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POSITION OF THE LE ROI MINE.

IT must be candidly confessed that the British investor has not received much encouragement to induce him to continue to put money into British Columbian mines, and it is certainly not to be wondered at that he is not inclined at the present time to consider favourably any new scheme, however promising it may appear in itself, having to do with a country with whose name so many failures and mishaps are associated. Many of these failures, in fact quite the larger proportion, have not been the fault of the country, but it would not be honest to say that every mining fiasco has been the result of bad or extravagant management, or to claim that only the "wild-cats" had turned out disastrously. During the last few weeks some very unwelcome and unfavourable intelligence has been made public concerning the position of two more British-controlled undertakings, Le Roi and Hall Mines, and as these mines have been, perhaps, more largely advertised than any others in the country the recent unsatisfactory developments is likely to create the worst possible impression on the London market.

According to Mr. Mackenzie, manager of the Le Roi mine, the grade of ore shipped in March, the average gross value of which was only \$9.99, does not admit of

profitable extraction under present conditions of high smelting costs and of low metal prices. The future policy of the directors, in view of this report, has not yet been decided upon, pending the arrival of a letter from Mr. Mackenzie more fully explaining the position, but it is quite clear that for the meantime at least the output will be largely restricted, if as, in fact, the manager has advised, operations at the smelter are not entirely suspended until a reduction in freight and treatment costs are obtainable. The present expenses incurred for transport, smelting and marketing Le Roi ores aggregate six dollars per ton, which is certainly excessive. Of these charges upwards of sixty cents per ton represents the cost of haulage from the mine to the smelter — about twice as much as it should be; while smelting costs are in the neighbourhood of five dollars per ton. The high cost of smelting is explained on the grounds that the works cannot purchase fuel at a lesser rate than eleven dollars a ton, while the best coke from the Crow's Nest collieries is delivered to smelters in the Boundary district at half that price. As the consumption of a quarter of a ton of coke is required in the smelting of one ton of Le Roi ore, it will be readily understood that the price of fuel is a very considerable item in connection with smelting costs amounting as it does to something like \$2.75 out of a total charge of under \$5.00 per ton. With the completion of the branch line placing the Crow's Nest coal areas in touch with the large American railway systems, coke from the East Kootenay collieries will undoubtedly be supplied to the Northport smelter at a very much cheaper rate than at present, but in view of the heavy indebtedness of the Le Roi company to the Bank of Montreal, the outlook for the shareholders is at best a gloomy one and a long period must necessarily elapse before the mine can be placed on a dividend-earning footing. The only satisfactory features in the situation is that the true position of the property is now known and that the mine is in capable hands. There will at any rate be no further attempt to deceive the public, and if by economical and efficient management it is possible to rehabilitate the property Mr. Mackenzie may be depended upon to successfully accomplish the task.

The case of the Hall Mines is somewhat different. The operation of the mine has always been attended with exceptional risk, on account of the frequent breaks in the ore bodies, and the difficulty and cost of relocating them. Since the reconstruction of the company a plucky and determined effort has been made to work the property, and a few months ago the prospects of

success appeared exceedingly promising, a relatively large amount of ore of better average grade having been developed and blocked out. All recent attempts, however, to locate the ore below the tenth level have been unsuccessful, and the manager has been instructed to close down the mine if after boring three more holes with the diamond drill the position of the vein is not then ascertained. It is yet too early to abandon hope of the success of this final effort, but surely the experience of the Hall Mines must demonstrate the doubtful advantage of employing diamond drills in mine development, particularly in cases where there is much evidence of geological disturbance. The Hall Mines has expended a very large sum of money to no purpose in this manner, and even when ore bodies have been discovered the cost of reaching them has been increased to the extent of probably three dollars per foot. When the lead is cut off in a mine-working there is nearly always some indications which, if followed, lead to its relocation in one direction or another, but these indications are of little use as a guide when a diamond drill is employed. The method at best is a blind and haphazard one, for as often as not the drill may be within a foot or two of an ore chute without anyone being the wiser.

Meanwhile it must be remembered that mining, like every other commercial enterprise carries with it certain risks, and if the Le Roi and Hall Mines have failed to realise the high expectations entertained concerning them, there are many mines in British Columbia which are making a satisfactory showing. We have but commenced to develop the mineral resources of the country and occasional set-backs and reverses should only act as a spur to further effort.

MINING IN THE YUKON.

IN a well-considered article, in the *Engineering and Mining Journal*, (New York), Mr. Walter C. Mendershell discusses the future prospects of mining in the Yukon, and arrives at the conclusion that while the maximum of production is probably past, a rapid falling off within a few years to an unimportant output is not to be expected, but rather that the territory will yield well for some years to come, not taking into consideration possible new discoveries or the inauguration of a quartz mining industry. Statistics of the gold output of the Klondike show an increase from \$2,500,000 in the year of discovery, 1897, to \$16,000,000 in 1899. In 1900 the same amount was taken from the creeks as during the previous year, but 1901 showed some falling off from these figures, the production being about \$14,500,000, and predictions have been fairly made that the district will quickly decline to an unimportant place as a producer, unless quartz properties of value are developed. All placer gold districts pass with greater or less rapidity through three phases: A preliminary feverish stage of unsystematic and costly but rather high production, in which operations are confined to the richer

properties; a second stage with more systematic working or reworking of the partially exhausted banner properties and of development of producing areas which were not sufficiently rich for exploitation during the first stage, and finally into a third, that of gradual decline. The rich region to the back of Dawson is in the period of transition from the first to the second of these stages of development. According to Mr. Mendershell a number of the best creek and bench claims are already worked out so far as profitable manipulation under present methods is concerned, and the majority of the others are rapidly approaching exhaustion. The camp has passed with unusual rapidity through this first most highly productive period because of the small size of the claims under Canadian law and the consequent large number of original holders and operators, each of whom could quickly cover his 500-foot claim. The great richness of many of the Bonanza and Eldorado properties, too, by making it possible to work at a profit no matter how great the lack of method, has encouraged the operations of the original staker and prevented his immediate sale to larger, more careful and more deliberate interests. It is this early unsystematic period of feverish operations on small holdings, which is now giving place to another of bigger holdings and more business-like management. A few weeks since the sale was recorded of a number of Gold Hill claims to one company, which will no doubt win large profits by reworking the famous bench upon which operations under present conditions have practically ceased. The Treadgold concession, which created such excitement in Dawson this winter, and by whose terms a syndicate with large capital was to have been granted all lapsed claims within the basin drained by Bonanza, Eldorado, Hunker, Bear, Gold Bottom and Last Chance creeks, in return for bringing to the district a sufficient water supply, is another one of the signs of the times pointing toward the passing of the small individual holder, and the incoming of the large capitalist. These new conditions alone could not keep production near the maximum of 1899 and 1900, but there are others which tend to counteract the shrinkage. Among them may be mentioned the steady improvement in transportation facilities between Dawson and the outside world, and particularly between Dawson and the various mining centres, which have advanced steadily since the discovery in 1897, through the stages of pack trail, private road, government road and government bridges, until now a railroad is projected. These improvements bringing about cheaper living and cheaper labour, increase the output by bringing within the zone of production many properties, whose richness, although high was below the standard necessary for successful operation under earlier conditions.

SOME MINING INVESTORS.

A CORRESPONDENT calls our attention to an interesting article which appeared in a recent issue of the *Australian Mining Standard* entitled "Some

Mining Investors." There are, it is pointed out, many classes of mining investors, each having its gradations and by reason of this the extremes are, comparatively speaking, wide as the poles asunder, but by glancing at the two ends and the middle, it is possible to indicate more accurately their range. At the one point is the man who, under a reasonable conviction, based upon the fullest information it is possible to obtain that a certain mine or prospect will give good returns for money in sufficient amount, judiciously devoted to its development, joins with others to furnish the capital, stands to the enterprise and is content to wait for its fruition in due season. This man represents the mining investor properly so-called, and he is of the class which has raised mining from the position of a speculative venture to that of a sound industrial undertaking. Such men as he are of prime value to a community, because in seeking their own profit they greatly benefit the country in which they carry on operations. At the opposite pole stands the mining investor improperly so-called—the mere market juggler in scrip—the man to whom the sale of shares is everything and the prospects of the mine only relatively important; the man to whom the very existence of the mine is a matter of indifference, except to use as a peg on which to hang his schemes. It was a "mining investor" of this type who recently offered a promising mine in British Columbia replied, "Yes, the mine seems to be good enough, but your report is too conservative. I buy reports, not mines." To this class our contemporary shows belong the wild-cat promoters, the bogus company mongers, the pavement parasites, and the other practitioners who make it their business to pick the pockets of the public without running the risks accepted by their less adroit fellows. These men are the cankers of the mining industry, and their association with it is its greatest curse. Midway between these extremes stands the small timid investor, in haste to grow rich, who expects large profits and quick returns; who is impatient of delay; and who apparently thinks that a mining investment should be an automatic arrangement by which, if you put a nickel in the slot a twenty-five per cent. dividend will straightway fall upon the platform. To legitimate mining in British Columbia the small investor has worked much injury. Although he would, in all probability, declare that it was the other way about, and that his misplaced confidence in the worth of British Columbia mines was the cause of his disappointment and losses. That, however, is not the case, for in nine cases out of ten he had no reason in the first place for reposing confidence in the property or properties in which he invested, for confidence or belief in the value of a mine can only be engendered by actual knowledge, and the small investors information has been as a rule derived from no more reliable sources than irresponsible newspaper gossip, or brokers' circulars.

In the share "boom" of two or three years ago, the small investor bit at every bait held out to him, and he suffered accordingly; but instead of taking his losses quietly and blaming his own folly and lack of discrimi-

nation for them, he loudly proclaims to the world his grievances and condemns the mines of British Columbia as valueless. At the first beginning of a mining industry in a new country men of this class exert a harmful influence by rendering it more difficult to secure capital for legitimate enterprises, but as the number of profit-earning undertakings increase, wild-cattling and injudicious speculation while it may and does continue, is viewed from a proper perspective and ceases to have the same interest in the same way. It is safe to say that the fraudulent promoter in London, and the wild-catter in Canada and the States—though these last are in a minority—have now done all the harm that it is possible to do to British Columbia mining. At the present time no one in his senses would attempt to interest British capital in no matter how good a mine in this country, while the attitude of Eastern Canada to British Columbia is not much more than friendly. Our only market for mining property is the United States, and it is a gratifying circumstance that a great deal of American capital has recently found its way into British Columbia, and is being invested by men who, in nearly every instance, have made large fortunes by applying their energies to make their profits out of the ground and not taken them from the pockets of a gullible public. When the Province assumes the important position she is destined to occupy as a mineral-producing country, it will be the American investor and operator to whom chief thanks will be due.

EVIDENCES OF RECENT PROGRESS.

