1,000,000	1	03
Poorman.....	500,000	1	14
R. E. Lee.....	2,000,000	1	3
Red Mountain View.....	1,000,000	1	3
Rossland, Red Mountain.....	1,000,000	1	10
St. Elmo.....	1,000,000	1	6
Silverine.....	500,000	1	6
Silver Bell Con.....	500,000	25	3
Victory Triumph.....	1,000,000	1	5
Virginia.....	1,000,000	1	6½
War Eagle Consolidated.....	2,000,000	1	1 40
White Bear.....	2,000,000	1	3½
AINSWORTH, NELSON AND SLOCAN.			
American Boy.....	1,000,000	1	8
Arlington.....	1,000,000	1	6½
Argo.....	100,000	0 10	10
Athabasca.....	1,000,000	1	32
Black Hills.....	100,000	0 10	10
Buffalo of Slocan.....	150,000	0 25	03
Channe.....	250,000	0 25	03
Dundee.....	1,000,000	1	3½
Dardanelles.....	1,500,000	1	9
Dellie.....	700,000	1	12
Exchequer.....	1,000,000	1	12
Fern Gold.....	200,000	0 25	6
Goodenough.....	800,000	1	11
Gibson.....	650,000	1	17½
Hall Mines.....	£300,000	£1	10
Lerwick.....	\$1 500,000	\$1	3
Leviathan.....	2,000,000	1	3
London.....	150,000	1 25	25
Miller Creek.....	1,000,000	1	08
Molly Gibson.....	2,000,000	1	35
Minnesota.....	1,000,000	1	66
Nelson-Poorman.....	250,000	0 25	20
Noble Five Con.....	12,000	1c. par	8
Ottawa and Ivanhoe.....	1,000,000	1	12½
Payne.....	3,500,000	1 00	1 33
Rambler Con.....	1,000,000	1	55
Reco.....	1,000,000	1	1 00
Slocan-Reciprocity.....	1,000,000	1	—
Slocan Star.....	500,000	50	1 25
Santa Marie.....	1,000,000	\$1	05
Silver Band.....	250,000	0 25	12½
Slocan Queen.....	1,000,000	1	10
Star.....	1,000,000	1	07
St. Keverne.....	1,000,000	1	5
Sunshine.....	500,000	10	8
Tamarac.....	1,000,000	1	8
Two Friends.....	240,000	30	06
Washington.....	1,000,000	1	25
Wonderful.....	1,000,000	1	4
LARDEAU.			
Lardeau Goldsmith.....	200,000	1	04
Consolidated Sable Creek Mining Co.....	1,500,000	1	5
Lardo-Duncan.....	1,500,000	1	05
TEXADA ISLAND.			
Gold Bar.....	100,000	10	10
Raven.....	1,000,000	1	25
Texada Proprietary.....	250,000	0 25	25
Texada Kirk Lake.....	600,000	1	1 00
Treasury Mines.....	250,000	1 25	2
Van Anda.....	5,000,000	1	4½
Victoria-Texada.....	150,000	0 25	02
VANCOUVER ISLAND.			
Alberni Mountain Rose.....	250,000	1	05½
Consolidated Alberni.....	500,000	1	5
Mineral Creek.....	500,000	1	05½
Mineral Hill.....	750,000	1	05
North.....	500,000	1	05
Mount Sicker & B.C. Development Co.....	£125,000	£1	4 85

Company.	Capital.	Par Value.	Price.
CARIBOO.			
Cariboo Gold Fields Ltd.....	£100,000		\$1 10
Cariboo Hydraulic Consolidated.....	\$5,000,000	\$5	25
Cariboo M. & D. Co.....	300,000	1	
Golden River Queanelle.....	£250,000	£1	
Horsefly Hydraulic.....	\$200,000		55
Ward-Horsefly.....	500,000	\$ 1	55
Victoria Hydraulic.....	300,000	1	
LILLOOET DISTRICT.			
Alpha Bell.....	500,000	1	
Cayoosh Creek Mines.....	500,000	1	
Excelsior.....	500,000	1	
Golden Cache.....	500,000	1	
Lillooet Gold Reefs.....	200,000		25
FAIRVIEW CAMP.			
Smuggler.....	1,000,000	1	01½
Fairview Corporation.....	1,000,000	25	04½
BOUNDARY CREEK.			
Boundary Creek M. M. Co.....	1,500,000	1	10
Brandon and Golden Crown.....	1,500,000	1	25
Dominion Copper Co.....	5,000,000	1	75
King.....	1,500,000	1	15
Knob Hill.....	1,500,000	1	55
Morrison.....	1,000,000	1	3½
Old Ironsides.....	1,000,000	1	80
Pathfinder.....	1,000,000	1	11
Pay Ore.....	1,000,000	1	07½
Rathmullen.....	2,500,000	1	4
Winnipeg.....	1,000,000	1	15
CAMP MCKINNEY.			
Camp McKinney Development Co.....	600,000	1	25
Camp McKinney Mines Co.....	600,000	1	10½
Cariboo.....	1,250,000	1	75
Minnehaha.....	1,000,000	1	9
Waterloo.....	100,000		6
Fontenoy.....	1,000,000	1	10
O'Shea.....	100,000	1	01
Waterloo No. 2.....	50,000		10
Mammoth.....	50,000		01
Little Cariboo.....	100,000	10	01
Shannon.....	50,000	5	05
Sailor.....	1,500,000	1	10
Silver Bell, Consolidated.....	500,000	25	2½
REVELSTOKE			
Carnes Creek Consolidated.....	1,000,000		1
EAST KOOTENAY.			
Canadian Gold Fields.....	1,000,000	10	05
Crow's Nest Pass Coal Co.....	2,000,000	25	\$39 00
North Star.....	1,500,000	1	1 25
Sullivan.....	1,000,000	1	11

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