THE Mining Statistics contained in the 1901 Report of the Minister of Mines, advance sheets of which have been kindly placed at our disposal, very convincingly instance the great progress made by the industry in British Columbia last year. The increase in aggregate values of metal production amounted to 23 per cent. over 1900. This percentage, though most gratifying, would have been still higher but for unfavourable weather conditions which militated against a successful placer mining effort and resulted in a falling off of 27 4-5 per cent. in gold recovered from this source; while the closing of the American markets to British Columbia lead ores had also a depressing influence upon this branch of industry, which shows a decrease of 25½ per cent. An enormous increase of 175 per cent., however, is shown in copper production, the value of which in 1900 was \$1,615,289, and in 1901, \$4,446,963. More than one-half of the copper mined in 1901 was produced in the Boundary District, but Rossland also contributed largely to the total output, the value of the copper yield from the mines of that district being over a million dollars greater than during 1900. A large gain in copper production from Coast mines is likewise to be noted. These three districts are responsible for the increase of 25 per cent. in the lode gold returns. The silver production, — this metal heretofore having been mined for

chiefly in conjunction with lead, as contained in the "wet" galena ores of the Slocan,—instead of decreasing should show an increase of 25 per cent., is due to the development of the dry-ore belt of Slocan City Division and to a quite remarkable increase in silver values in proportion to tonnage from the Rossland ores. In fact, the returns from Rossland, it may be remarked, in passing, are somewhat astonishing, having regard to recent less favourable reports of the grade of ore now being mined in that district. In 1900, 217,636 tons of ore were treated by the smelters, and in 1901, 283,360 tons. For the two years the proportion of gold to the ton remains practically unchanged, but while in 1900 the returns show that the ore carried about three-quarters of an ounce of silver to the ton, the 1901 figures raise the proportion to over three ounces; and in the same manner the value of the copper contents have increased from \$1.50 to \$4.75 per ton. It would be interesting if these somewhat striking discrepancies were accounted for. The inconsiderable increase of only 1½ per cent. in coal production may be explained by the keen competition to which colliery owners on the Coast were subjected by the successful introduction of mineral oil as a substitute for fuel in California, which in the past has been the chief market for the British Columbia product. The increased production, however, from the East Kootenay collieries, for whose coal a large demand has been created both in Interior British Columbia and the neighbouring States, helped to maintain the 1901 output at a little over the average yield of recent years, while a 49 per cent. increase in coke output is noted as a result of larger activity at Fernie. For the first time in the Annual Reports issued by the Department, the iron ore output is specially referred to, instead of being considered and included under the head of miscellaneous mineral production, such as building stone, brick and "other metals," and the small beginnings of an iron industry is recovered in a footnote stating that iron ore to the value of \$17,288 was mined in 1901. Among other indications of last year's progress the report mentions that tonnage increased 66 per cent. the value of the metalliferous output was 36 per cent. greater, and forty-one mines were added to the list of productive properties.

PREACHER AND PROMOTER.

OF new mining districts in British Columbia which have lately come into prominence the Lardeau and the Similkameen rank highest in point of importance and popular esteem. It is but natural, therefore, that among the many new enterprises to be started in these promising localities some should be "wild-cats"; for the wild-catter being no fool makes a point of studying the inclinations and idiosyncrasies of his public; and so directly any one particular mining field begins to "boom" it is there that he sees an opportunity to suc-

cessfully operate. We have already referred to more than one wild-cat scheme promoted recently in the Similkameen. But without accusing the "Rev." Chas. W. McCrossan, of Minneapolis, Minnesota, of following the same practice in the Lardeau, we can nevertheless confidently assert that his methods, like those of the Heathen Chinese, are unquestionably and undeniably, peculiar. In the first place it is out of the ordinary, though we will not say inexcusably so, for a preacher to take to a business to which his special training should by rights not fit him at all; but the Rev. Mr. McCrossan very possibly has taught that true charity begins at home, and in accordance with that most excellent and convenient theory, he is making very admirable use of his opportunities. The reverend gentleman is responsible for five promotions. These are the Golden Link Mining Co., the Golden Circle Mining Co., the Sicamous Gold & Copper Mining Co., the Metropolitan Gold & Silver Mining Co., and the Lardeau Smelting & Refining Co. The capital of these concerns is in each case, except one, a million dollars. The exception is capitalised at two millions. Not having heard of these wonderful properties before, and there being no mention of any of them, except the Metropolitan, in the Reports of the Minister of Mines, we applied to mining engineers resident in the district for information. Unfortunately these gentlemen prove to be as ignorant as ourselves, and all we can learn from what have hitherto proved well-informed local sources, is that the ore on the Metropolitan claim occurs in small stringers. Now, a two-inch vein,—and one of the Metropolitan stringers is, we understand, as wide as this,—must carry very high-grade ore to admit of profitable mining and although a few tons of ore were actually taken out last year, a correspondent informs us, and we can quite easily believe him, that the operation was conducted at a considerable loss. It was probably on account of this that the enterprising Mr. McCrossan purchased a small 30-ton "Vulcan" furnace, the efficiency of which has not, however, yet been demonstrated, and floated on the strength of it another million-dollar company. This, so far as it went, was a capital stroke of business, as it is not unlikely that the plant cost as much as ten thousand dollars. The shares in this undertaking were offered to the public at par. The "smelter," by-the-way, was to have been blown in in January last, but the interesting event was most regretably postponed, as by an oversight *the search for fluxes was not begun until after the smelter had been set up*, and it was then ascertained seemingly somewhat late in the day, that there was no limestone within several miles of the works. Quite recently Mr. McCrossan acquired for the Metropolitan Company another property, the Triune, which really is of some determined value, and in capable hands would doubtless develop into an important mine, but—well, as we said before, the Rev. C. W. McCrossan's methods are peculiar.

Nearly all the shareholders in Mr. McCrossan's million dollar companies reside in the east, and they own

shares by virtue of exhortation. The agents for the sale of stock are, like Mr. McCrossan, preachers—worthy men who at the solicitation of their principal have actually visited the mines and so are well qualified and equipped to extol them “to the skies.” Each preacher has his little flock, and the arrangement seems to have worked very well. It is quite extraordinary, too, how the shares have appreciated in value, but so far as we can ascertain, the shareholders have to thank Mr. McCrossan’s benevolence for this; for as he holds controlling interests, one can well imagine the elevating pleasure he finds in exerting the power thus at his command of bringing joy to many a humble home by the simple process of merely announcing that the shares of such or such a one of his companies have been advanced. Although the space at our disposal is limited, we cannot refrain from adding to this short and necessarily imperfect notice a few remarks concerning another instance of Mr. McCrossan’s genius and enterprise. It appears that in his capacity of secretary and treasurer he was very much pestered by shareholders and others who wrote seeking information. Mr. McCrossan after doubtless deep and anxious cogitation as how best to deal with these numerous enquiries, hit on the brilliant plan of publishing a newspaper, and in due course *The British Columbia Monthly Mining Bulletin*, (four pages, price 25 cents per annum), made its appearance. As a journalistic achievement, the *Bulletin* is distinctly unique in that it is a sort of cross between a bucket-shop rag and the *War Cry*. The first object of the editor, the Rev. Chas. W. McCrossan, is to advertise, or rather boom, by the employment of the grossest exaggeration, the companies promoted by the Rev. Chas. W. McCrossan; the next to advertise a book entitled “Love and Life” written by the Rev. Chas. W. McCrossan, of whose work “the world-famed evangelist, Rev. E. P. Hammond says: Any minister, in this production, could find material for a dozen sermons. Skepticism is dealt with lovingly, yet masterfully”; finally and incidentally the *Bulletin* is used as a medium to advertise Heaven. Meanwhile as many people in British Columbia do not believe in the Rev. Chas. W. McCrossan, nor in his Lardeau mining schemes, he should have here a fine field in which to exercise his ability as already described of dealing with sceptics.

Mr. W. Blakemore, who has just returned to the west from Montreal, was interviewed the other day by the Nelson *Daily News*, on the subject of the Kitchener iron mines. These properties, it will be remembered, were acquired last year by an eastern syndicate and the claims sufficiently developed to determine their value. They have now been crown-granted, but according to Mr. Blakemore there is nothing more to be done until the time is ripe for the establishment of steel works and the development of the mines. The state of the market and the general condition of affairs in the Pro-

vince would not justify the large expenditure which this would involve at the moment, but the company is prepared to go ahead on the lines outlined as soon as such a course is justifiable. Meanwhile plans are being prepared and the necessary preparations being made for the erection of a steel plant, and the actual work will be inaugurated at no distant date. This season no work will be done on the property except the necessary assessment work on properties bonded. It is understood that the company is fully satisfied with the merits of the property, and intend to establish steel works in due course, but the only question is as to whether the conditions are favourable for launching so large and so costly an enterprise at the present moment. During Mr. Blakemore’s absence in the east the ore was submitted to the most trying tests by the best experts in analysis, and these proved that his opinion as to the value of the property is correct.

It appears to us that the public has been misled by the promoters of the Similkameen Valley Coal Co., Ltd. The object of this concern, everyone supposed, was the exploitation of coal areas in the Similkameen valley. From a recently issued report of the managing director it would certainly seem that the coal mining is merely a secondary consideration—a sort of side issue, and that the company is really devoting its chief energies towards the production of “gas.” We are of course aware that gas is manufactured from coal, but here evidently the order is to be reversed. The company meanwhile is to be congratulated on its recent output—of gas, not coal or “even lignite”; but the colossal assurance of the managing director in publishing broadcast through the country such a report as that in which he unblushingly states that out of some twenty-eight thousand dollars of working capital subscribed by the public, over seven thousand or about a quarter of the whole amount has been squandered in newspaper advertising, is beyond all admiration. An undertaking with a managing director so well disposed towards the press deserves to succeed, but whether it will is another matter.

Steps are now being taken towards the organization of local sections or branches of the Canadian Mining Institute in each of the prominent mining districts of Canada, and for this purpose a meeting is shortly to be held in Kingston, Ontario, to form an Eastern Ontario section, while in June meetings will be held at Sherbrooke, Quebec, to organise an Eastern Township section, and also at Sydney, Cape Breton, to arrange for a branch representing the province of Nova Scotia. Later on in the year it is proposed to organise one or two branches in British Columbia, one with headquarters at Nelson and another at the Coast. The project is that these local branches shall embody the best elements in

the profession and industry of mining in respective localities, and that they shall independently of the institute, hold meetings and read papers as frequently as they like, and be in a position to take prompt and effective measures on any matter affecting the welfare or interests of the mining community. It is not likely that steps will be taken to organise in British Columbia until after the summer season, as it would be hardly possible to get together a representative gathering of mine managers and engineers until September at the earliest. The institute has now an active membership of close upon four hundred, and is doing most excellent work in the interests of the industry.

The shocking disaster at the Crow's Nest colliery on May 22nd last, whereby nearly a hundred and fifty miners lost their lives, has cast a gloom over the whole community. The cause of this distressing accident has not, as we go to press, been fully ascertained, but it is believed the explosion resulted from the ignition of coal dust brought about by faulty tamping. Another explanation, however, is that the fans at the mouth of the tunnel refused to work, and fire-damp thus accumulated in the workings. But this particular spot has always been considered dangerous, and only recently a number of miners from Nanaimo declined to work there on that account. Fire-damp is more than usually prevalent at Coal creek and it is a very difficult task to maintain a supply of pure air. Only the day before the accident the Government Inspector had visited the Crow's Nest mines and pronounced the workings safe, hence it would seem that the company cannot be held in any way to blame for the sad occurrence. The directors have meanwhile voluntarily come forward in a very creditable manner, and have promised to provide permanently for the bereaved families of the men killed or injured in the explosion, and already relief funds have been liberally subscribed to throughout the country.

The New Vancouver Coal Co. declared last month a further dividend of 3 per cent., making with the interim dividend paid in October last, a total distribution of 6 per cent. for the year 1901. Dividends at the same rate were paid during each of the two previous years. Meanwhile in a report to shareholders it is stated that during the half year ended December 31 last, the net output was 229,917 tons, making a total for the year 1901 of 494,488 tons, against 501,474 tons for the year 1900. The sales for the six months were 233,033, bringing the total disposed of during the year up to 509,603 tons, against 496,926 tons for the year 1900. The sum available for dividend is £6,888. The debenture capital remains at £22,850, and the reserve fund is unchanged £45,459, as is also the land sales reserve fund account at £22,272, but the insurance fund account is £100

more at £2,600. The directors also point out that the competitor of fuel oil is assuming a more serious aspect.

Mr. R. W. Northey, manager of the Keremeos Copper Mines, writes to the Rossland *Miner* protesting against the article we published last month on the subject of the "Ollala Copper Co." Mr. Northey expresses the opinion that the criticisms of the *MINING RECORD* were neither fair nor just, but he fails to indicate where in the unfairness or injustice lays. He, however, asserts that "the Olalla Copper Company is no fake company" as it owns "some magnificent copper propositions" and intends to erect smelters at suitable points in the vicinity. Mr. Northey admits that he is not personally acquainted with "any of the gentlemen forming the Olalla Company," and yet he vouches for their benevolent intentions. In that case then he could not do better than take advantage of the company's "generous offer," for what is faith without works?

Notwithstanding that business in the interior is still considered to be in a very depressed condition, it is satisfactory to note that during the past few weeks an unusually large number of mining deals have been made in the Kootenay districts. The Lardeau, Ymir and Similkameen divisions appear to be receiving the larger share of attention from the investor at the present time, but in other sections also a considerable amount of capital has lately been invested in the acquisition of promising mineral property. On the Coast, too, enquiry for copper properties continues, and American capital is being heavily invested in East Coast mining.

THE FUEL SUPPLY QUESTION IN BRITISH COLUMBIA.

BY W. M. BREWER, M. A., I. M. E., Etc.

AS the smelting industry in British Columbia grows, the question of fuel supply will occupy a very prominent position for the consideration of all engaged in this branch of industrial enterprise.

The visible fuel supply to-day in the Province is confined to the East Coast of Vancouver Island and the Crow's Nest Pass, but probable sources of fuel supply which can be drawn on in the future as development progresses include the Similkameen, the Tulameen or Otter Flat, the Nicola Valley, North Fork of Kettle River, Fairview and Queen Charlotte Islands, and West Coast of Vancouver Island coal fields, besides a limited area near the International boundary which may be designated as the Abbotsford. This area of probable productive fields would appear at first glance to be sufficiently extensive to warrant the assertion that any uneasiness whatever, with regard to the future fuel supply for the Province, was uncalled for.

But when the subject is more carefully considered in

a matter-of-fact manner, what do we find? That none of these possibly productive areas are sufficiently developed, or in fact prospected, to be taken into consideration to-day in discussing the fuel problem. In fact none of these fields have yet been afforded transportation facilities. In order to make a coal field productive transportation facilities must be furnished of such a character that the lowest possible freight rates can be secured. In order to open a colliery of sufficient capacity to be operated in competition with those already developed in the Province vast expenditures of capital must be made first for thoroughly prospecting a field, and next for mining plants of sufficiently large capacity to compete with those already established. Comparatively few of the residents of the Province fully realize the extent of the operations at present being carried on on Vancouver Island and at the Crow's Nest Pass. The statistics showing an output of about a million and a half tons of coal during the year hardly convey an adequate idea of what is necessary in the shape of invested capital, labour and transportation facilities, to produce such a result. It will probably be news to many of the readers of the MINING RECORD to learn that on Vancouver Island alone upwards of two thousand employees are engaged in the coal mines, and in the Crow's Nest Pass at the present time there are upwards of one thousand.

The combined capital invested in mining plants as they stand to-day represent figures which run into millions, and which were it not for the very large export trade, which is enjoyed by all the operating collieries would be very largely in excess of the present requirements of the Province, because when the home demand is considered it represents merely a fraction of the present output. So far as Vancouver Island is concerned the erection of new smelters will in the near future cause the home demand to be very largely increased. The same argument would also apply to Southern British Columbia, but these demands will hardly increase to such an extent for some time to come to tax the capacity of the operating collieries and coking plants.

So far as the export trade is concerned the strong possibilities are that because of the introduction of oil fuel in California this trade will fall off in the future, while the trade from Montana and neighbouring interior States directly tributary to the Crow's Nest Pass promises to increase and develop with phenomenal strides. Such being the fact the question naturally arises, whether under existing circumstances the management of the Crow's Nest Coal Co. will consider favourably an increased demand in British Columbia for fuel when their export trade taxes the producing capacity of their mining plants. The home demand from the Boundary country is increasing daily, the Grand Forks smelter has been enlarged to an increased capacity of treating 1500 tons of ore per diem, or double its former capacity. The Greenwood smelter has been increased to a capacity of treating 800 tons per diem, or to double its former size. The Montreal or Boston Co. has purchased the Boundary Falls smelter and will shortly be treating 400 tons per diem. The Trail smelter has been enlarged as well as the Nelson. Besides this, there is the fact to be taken into consideration that the mines which have been producing low-grade ore will undoubtedly increase in number because it has been demonstrated that the decline in copper prices, although very seriously affecting the profits, was not sufficient to close these mines down as was anticipated, consequently the owners of many properties who have been hesitating as to whether it was desirable to operate need do so no longer.

There is no question but that the visible coal supply in the Crow's Nest Pass, from the workable seams known to exist, is practically inexhaustible, but all the available points for opening mines on an economical basis are controlled by the present Crow's Nest Pass Coal Co., except one, and even to equip and open a mine at that point would involve a much larger expenditure of capital than has been required for those already opened. Aside from this point there is absolutely none other in the field west of the summit of the Rockies where any conservative coal operator would make an attempt to equip a colliery in the expectation of competing with the present company. Such an attempt would mean, first an expensive outlay for diamond-drill boring to locate the seam, because the coal measures dip to the east at angles from 12 to 15 degrees in the mines already opened, consequently to start a new mine it would be necessary to locate east of the present ones, and beyond the boundary of the holdings of the Crow's Nest Pass Co. In addition to this would be the difficulty of building branch lines of railway to connect with the main line for transportation purposes.

This subject cannot be fully discussed in one article, but in the foregoing the writer has briefly attempted to outline the present conditions surrounding the fuel problem in British Columbia and afford food for thought as to what may be looked for in the future.

B. C. IN LONDON.

HEAVY FALL IN LE ROIS IN LONDON—THE SHARES WITHIN A FRACTION OF £2—YMIR REPORT AND MEETING—CANADIAN EXHIBITS TRANSFERRED FROM LONDON TO NORTHAMPTON.

(From Our Own Correspondent.)

UNDOUBTEDLY the most important development in connection with the British Columbian market in London since my last report is the sensational slump in the shares of the Le Roi, which, on the very alarming news cabled from Rossland, fell to within a small fraction of £2, a quotation never reached even in the black days which followed the collapse of the London & Globe group. The following is the official circular which brought about this bad break:

"In consideration of the fact that 24 528 tons of ore mined during the month of March were estimated to yield a profit of only \$9,950, the directors cabled to Mr. Mackenzie asking whether it would not be politic to conserve the ore reserves pending a reduction of working expenses, and his reply (dated 27th April) has been received to-day 28th April:—

"Mr. Mackenzie says that with copper and silver at present prices, and fuel and freight at present prices, the March grade of ore leaves no profit, and he has already begun to sort the ore more closely, making April grade up to \$10.50 per ton. He also reports that he is experiencing difficulty with smelting operations, and has reason to believe a considerable percentage of the copper contents are not being recovered. He is, therefore, going to clean up at the smelter to ascertain to what extent this is so. If the clean up shows losses which the difference between assay values and recovery indicate, Mr. Mackenzie strongly advises treating the ore on hand at the smelter, and then to shut down smelting works entirely until we can obtain satisfactory freight and fuel rates, and prices have risen for metals, to push ahead with developments in the lower levels, work being done by contract, and reduce expenses to the lowest possible point.

"Mr. Mackenzie further informs us that he has written fully on this subject, and advises delaying action pending the receipt of his letter and the result of the clean up at the smelter."

You will of course understand that this was a very bad blow to the British Columbia market, and quite

justified the heavy fall in the shares of the concern which has always been regarded as the premier B. C. mining company. For a very long time unpleasant statements have been in circulation as to the actual position of affairs in connection with the Le Roi, but there has of late been a subsidence of these disturbing rumours and the shares picked up a little, being in part favourably affected by the sharp recovery in Le Roi No. 2 on its satisfactory showing, and also in part by the hope that with the change in the control of the property there would be a corresponding change in the fortunes of the property. But unfortunately events have not justified those who advanced these views, and it now appears that the cables sent to the London *Financier* sometime ago, — and which were freely criticised and discredited at the time — were only too well founded. In the circumstances you can well understand the bitter disappointment which has been caused to those who had all along hoped that whatever might happen in the case of less reputable companies, the Le Roi could be relied upon to substantiate the claims which had been put forward on its behalf, both by London and Canadian mining authorities. As it may interest many of your readers to read the price history of the shares of this company since it was floated on the London market, I append same:—

	1898.	1899.	1900.	1901.	1902.
Highest.....	5 3/4	9 1/16	8 7/8	9 5/8	4 1/2
Lowest.....	5 5/16	3 3/4	4 1/4	4	2 1/8

You will see from the above that the trend of quotations has on balance been steadily downward ever since the Whitaker Wright crowd obtained control of the mine. Your opinion upon this unfortunate concern and its prospects would be welcomed by all who are unfortunate enough to be included in its proprietary.

The proposals put forward for amalgamating the Rossland Great Western and Kootenay Mining Companies, and effecting a drastic reduction in the capital accounts of the two concerns were approved at meetings of the shareholders of the two companies held to consider the scheme put forward, although by no means unanimously. And it is hardly surprising if there should be objection to such proposals, seeing that they practically cancel by a stroke of the pen a sum of about £800,000, the nominal capital of the new concern being fixed at £150,000. This will make available for the purposes of the new company working capital represented by cash in hand, book debts and unpaid calls of £35,000. The following is a statement showing the position of the respective companies as fixed by the committee who are responsible for the amalgamation scheme:—

	Assets.	Property.
Kootenay Mining Co.....	£32,800	£15,200
Rossland Great Western.....	25,300	74,700

Another feature has been the somewhat sharp fluctuations of late in the shares of the Ymir Company. A little while ago the price went well over £2. There was then a somewhat mysterious fall to about £1½, with a subsequent recovery to about £2, on its being rumoured that there was nothing to justify the decline. There has since, however, been a reaction to about £1½ again, and the report of the company recently issued was awaited with much interest. This document which deals very fully with the operations of the company for the year ended 31st December, 1901, shows that after charging against revenue £2,345 for development, and writing off £3,578 for depreciation on machinery, etc., a net profit of £45,242 remains. This added to the balance brought forward made the total

standing to the credit of profit and loss account at £86,201.

The meeting of the Ymir was held yesterday, and as you will see from the report there was nothing at all disturbing in the statements made by either the chairman or Mr. Oliver Wethered. The latter having the advantage of spending some time on the property, was able to explain the present position very clearly to the shareholders, and he spoke in the most hopeful terms of the prospects of the mine, which so far has been the only one which has steadily paid dividends to its shareholders. Of course the recent returns had caused disappointment, and this subject was referred to by both the chairman and Mr. Wethered, who also dealt fully with the cables which have been received from the manager during the last few days, indicating that only 40 stamps were running, that the water was causing difficulty, and that there was no improvement to report in the lower workings. It was pointed out by Mr. Wethered that the water difficulty was probably caused by the melting snow, and that in his opinion there was no reason whatever for apprehending any serious or permanent falling off in the returns. They had every confidence in Mr. Fowler; they had every confidence in their mine. At an extraordinary general meeting subsequently held it was decided to increase the capital by £20,000 to the total of £220,000, and thus enable the board to charge to capital account expenditure which has been so far drawn from revenue. By so doing the directors will be enabled to distribute the profits earned to the shareholders, instead of, as has hitherto been the case, putting back a very large proportion into the mine in the way of development, and also in the acquisition of plant, etc. The chairman made a very sympathetic reference to the loss the company had sustained by the unfortunate accident which had deprived them of the services of Mr. Robertson.

The shares fell sharply yesterday and were at one time as weak as £1, but they subsequently hardened a little and closed a trifle above the lowest point of the day, but are of course very materially under the figure of £2½ at which they stood only a little while ago.

Those having the advancement of Canada at heart are glad to know that the section devoted to the Dominion in the Colonial Exhibition which has been held in the Royal Exchange here, has attracted an enormous amount of interest in the city. Crowds have flocked to the Royal Exchange daily, and the magnificent specimens of minerals and metals have been minutely scrutinized. It has been one of the finest advertisements Canada has ever had, and the pity of it is that a permanent home could not be found somewhere in the city for these splendid exhibits. However, arrangements had been made to transfer the Canadian section to the Wolverhampton Exhibition, opened a few days ago, and there is no doubt that it will attract quite as much attention there as it did at Glasgow, and more recently in London. I have heard rumours of efforts being made to eventually arrange for the housing of these valuable specimens of what Canada can produce, in the City of London, but apparently nothing definite has been decided. There was some talk about a portion of them being sent to the Imperial Institute, but it is to be hoped that wiser counsels will prevail, for it can be safely said that their value as an advertising medium will be gone if they are sent there. What is wanted is some building in the heart of the metropolis where these exhibits can be on view permanently for the benefit of all interested in Canada, either as financiers, investors or prospective emigrants. To send them to South Kensington is to absolutely stultify their usefulness.

THE COUNTRY OF THE SKEENA.

By J. HERRICK MCGREGOR, P. L. S., ETC.

THE Skeena (from Scheean, the river) long solely travelled by Indian canoes, was in 1866 ascended as far as Kitsumgalum, some 45 miles above tide water, by the steamer Mumford, with supplies for the great overland telegraph line, and 15 years later so good an authority as the late Dr. Dawson gave it as his opinion that this marked the limit of possible navigation.

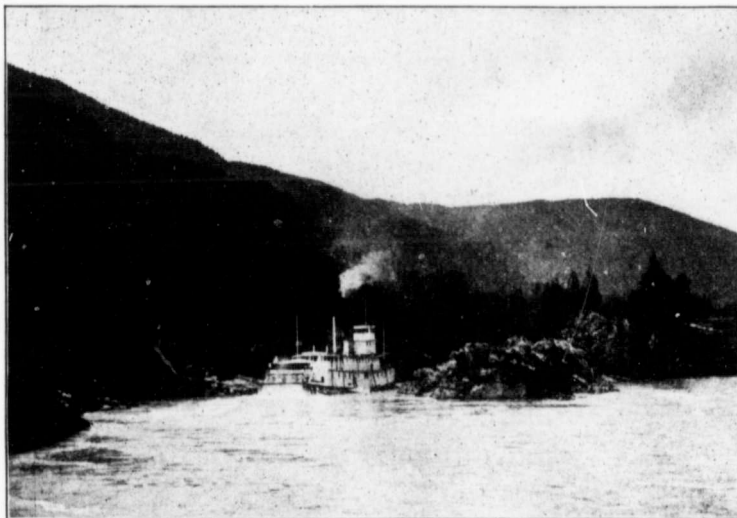
An old settler on the Skeena, however, who was on the steamer at the time, tells me that the Mumford would have had no difficulty in reaching the Forks at Hazelton, and that her reason for turning back when she did was in order to make a trip up the Stikine with wire and provisions for Telegraph creek.

At all events the navigation of the river for about 200 miles has been successfully accomplished by the Hudson

Hazelton to Port Simpson, but also beheld again a party of railroad locators working from Kitimat Arm, by way of Lakelse lake to the Skeena, and up towards the Forks under the management of Mr. J. H. Gray, who first became acquainted with the possibilities of the region on the old survey above mentioned.

About the time the Kitimat company secured their charter an attempt was made by Victoria parties, on behalf of American mining capitalists to secure 30,000 acres of land as a bonus for building a waggon road through the Kitimat and Skeena valleys to Hazelton. That they failed to obtain the required assistance was perhaps unfortunate — certainly not conducive to the rapid occupation of these valleys, as the capitalists in question had planned a very interesting scheme of colonization and mineral development.

However, since the ultimate destiny of the Skeena watershed rests entirely on its exploitation as a railway route, the delay in establishing settlers will count for little if the present charter holders are able either to



STEAMER CALEDONIA ASCENDING THE SKEENA.

Bay Co., and the Cunninghams of Port Essington, for some twelve years past, and last season saw no less than four steamers plying on her waters at one time.

About four years after the fall through of the old telegraph scheme, a considerable rush of gold seekers opened up the Omineca placer camp. Caucasian travellers were more common on the river and the vested interests of those Indian tribes who, at Kitsalus and other points, levied tribute on passing commerce, suffered a shock from which they have never recovered.

Shortly after this, preliminary surveys were carried up the river with a view to making Port Simpson the western terminus of what is now the C. P. R., and if I am not in error it was rather against Mr. Sanford Fleming's recommendations that the railway was ultimately carried through the lower latitudes and down the valleys of the Thomson and Fraser. This survey, like the preliminary operations of the telegraph company, was abandoned, fell into oblivion and appeared to have been so much waste effort. It is encouraging, therefore, to note that last summer not only saw the great telegraph line in actual operation, with a branch extension from

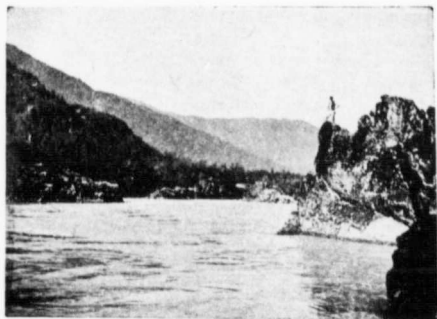
carry out construction say as far as the coal beds tributary to the Bulkley—or to make terms with the builders of that through line which alone can fully rouse to prosperity the great central portion of British Columbia.

It has been known for some years that the owners of the Canadian Northern, while gradually building in sections a railway chain from Edmonton to Port Arthur, have had the ambition to expand the results of this enterprise until they should control and operate the most northerly of roads across the continent. While this progress so far has been comparatively slow, it may be taken as owing to the fact that this speed has been regulated by the rapidity with which settlers have taken advantage of the new lines, and by agricultural development and consequent traffic assisted in placing the costs of construction directly upon the wheat and cattle-raising resources of Manitoba and the Territories.

Westward of the Rockies, however, the largest proportion of railway receipts must be looked for farther afield. An extension across British Columbia to the Pacific can for many years be made profitable only as a through carrier, and it is safe to assume that once the

ground is broken on our Provincial territory, all efforts will be directed toward a swift construction of the Coast section and an early appearance among the factors of trans-Pacific commerce.

Since it is probable that a year from now the Canada Northern will be running its own cars from Edmonton to the Great Lakes, one may reasonably expect to see railroad building commenced in B. C., at least as early as 1904 and a consequent stir of mining, farming and business enterprise along the line of construction. What direction that line will follow is matter of opinion.



THE SKEENA CANYON.

It has been recently hinted that negotiations were under way to draw the railway to Bute Inlet, where ferries would connect with a north and south line on Vancouver Island, with sea ports at Victoria and Hardy Bay. It is hard to believe, however, that anyone planning a short line to the Orient, could be drawn by negotiations, however delicate, so far out of the way as this would be.

Given Edmonton as the starting point and Japan as the ultimate goal, we are at once compelled to the most



THE LOWER SKEENA VALLEY.

northerly sea port that the political boundaries and topographical features of British Columbia will permit.

From Edmonton, lat. $53^{\circ} 30'$ some 250 miles westward brings us to the Yellowhead Pass, with about 40 miles of southing. From here down the Fraser valley 200 odd miles to Fort George, in lat. 54° , whence we may figure on about 350 miles to Kitimat harbour, in the same latitude, or to Port Simpson lat. $54^{\circ} 30'$, by the easy route of the Hazelton trail and Skeena river; or the suggested alternative of about the same distance almost due south via Bute Inlet to Vancouver Island in lat. 50° .

There is no doubt that the former roadway would be the easier and cheaper to construct, besides passing through more desirable country and giving a shipping point two days nearer to the Japan coast.

The territory thus opened would fall naturally into these sections—the Upper Fraser valley on the east—the Nechaco, Stuart lake and Upper Parsnip in the centre—and the Skeena watershed on the west.

This last contains some twenty thousand square miles being much the same in area and physical features as that portion of the Province lying between the C. P. R.



O. K. MOUNTAIN, SKEENA RIVER.

and the 49th parallel from Vancouver to the Arrow lakes, and capable of supporting as important industries and as large a population as will the district which already carries such towns as Vancouver, Rossland, Greenwood and Grand Forks. The country in question has so far been but very casually explored, its difficulty of access being such that flour is sold for \$12.00 per 50-lb. sack within a few miles from the proposed railway line and 50 miles farther north the legal price of sugar is 50



KITSALAS MOUNTAIN.

cents per cupful, with occasional agreement as to the size of the cup. In spite of such drawbacks, the general knowledge of gold-bearing gravel beds that will surely pay with reasonable freight rates, has been gradually added to, until now we know of copper deposits extending far up the main river, of large coal beds on the Kispiox and the Telkwa; of iron on the Bulkley, and of mineral veins sufficiently dispersed throughout the country to make the whole of it an attractive field for prospecting.

As yet development of mineral claims has been carried on only at points near the coast such as the copper-

sulphur mine on the Hocsall, opened up within the last year by a Victoria company, sufficiently to show an immense amount of pyritic ore whose value will be greatly increased by the proximity of a railroad with its ensuing industrial growth. About 90 miles up the Skeena from the Hocsall is Kitsalas mountain overlooking the canyon of that name where a considerable amount of mining progress has been made under very adverse circumstances.

On this mountain some 50 claims are held by various

demonstrate the strike and dip, a short adit 500 feet down the hill would probably lead to a long drift on the vein and to very economical mine working. The necessity of sticking to the ore until the peculiarities of the vein are known and tabulated makes the continuation of the shaft imperative for a considerable depth, and this is a very expensive proposition under present conditions of river traffic. Freight and passenger charges, although reasonable considering the difficulties in the way of navigation, mount up rapidly



PTARMIGAN MINE, SHOWING GALLOWS FRAME.



THE DIFFICULTIES OF MINING ON THE SKEENA—PACKING IN MACHINERY.

owners, principally located on copper, of which there are indications almost everywhere hereabouts, with an occasional quartz vein said to carry fair gold values—and others, notably the Ptarmigan, containing a high-grade ore of silver.

The Ptarmigan group, owned and operated by a New York syndicate, lies on the top of the mountain some 5,000 feet above the sea level, and about six miles from the river bank. It is reached from the canyon by a

where many men are handled. The uncertainty as to when, and how often, steamers will make the trip, necessitates the ordering of goods sometimes months before they are required, and also compels the carrying of duplicates in all sorts of tools and machinery.

The total absence of population prevents the mine operator from taking a cheerful view of cousin Jack's inclination to try a new camp, nearer civilization, after a month or two of work, as the men can only be replaced



PTARMIGAN MINE—A LATE SPRING.



DIAMOND DRILLING ON THE PTARMIGAN MINE.

good horse trail which was partially replaced last summer by three miles of waggon road. Development consists partly of a 100-foot perpendicular shaft with several crosscuts to the vein, and short drifts thereon.

This form of development is more than usually costly as the timber line is very low in this latitude and all lumber for timbering is packed up hill for nearly 1,000 feet before letting it down the shaft. Should the vein hold good for a fair depth, and interior workings fully

after week's of delay, and the loneliness of the district makes it almost impossible to keep men through a full season.

These difficulties have been partially remedied by the installation of the telegraph, but only a railroad will bring cheap freight and fares, quick delivery of goods and nearby towns to keep the miners in better humor, and to fill the vacancies left by those who feel the need of a holiday.

Westward, and on a lower level than the Ptarmigan, lie the Ormonde and Four Ace groups, both of which carry plentiful indications of copper, without sufficient development to determine probable size of ore deposits—the latter showing croppings of quartz with very pretty specimens of bornite. Westward again, the Bootjack, I. X. L. and Emma, form a group of which the Four Ace is an up-hill extension. This group is splendidly situated for operating; commencing at the river level the Emma vein strikes directly up hill, apparently entirely workable by drifts and back stoping, and free from all costs of road making and packing.

Considerable work has been done on the Emma and I. X. L., but since 1899 it has been neglected.

Free-gold quartz strikes have been reported in the valleys of Tsimnams and Kleanza, streams entering the Skeena on either side of Kitsalas mountain, and as old placer grounds have been worked on the latter it is not unlikely that one or more gold mines may eventuate.

As may be gathered from this brief description, and confirmed, if the reader wishes, by a personal tour of



THE CREW OF PACKERS AT THE PTARMIGAN.

inspection, the Skeena is to-day a roadway of great obstacles, a land of hardship, privation and immense possibilities in the near future. Apart from mineral indications which point to as rich an area as any of its size in the Province, there are farming lands whose acreage I will not venture to estimate, since that way lies controversy. Vegetables, fruits and berries, are successfully raised from Spokeshute to Babim, grazing lands are abundant and large tracts of apparently worthless soil are suitable for orchard cultivation.

For the energetic prospectors and ranchers who can look forward with equanimity to "rustling" and waiting for from two to five years for profitable results there is a very promising field. Those more gregariously and luxuriantly inclined will do well to go in later by rail and contribute to the finances of the earlier bird. And if the railroad does not materialise the early bird will come back hungry and discontented—which sometimes happens.

APPLICATIONS OF ELECTRICITY TO METALLURGY.

BY A. A. WATSON, B. SC.
(Assayer and Metallurgist, Vernon, B. C.)

ELECTRICITY has been applied to metallurgy in several ways not only in the precipitation of the precious metals from solution, but also in the reduction of aluminium from its ores and in the conden-

sation of lead fumes. At present, however, its use is chiefly confined to electro-plating and to the recovery of gold and silver from solutions in which other ores have been located. There is no doubt that the electro-plating process was the forerunner of the cyanide process and it probably led up to it. In the process of silvering the articles to be electro-plated are suspended by copper wires in an earthenware vessel containing a solution of cyanide of silver in potassium cyanide. The wires are connected with the last zinc plate of a galvanic battery, the last copper plate of the battery being connected with a series of silver plates suspended on the silvering liquid opposite the articles. The galvanic current causes the decomposition of the silver cyanide in the solution, the silver being deposited upon the articles to be plated and the cyanogen uniting again with the silver on the plates and forming a fresh quantity of silver cyanide equal to that which was decomposed. To make the silver adhere firmly the objects to be plated are sometimes dipped into a solution of nitrate of mercury before being immersed in the bath.

Electro-gilding is performed in the same way by using a solution of cyanide of gold in potassium cyanide.

A process which has been much used of late years is the Siemens-Halske process of electrical precipitation of gold from its solution in potassium cyanide. In the process of extraction of gold from its ores by potassium cyanide, the gold is usually precipitated by means of zinc, but it sometimes occurs when zinc is used that the solution is too alkaline or too acid resulting in the formation of zinc salts. The advantages of electrical preparation are:—

(1). The preparation is as good in weak solution as in strong ores.

(2). However acid the solution may be the gold precipitates. The advantage of being able to use very weak solutions is great, as not only is there a less consumption of cyanide but a weak solution, say five parts in ten thousand can be used for treating cuperiferous ores which would destroy stronger solutions. Zinc alone will not precipitate gold from a very weak solution, and the advantage of electrical precipitation in such cases is manifest. The cathode upon which the gold deposits itself is made of lead sheets fastened in light wooden frames and connected with the negative pole of a dynamo. The anodes are made of iron. The current required is about .06 ampere per square foot. With cathodes a foot and a half apart a force of seven rolls is sufficient. In the manufacture of aluminium from bauxite, an oxide of aluminium, the ore is heated in an electrical furnace. The furnace is made of fire-brick, and originally the carbons were placed in fire-brick lutes but the heat was found to be so great that they melted. The sides of the furnace were, in a later process, coated with carbon but the carbon became converted by the heat into graphite and conducted electricity so that the walls of the furnace were fused. Finally the difficulty was overcome by coating the carbon with lime which prevented the formation of graphite. The bauxite is placed in the furnace and carbon thrown over it. An iron plate is luted on over the furnace. The carbon poles are separated and an electric arc formed. The electro-motive force used is 60 volts, and the current 5,000 amperes. Many devices have been introduced for condensing the fumes which arise from the smelting of lead. An electrical method has been recently proposed in which the fumes are led from the furnace through flues, and the fine particles of metal suspended in the fumes collected by means of a discharge of high potential electricity from metal points situated in the flue. A process was patented a few years ago by Mr. Keith, of Brooklyn, U. S. A., for re-

fining lead electrolytically. In this process solutions of lead salts are used, which under the influence of an electric current dissolve lead but do not dissolve gold and silver.

Electro-chemical reactions depend upon the fact that the salts of metals are dissociated when in solution. When potassium chloride is dissolved in water what actually exists in the water is a succession of free atoms of chlorine and potassium with enormous electrical charges. Similarly when silver or gold cyanide is dissolved in potassium cyanide solution the atoms are free and the weaker the solution the more perfect the free condition. As soon as the atoms of gold or silver lose their charge of electricity, as they do when an electrical current is passed through, gold with its ordinary properties is at once produced and therefore precipitates itself in the solid form. This fact agrees with what has been found in the Siemens-Halske process. The weaker the solution the more easily is the precipitation effected because the condition of dissociation is more perfect.

THE AUDITING OF A MINING COMPANY'S ACCOUNTS.†

BY CHAS. V. JENKINS, ROSSLAND, B. C.

THE comprehensive audit of the accounts of a mining company is extremely important in its relations to the legal situation and obligations of the corporation, the personal liability of the directors, and the interests of the investing public. A consideration of the subject as affecting the professional duties and fixing the responsibility of a mining engineer engaged in the expert examination of a mine, or in charge of mining operations, is equally important, though this phase of the question is not often presented systematically.

Business customs have pretty clearly established the purposes and principles of an audit. But in the absence of statutes compelling strict periodic investigation of their financial affairs, many companies of excellent repute do not avail themselves of the advantages afforded by such an audit. On the other hand the failure of many companies to make public the true state of their affairs by means of an adequate financial audit is the frequent cause of loss to investors. The value to both parties of a systematic and thorough examination of company accounts is becoming, however, more and more generally appreciated; and it is to be hoped that this may result in suitable legislation, requiring an annual audit of the accounts and financial affairs of all private corporations, and providing for the license and registration of competent, professional accountants. Such a rule would tend to eliminate that element of fraud and the consequent danger of loss to which the stockholder is exposed, when he is forced to rely upon officials for information relative to the standing of the company in which he is interested. True, a financial audit offers no protection against the false or erroneous statements of the condition of the mine itself. Nor will it assist stockholders in penetrating the mysterious reticence or paradoxical ambiguity with which boards of directors muzzle and muffle their reports regarding the present condition and future prospects of their mines—a policy of concealment and of mystification which operates, as positively as tangible fraud, to enhance the element of speculation present, in varying degree, in all mining enterprises.

† Paper read before the American Institute of Mining Engineers, February, 1902.

But it is safe to say that in a mining venture, where risk is always expected, capital will more readily seek investment, and stockholders will more cheerfully assume risk and more willingly support any reasonable policy of a board of directors, if good faith and frankness are shown by regular and comprehensive reports and audits.

THE VALUE OF AN AUDIT.

The value of a commercial or general business audit depends upon its purpose, its minuteness of detail, the authority and responsibility of the auditor, and the scope of his instructions. The duties of an English chartered accountant, acting as an auditor, are defined and to a certain extent specified by the Companies Act of 1862, which compels an annual audit of all registered joint stock companies. The United States law has a similar provision, compelling the examination of all national banks by qualified government examiners. But so far as other corporations of private enterprise are concerned, an auditor's duty consists in performing that for which he is employed, and he is responsible to his employer only. If his appointment depends upon the good will of the company's officials, the presumption is that he will act as their agent rather than as the agent of the stockholders; or, if he be engaged to examine accounts and report upon some particular question, it is not likely that he will take it upon himself to extend his examination and report to cover more than that question. For instance, if he is asked to ascertain whether a reported reserve fund is real, or exists upon paper only, and how the said fund is invested, or to say whether in his opinion the working capital is sufficient, he would discharge his duty by a partial examination of the accounts and a report upon the one question submitted to him. But when a complete audit of the accounts of a mining company is required for the purpose of presenting to the stockholders a statement exhibiting the financial position of the company, and giving data which may possibly assist in deciding upon future operations, the auditor, if employed as the agent of the stockholders, will exhaustively examine and check all books of account and all the financial affairs of the company.

INSPECTION OF ACCOUNTS BY MINING ENGINEERS.

In examining a mining property for clients who contemplate purchase, the mining engineer often finds it necessary to make an exhaustive search through the accounts and records previously kept by the owners of the mine. This is, perhaps, most frequently the case when it is desired to ascertain the actual cost of mining at a producing mine. If such a mine has been operating sufficiently long to have established a fairly uniform cost, he may be warranted in accepting the figures given by the owners, supplemented by only a cursory expenditure of the accounts. But in cases of doubt or suspicion it may be desirable to verify the figures given. While some mining companies, in calculating the cost per ton of the ore extracted, include all expenses of dead work, development, exploration, etc., many others state as the cost of extraction work the actual expenditure for stoping and hoisting only, treating the development work, especially in shaft sinking, as a "capital" expenditure. Practice in classifying expenditures in this respect, and the arrangement of accounts relative to mine costs, is so varied that an engineer can satisfy himself only by an examination of the books, if he would know what items are included in the costs. Particularly in considering a "low-grade" proposition, where accurate data are absolutely necessary, it is an immense advantage to be able to determine in detail, by personal investigation, the actual facts.

Of course the present worth of a mine cannot be determined by the amount of its past dividends; yet, in many instances the gross earnings, as represented by the tonnage and value of ore already produced, may have a signal importance in considering the future relation of profits to operating expenses.

The value of the product of the various stopes, as shown by the record of ore sales, affords the closest possible check upon the values obtained by sampling the several ore bodies from which ore has been shipped. A determination of the tonnage and value of "ore in sight" is naturally the first consideration of the engineer. But in his judgment of the mine as an investment, the item of costs is a factor of equal importance. From no other source can he obtain such accurate detailed information relative to the costs and charges of mining as from the books and past records of the mine under examination.

THE CONDUCT OF AN AUDIT.

Since the mining business is so radically subject to local conditions, it is to be expected that the forms of records and accounts will be varied to suit each special case. And although the principles of accounting are fixed, there exists almost as great a diversity in the systems of accounts in use as in the forms and registers employed. With due appreciation of the difficulties likely to arise from this lack of uniformity, the following general suggestions are offered as to the manner of conducting a practical audit of mining accounts.

In the majority of instances, a mine is owned and operated by a corporation, the main or financial office of which is far from the mine. This makes it practically necessary to consider two sets of accounts: those conducted at the mine, which directly concern the mine management; and those belonging to the province of the secretary, which constitute the permanent financial records of the company. The mine-office accounts in full detail, together with vouchers, are usually forwarded at regular intervals to the main office, where a general audit is made, there being at the mine office but a local audit or checking of the accounts. For the present purpose, however, it may be assumed that all the records are kept and all the accounts conducted in the office at the mine.

List of Books.—In order to plan an intelligent dissection of the accounts, it is necessary to know how they are put together. At the end it will be well, first, to secure from the person in charge an explanation of the system employed, with a list and description of the books used. Indispensable, of course, to the double entry set of books usually kept at a mine, are the cash book, journal and general ledger. In addition to these and to the several subordinate record books, blotters, etc., which convenience demands, a well-regulated system of mine accounts ought to include books of ore shipments and of mining costs. The former should show in detail the lots of ore sold at the mine or shipped, identifying each lot by number, and giving date of shipment, date of payment, weights, terms of settlement, values and net returns, and also specifying the stope or heading in the mine from which the lot was mined. The costs book, in the nature of an independent or special ledger, is kept to relieve the general ledger of the burden of the many accounts necessary when accurate record is made of the costs chargeable to each separate place of working in the mine. Cost keeping is one of the most important departments of mine accounting; and the costs book, when properly conducted, is a regular monthly statement and analysis of costs, itemizing the cost of labour, material and supplies, and distributing the power and operating charges, and the

indirect or fixed and general expenses. Moreover, it is also a special ledger, containing an account with each place of working, in which are charged monthly the itemized costs as above, and from which are carried, by journal entry, the totals only of the month's expenses to a "Costs of Mining" account in the general ledger.

The general ledger is considered the principal book, being the source from which is obtained all classified information relative to the financial condition of the business. But it may be well to suggest that although this book is the receptacle for all transactions, in whatever book the entries may originate, the ledger itself is generally ignored by courts of law. The "book of original entry," legally defined as that in which the preliminary record or entry of a transaction is first written is accepted as authority on all questions involved in a transaction or in a series of transactions.

Capital Stock, Treasury Stock, Working Capital.—The capital stock comprises the full amount of the capital authorized to be raised by the charter or articles of incorporation. The treasury stock is the stock over and above the amount subscribed and paid for when the company is organized, which is set aside and held by the treasurer, to be sold for the purpose of securing funds to carry on operations. If the entire capital stock was subscribed and the whole amount paid in was absorbed in the purchase of the mine and the necessary equipment, and further capital is needed to carry on work, the stockholders may, by agreement among themselves, instead of increasing the capital stock, donate *pro rata* a certain number of shares to be held and sold by the treasurer for working capital. A working capital account is sometimes opened with a credit of a certain amount of the subscribed stock or capital, this sum being set apart for use in prosecuting the development of the mine, etc. These accounts should probably receive first attention. An examination of all entries should be made from their origin in the auxiliary books to their final posting in the general ledger. The principal books auxiliary to the general account books of a corporation are the subscription book, instalment book, transfer book and stock ledger. The stock ledger is used solely for carrying accounts with stockholders of their respective holdings in the company. All the other books mentioned are books of original entry, subsidiary to the stock ledger. Examination of these books should establish the fact that the capital stock account in the general ledger is credited with the full amount of the authorized capital, whether paid up or not. If it has not been fully paid, an open subscription account will probably be found in the ledger, exhibiting the amount of stock subscribed and not paid for. The amount issued and paid in should correspond with the aggregate holdings as shown on the stock ledger. A close scrutiny of the treasury stock account, or working capital account, if either exist, should be made, to ascertain the character of the account, and how it was created. If there is treasury stock on hand, carried as an asset, the amount should be noted.

Cash Receipts.—A complete audit involves a careful and systematic checking of each and every individual transaction during the period under audit. The opening and subsequent entries covering cash receipts for capital stock subscriptions paid, and for treasury stock sold, should be examined and checked. The records of sales of treasury stock should be critically examined, and their entries traced to their final exhibit on the books. If stock is sold at par, "Cash" will, of course, show the proper debit entry for the amount received. If disposed of at less than par, or if sold at a premium, the entries covering the balance or difference between

the amount received and the nominal or par value of the stock, as well as the cash entry, should be carefully investigated. Strictly speaking the discount on stock sold at less than par is not a loss, nor is the premium on stock sold above par a gain, of the business proper; and the amount in either case will be probably carried into the working capital rather than the profit and loss account. Frequently, however, especially if a profit has been realised on such sale, the amount is carried directly into Profit and Loss. Practice varies considerably in the conduct of accounts relating to treasury stock and working capital. But in whatever manner transactions of this nature are recorded, an audit will prove its efficiency if it determines that fictitious values are not given in the accounts representing resources, actual liabilities, expenses, or any other account affecting profit and loss account.

Practically, the only revenue of a mine is derived from the sale of its product, in whatever form (crude ore, concentrates, matte, bullion, etc.) it may be marketed. All items of cash, as shown on the cash book, should be checked; but this one principal item should be verified by comparing the receipts, as entered, with the ore shipment register, and with the settlement sheets or statements rendered by the smelter or other purchaser. Such a statement is rendered for each shipment separately by all ore purchasers, or in the case of a company smelting the ores from its own mine to crude bullion or matte, by the refinery to which this product is sold.

Cash Disbursements.—All items of cash disbursement should be checked and compared with the vouchers or proofs of payment.

If the "voucher system" is employed, and transactions are recorded by classification in a voucher journal, from which the totals of like debits and credits, instead of individual items, are posted, the work of checking and comparing the itemized expenditures will be confined to this book of first entry. The footings of this journal are then verified, and the posting of aggregate totals is regularly checked.

A critical examination of the vouchers should be made to ascertain whether the payments made were properly authorized and certified.

Pay rolls should be examined to see that they are properly and duly signed by employees, and that the totals of each are correctly entered.

The balance of cash shown by the books should agree with the amount of cash on hand and in bank, less the amount of outstanding checks not yet presented for payment.

After the purely mechanical checking of all entries in and postings from the cash book, journal, etc., and the verification of their arithmetical accuracy, the next, and essentially the most important step is to trace each entry from its inception to its final posting, with the view of detecting errors and irregularities, whether of ignorance or intentional fraud.

This critical examination is of considerable moment, particularly if the audit is made under conditions exacting a close discrimination between expenditures of capital and of revenue.

Capital.—Capital expenditure accounts are debited with all disbursements which result in the acquirement of something of permanent value.

Such entries require very careful inspection, not merely to prove clerical accuracy in recording the transactions, and the vouchers and receipts covering them, but also the legitimacy of their classification as capital expenditures. A systematic investigation of the amounts carried to capital, and of all entries of amounts expended and covered into the accounts of buildings, plants, machinery, equipment, air-pipe lines, water mains, etc.,

should afford an approximate verification of the correctness of these property accounts, and put to proof the fairness of the valuation of the several plants carried as assets.

These accounts should be also scrutinized, to see that they are duly credited with amounts written off, from time to time, for depreciation. Such amounts, taken out of income for deterioration of plant, are usually debited to profit and loss direct, but are sometimes carried by a charge to a depreciation account.

A close discrimination between expenses properly chargeable to capital and to revenue, respectively, is of vital importance; for it is apparent that if too great a portion of the expense of any year be charged against capital, then the current expense will appear smaller and the profit correspondingly greater. On the other hand, if the entire cost of plant and equipment, or of improvements, which for all practical purposes, may be considered of permanent value, is charged against the operating expense or cost of mining of any year, a true profit with respect to the ordinary working expenses and receipts may be made to appear as a loss. If the whole, or any portion of the development work of a mine for any year be charged to capital and the current operating expense be relieved of this cost, the apparent profit will be unduly increased.

In the business of mining, custom has not yet established a uniform method of treating expenditures for renewals and repairs of machinery, plant and equipment. In fact, the question of distinguishing between capital and revenue for sums expended in the original purchase, enlargements and improvements of plants is a matter of individual concern and choice. Some companies treat every expenditure for machinery and equipment as fairly chargeable to the cost of mining for the year during which the purchase was made. Practically this method was said to be correct; since the sums so expended are part of the expense of mining, and must eventually be repaid by the revenue derived from the sale of the mine's product. Other companies are too prone to treat as capital not only the original purchase price, but all sums expended for improvements, and for renewals and repairs as well. And some companies do while others do not, make provision for depreciation. In any event, an examination of the accounts should prove that the aggregate amount appearing in capital accounts as expended for machinery, equipment, etc., is represented by plant of that value, maintained in efficient repair.

As stated, an approximate verification of these amounts can be arrived at by tracing from their source all entries for items so charged. For example, in case a mining plant is purchased and erected under contract it is easy to determine its original value by reference to the contract. The erection of plants, the installing of machinery, etc., when done by a company by day's labour, involve a careful consideration of the cost of labour, as well as of material and supplies.

It must be confessed that the wages account is the most difficult of all to check effectually, especially in trying to distinguish between capital and revenue expenditures, when mining operations and construction are carried on simultaneously, and more especially when a company has no system of keeping and correctly recording amounts expended for wages. Where such a system exists, and where the records of one department are examined and checked by another and independent department, it will not be so troublesome to arrive at a comparatively accurate proving of the correctness of all wages charged to capital.

Revenue.—In a mining enterprise of any magnitude the debit side of this account represents the expenditure

of considerable money. An audit to determine the actual amount, and the correctness of the entries, of expenditure of revenue must be very comprehensive.

The vouchers and receipts, in addition to the checking on the cash book, must be critically inspected, and the classification and distribution of the expense represented by each voucher must be verified.

Mining supplies purchased are charged to revenue when used, not necessarily when paid for. This requires an exhaustive investigation into the nature and conduct of the stores accounts, and a complete checking of these accounts, to make sure that all supplies taken from stores are properly charged, when credited to the stores account. The entries covering these transactions should be gone into pretty thoroughly. The prices charged for supplies consumed should be compared with the purchase price and the cost as stated in inventory. An inventory ought to be taken of all material and supplies on hand, the values being compared with the purchase prices, and the total with the aggregate of the various stores accounts on the books.

Wages, salaries, and all fixed and general expenses, such as taxes, insurance, etc., are direct cash disbursements. All these items, with the possible exception of wages, can be effectually tested by comparing with the vouchers, and by reference when necessary, to the authority for the payment. As for instance, the correctness of salaries paid could be ascertained from the directors who had the fixing of salaries; taxes, by comparing the payments with the demands of the government, etc.

In the matter of wages it is impracticable to verify all the items on the pay rolls which go to make up the aggregate expenditure of labour. The distribution and legitimate "expensing" of the cost of labour can be fairly tested as explained; but an auditor may be obliged to rely to a considerable extent upon the system of interstaff corroboration referred to above, and upon the certificate of an official in authority, as to the veracity of the various pay rolls.

If all accounts representing the operating, fixed and general expense of the business are carried into one account, "Costs of Mining," at regular intervals, a comparison of the entries in this account with the mining costs book will facilitate a verification of the aggregate expenditure chargeable to revenue.

Personal Accounts.—Personal accounts, accounts and bills receivable, and accounts and bills payable, should be examined carefully. In the business of mining, accounts of this nature are not frequent, and liability of loss from bad debts or doubtful accounts is limited. Such accounts, and the contingency of such loss, however should be considered. The amount of accounts due and bills payable, as shown on the books, should be verified and taken into calculation in determining the gains or losses for the period under audit.

The task of checking and verifying all book transactions being completed, the footings of all accounts in the ledger, whether closed or still operative, should be tested, balances verified, and a trial balance taken. This trial balance proving the correctness of the ledger, it is now in order to prepare a statement of assets and liabilities, and a statement of profit and loss.

The financial condition of the company should be very clearly set forth in this financial statement, the balance sheet exhibiting:

PROPERTY AND ASSETS.

1. *Property*, showing mines and mineral claims, and other real property.

CAPITAL AND LIABILITIES.

1. *Capital Stock*, showing in detail the number of shares; amount paid up; amount, if any, remaining unpaid; amount and nature of arrear of calls, particulars of forfeited shares, etc.

2. *Improvements*, showing buildings, machinery, plants, equipment, etc.; also stores and supplies on hand.

3. *Cash and Investments*, showing amount of cash on hand and in bank, the nature of investments, rates of interest, etc.

4. *Debts Owing to the Co'y.*, showing all debts, accounts and bills receivable.

2. *Debts and Liabilities* of the company, showing the amount of debts owed by the company, enumerating the same, and distinguishing actual from contingent liabilities, etc. These contingent liabilities, such as claims against the company not acknowledged as debts, or moneys for which the company is contingently liable, should be stated; but only the amount of acknowledged debt is carried out as a liability.

3. *Reserve Fund*, showing the amount set aside from profits to meet contingencies.

4. *Profit and Loss*, showing the disposable balance for payment of dividends, etc.

The statement of profit and loss should state specifically upon what accounts losses have been sustained, and detail the accounts through which profits have been realised. In calculating the gains and losses, it must be borne in mind that the loss or gain of a mining venture for any given period is not merely the difference between the receipts for ores sold and the cost of mining. Depreciation must always be taken into consideration.

REDEMPTION OF CAPITAL.

In connection with an audit it is essential that the questions of depreciation, dividends, surplus and redemption of capital be taken into account. Most industrial enterprises involve the same elementary principles. But there are considerations in mining which do not affect other kinds of business.

A mine cannot be said to be a permanent source of wealth. Every ton of ore mined and marketed involves a depreciation in the value of the property which cannot be repaired. Hence, during the life of a mine, not only must interest be realised upon the capital invested, but the capital itself must be recovered, if the venture is to prove successful. In this respect depreciation and dividends may be considered as different causes operating to the same end, namely, the diminution of the value of the property.

Depreciation.—Generally speaking the loss upon assets which are diminishing in value is called depreciation. As applied to plants, equipment, mining machinery, etc. (provided the original cost of these items is not treated as a portion of the current operating expense, and so charged at time of purchase), a certain sum, estimated upon the life of the plant, should be charged against the gross revenue of each year, to replace the capital destroyed or reduced by wear and tear. The method of treating sums expended for plant as current expense is manifestly unfair, both to the management desirous of making a record in the matter of mine costs and to the present stockholders; for in the early stages of a mine, when most of the equipment is purchased, costs will be exaggerated, and dividends which might otherwise be paid may be deferred, by reason of this abnormal increase in the current expense account. But since the life of mining machinery is comparatively short, and there is practically no residual value, in case the mine is abandoned as worked out, or the machinery has to be replaced by a plant of greater capacity, it is not only prudent but absolutely necessary that some provision be made to redeem its cost.

Depreciation as applied to the redemption of the capital invested in a mine, provides for the writing off of a certain sum each year, estimated upon the life of a mine, to accumulate a sinking fund for this purpose.

In the business of mining, however, much may be said in favour of some method of accumulating a sinking fund, such a fund is seldom, if ever, provided for. The individual stockholder usually thinks that he would prefer to have his capital returned to him as fast as it can be taken from the mine, rather than await the accumulation of a fund sufficient to redeem the whole capital. To this end the custom prevails, and will probably be considered the better method, so far as mining is concerned, of repaying capital by dividends. By means of dividends, or as they might properly be called, enlarged dividends, the stockholder, after calculating a fair interest on his investment, can consider the sums received over and above this interest as repayments of the principal of his investment.

This method may be subject to some question, since there are few (except those who have given special thought to the matter) who properly appreciate the difference between a dividend, which is purely a distribution of profits and a dividend which is to repay capital. Then there is the contingency to face: in the case of a successful mining enterprise it may transpire that the full amount of the company's capital is carried as a liability, when in fact it has all been repaid in the shape of dividends; while on the other side of the balance sheet the mine, valued at its original cost and worth, is still shown.

The amount paid in dividends in this way each year may be estimated, or rather will depend, upon the amount of output and the profit realised on the sale of product.

Dividends.—The term dividend as generally accepted, means a sum which a corporation sets aside from its profits to be divided among its members. It is a fundamental rule that dividends shall not be declared or paid when a company is insolvent, or the payment of which renders a company insolvent. A dividend must be declared from realised, and not from estimated, profits. The violation of this rule is not common. But it too frequently happens that when profit does not follow on the heels of promise the directors of a company, anxious to appease the importunity of stockholders, are led to ignore one of the most important precepts of financial prudence. Under this constraint they declare and pay dividends without first having provided a surplus or reserve fund; that is, a special fund of profits set aside for the purpose of meeting contingencies, or of equalizing dividends.

Reserve Fund.—If such a fund, set apart from current income, or created by withholding a small percentage of the annual net earnings, is shown upon the books, this account should be examined by the auditor, and its accuracy should be tested. The amount should be held either in actual cash on hand, or on special deposit in bank, or invested in safe and readily convertible securities. A reserve fund once established should be drawn upon only in case of urgent necessity, or to meet exceptional and temporary reverses in profits.

The history of the mining industry is replete with records of companies wrecked by adverse circumstances, by reason of the lack of means with which to carry exploration to a probable successful issue,—means which might have been provided at a time when the mine was earning regular profits. But with working capital exhausted; stockholders reluctant to pay assessments or to render themselves personally liable for borrowed capital; the ore reserves of the mine worked up to their limit, and no reserve fund to meet the exigency, the mine is abandoned. And thus is recorded another mining failure which a little forethought and business prudence might have averted.

Again, it may occur that a mine in the full flush of prosperity is compelled to discontinue dividends for a period. There would be fewer disappointed stockholders in this respect, if the policy of providing a surplus were rigidly insisted upon. Regular dividends could be continued, and the most distressing period in the affairs of a mining company could be safely tided over if, during its most profitable period, provision had been made for such a crisis.

GENERAL REMARKS.

As has been observed, and will no doubt be confirmed by the experience of most mining engineers, there is a noticeable lack of uniformity in the systems of keeping mine accounts. Such irregularity in the matter of registering and recording the routine of business details at the mine may be attributed to arbitrary local conditions. But the absence of uniform system in the more important departments of accounting, especially in the treatment of expenditures and in respect to mine costs, must be ascribed, in part at least, to the scarcity of practical literature on the subject, and to the lack of active discussion of the questions involved by those most vitally interested. In all other important productive industries, a considerable degree of conformity, not only in general system, but in details of shop organization, cost keeping, etc., has been established. This uniformity obtains to a greater or less extent, even in manufacturing and mercantile pursuits, where processes and mechanical methods, locality, competition, and other conflicting influences, affect trade conditions.

It is not intended to insist pedantically upon similarity of forms, methods and like details, nor is it deemed necessary, on the other hand, to formulate the reasons for a general uniform practice with respect to mine accounts; but it may not be amiss to offer the opinion that in no other way can uniformity be secured except by concerted effort on the part of those who are actively interested in all that pertains to the economy of modern mining.

If, in connections with the many discussions relevant to the science and practice of mining, the business side of the question could receive the attention it deserves; if the interchange of ideas and opinions by those whose authority and interest are unquestioned were more frequent and general, reforms in this direction could be induced. By urging the adoption of a few conservative rules and principles of business which would tend to safeguard the commercial interests of mining, and by pressing the importance of a practicable uniformity in system and method, the engineering profession could increase the credit which it has already earned by what it has done to advance the business of mining from the plane of mere speculative gambling to its present high rank among the prosperous productive industries.

THE PRESENT POSITION AND THE POTENTIALITIES OF MINING IN THE DRY-ORE BELT OF THE SLOCAN DISTRICT.

By W. D. MCGREGOR.

THE so-called Dry-Ore Belt of the Slocan, may be roughly described as the area of granite and granitic rock lying south and southwest of the Sandon slates; extending from the West Fork of Carpenter creek to Slocan lake and river. This area is chiefly contained in Slocan City Mining Division, but extends into the Slocan, Ainsworth and Nelson divisions as well.

With respect to the term "dry ore," all ores containing the precious metals are primarily divided into the two great classes of milling or smelting ores. The milling ores are either free-milling or refractory, often the ore from a vein being partly one and partly the other. The smelting ores are divided, first with respect to their contents of copper or lead which, in the furnace, serves to collect the precious metals. In this district we may leave the copper ores out of the question, and we have left the two grades of lead smelting ores "wet" and "dry." In smelting the charge for the furnace has to be made carrying fixed proportions of acid and basic mineral, lead, iron, etc., in order to melt quickly and that the slag may be of the right quantity and quality to leave the rich lead, or the lead containing the gold and silver free from impurity. Now if this calls for, say 10 per cent. of lead in the ore charge, all ores containing this percentage or more of lead are wet, while those containing less or none are classed as dry ores.

Now, it happens that the great bulk of the smelting ores produced in this part of West Kootenay are wet ores, running 40, 50 to 60 per cent. and more of lead, and in order to smelt these it is necessary to add a sufficient quantity of iron ore, limestone, quartz, etc., to reduce the percentage of the lead and properly balance the charge for the furnace. Of course if dry ore comes in, in sufficient quantity, the smelter has no trouble but in West Kootenay the output has always been very one-sided, and this has led to the smelters offering better terms for the necessary dry ores for fluxing. The ordinary run of lead ores to the smelters calling for some three tons of dry to one of wet ore while the production has been the other way about, has led to the reduction of the charge for freight and treatment from \$15 to \$10 and from \$10 to \$8 and even lower per ton, and we look for a still further reduction as it will pay the smelters to make them.

This has stimulated the production of the dry ores and we find that there has been a continually increasing output during the past year or more. Slocan City Mining Division showing an increase to 6,500 tons last year from 2,800 in 1900, all in round numbers. This, it must be remembered is practically all high-grade ore, hand sorted from the rich paystreaks in the vein, and having behind for future attention, or as waste, all low-grade ore.

The development work undertaken and the increased interest in prospecting have materially increased our knowledge of the vein and ore occurrence in this camp, particularly of the series of wide veins on Springer creek.

This section came into prominence in '96. The first discoveries were made in '94 and '95 and reports of astonishingly rich finds were confirmed by shipments of ore running \$100 a ton and better from several of the prospects, notably the Arlington, the Exchange and the Two Friends, the last a lead or wet ore proposition, for not all the ore in the dry-ore belt is dry by any means. Then high gold values were found on Lemon creek, and the boom was on. Prospects of all kinds fell into all kinds of hands and, as on most of the veins, some spots can be found that will give assay returns, it was very easy for the inexperienced prospector or purchaser to deceive himself and others. The mining men that came in to look the field over found prices and terms so hard that they would not meddle. Amateurs took hold, however, right and left, and in the spring of '97 the boom broke. Properties that had been bonded for big figures came back to the prospectors. Everyone found out that the veins were by no means all ore. Some met with faults and thought they had arrived at the end of the vein. Development was more expensive than

had been expected and generally it was found that making a prospect pay for its own development and incidentally furnish funds to meet payments on a big bond is an uncommon thing to do.

The natural reaction held the camp back till 1900, when the development of the Arlington and the Hewet showed that profitable mining of the dry ores was at least a possibility.

The mountain formation here is very irregular though the main trend is north and south, we find the principal series of veins coinciding with this. The general strike being a trifle east of north, though there is a secondary series crossing the other nearly at right angles. These are smaller veins and it would seem somewhat less erratic in ore production than the first series.

The question that comes to every manager and mining engineer, responsible for results in mining—"What plan shall I follow to get the greatest yield and the most gross profit for the owners?"—has by no means been settled for these deposits and indeed the problem varies, not only with every vein but with different parts of the same vein. The mines that are working generally content themselves with stoping out the ore bodies encountered in development, sorting the ore by hand so that none (theoretically) below a certain grade gets into the shipping bin. This method has proved a commercial success, but there is no doubt but that it is wasteful and expensive. Wasteful because all the ore below a certain grade, and quite a percentage of that above, is lost or left to be rehandled at some future time. Expensive because it all has to be handled with such care and in such small quantities, the highest grade sacked, etc., bringing the tonnage cost of the ore to a fancy figure.

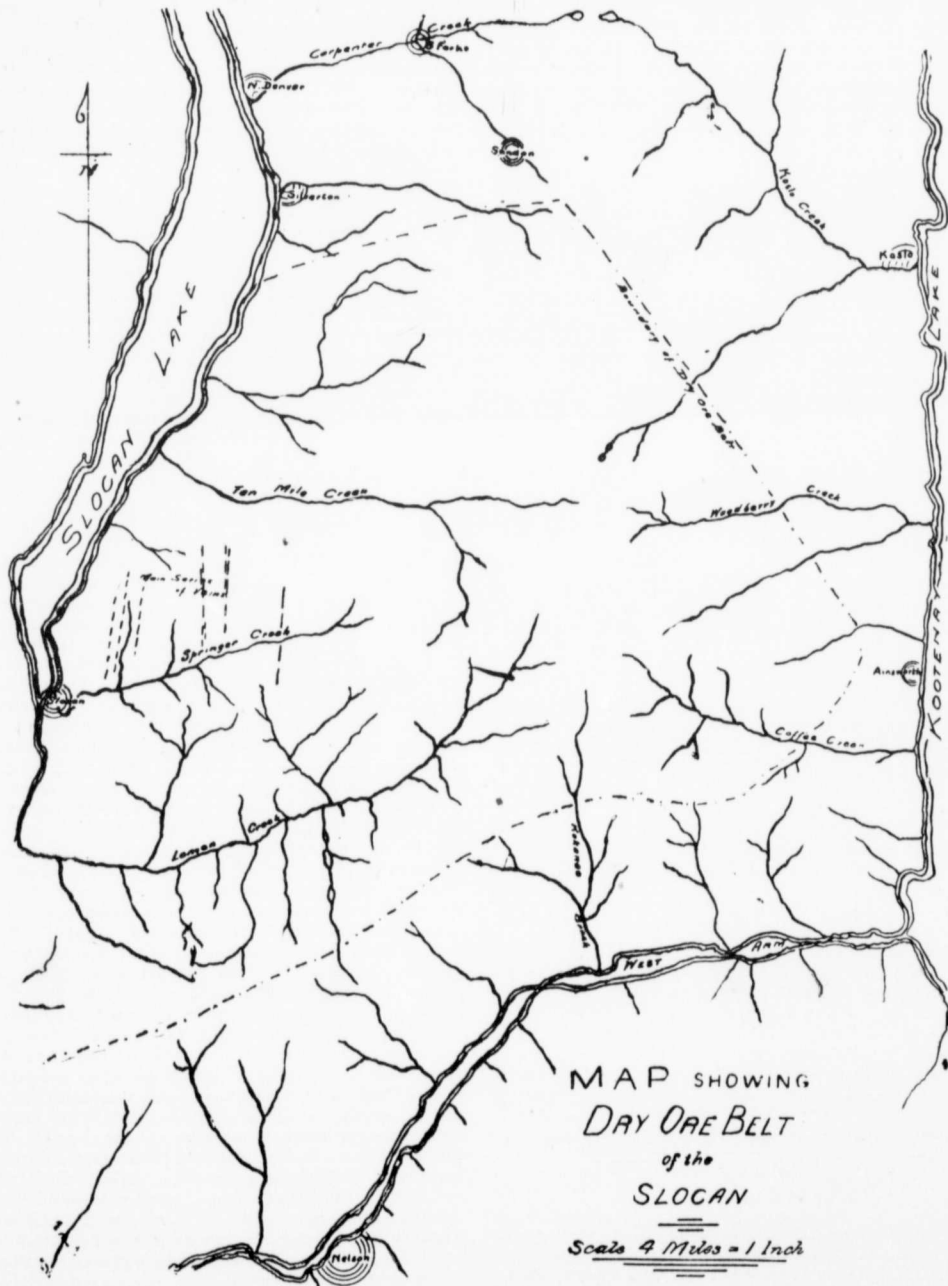
Now the suggestion has frequently been made that we should stope out the contents of these veins clean, and figures have been given showing a good margin of profit on the undertaking, provided that the cost of shipment and treatment were brought down to a point that is quite possible. I quite agree that it is too bad to rob a mine by extracting its rich streaks of ore, but it would surely be a worse policy to use the surplus in the valuable portions of the vein in taking out and treating those portions which are either barren or of a grade so low that there is no present method of treating them at a profit. This is a condition that any investor should understand, and it is to the disappointment of those who started work on ore believing that it would be continuous to the centre of the earth that most of our so-called failures were owing, and I think that without exception where work has been prosecuted on the vein, other ore bodies have been encountered. Now if the ore body is properly located in development and a sufficient quantity encountered to warrant taking it out on a big scale (and that we have such bodies there is practically no doubt), how can we treat it so that \$5 ore will pay to mine? Well, in some cases, no doubt oil concentration will solve the problem, but for most of the Springer creek mines local smelting is the best. A smelter at Slocan should make a profit on 400 tons of this dry ore per diem at \$3.00 in conjunction with the market rate on 100 tons of galena which is at hand, and a tram line up the creek, handling timber and supplies up, and ore down, would naturally be operated with it. The site, water-power, etc., lends itself to very economical operation and there will be no difficulty in establishing the undertaking, when once the mines show ore reserves to warrant it.

The cost of opening and determining the ore contents of one of these veins for, say, 500 by 1,000 feet would be from \$40,000 to \$60,000, less of course the net returns of the high-grade ore produced from the develop-

ment work. This should show tonnage sufficient to warrant the erection of an aerial tramway to the smelter or to the trunk line, and a heavy investment in the smelter project itself.

the ore runs to the two extremes, it is either high grade or practically valueless; the retail method, if one may use such a term, is the only practicable one.

The matter may be made clearer by a little study of

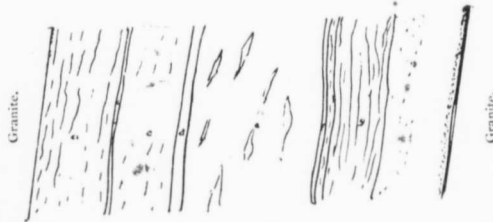


At least two strong companies will be working on some such lines this summer and probably more. Of course, in many of the small veins and in those where

the drawings of typical vein sections. No. 1 gives practically 14 ozs. silver throughout and if the average holds could be worked on a large scale, say, taking out

200 tons per diem at a profit of \$1.50, or thereabouts, per ton. This would be increased by leaving *c* in the stopes, provided it could be done without too much expense in separating it from its neighbours. If the paystreak alone is worked the yield of the mine would be about 10 per cent. of the whole. The cost of development and mining practically the same. An addition of \$6.00 to \$10.00 per ton for sacking and sorting but only freight and treatment on 1-56 of the vein. Of course no cheap method of handling could be put in for such a small quantity, which would make these charges, say,

SECTION OF 14-FOOT VEIN.



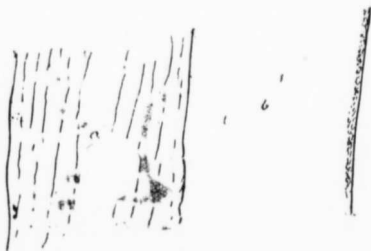
Cut No. 1.

- a. Gangue, 2 1-2 feet, intermixed with quartz stringers, assays 16 ozs.
- b. Three-inch streak, assays 22 ozs.
- c. Two feet almost barren gangue, assays 2 ozs.
- d. Six-inch streak, assays 40 ozs.
- e. Gangue, 4 1-2 feet, assays 10 ozs.
- f. 1 1-2 inch streak, assays 30 ozs.
- g. Gangue, 1 1-2 feet, assays 4 ozs.
- h. Quartz, 2 1-2 feet, assays 16 ozs. with 3-inch paystreak on footwall assaying 80 ozs., average sample across vein 14 ozs.

\$15.00 instead of \$4.00 which we have allowed in the other case — altogether an expense of \$30.00 to \$35.00 in handling three inches of ore — leaving a profit of something less than \$10.00 a ton on one ton, while the other and safer method would give 1.50 on 56 tons or \$84.00 to the former \$10.00. A difference which would warrant extensive equipment in order that it might be brought about.

Cut No. 2 shows the section of a vein four feet in width, low grade throughout, with the exception of a

SECTION OF 4-FOOT VEIN.



Cut No. 2.

- a. Twenty-four inches soft gangue highly mineralized, assay 15 ozs. silver.
- b. Twenty-two inches massive quartz, assay 8 ozs. silver, with two-inch average paystreak assay 300 ozs. Average return from whole vein 24 ozs.

very rich paystreak on the footwall, averaging two inches of 300-oz. ore. In this case we see that 1-24 of the vein would give us \$150.00 per ton at a cost of about \$45.00 or a net profit of \$105.00 from that portion of the vein. If, however, we work the whole vein at a cost of \$6.00 per ton, while losing on *b*, we would save 576 ozs. or \$288.00 at a cost of \$144.00 or a net return

of \$144.00, being \$39.00 more than the first method from the same extent of vein.

On the other hand, were *a* to drop in value to 8 ozs. the same as *b*, it would reduce the value of the whole product by 3½ ozs. or \$1.75 per ton, making \$42.00 on our unit of 24 tons giving net returns in this case of \$102.00 or \$3.00 less than from the paystreak alone.

With factors such as these, and these constantly varying and with others, such as the fact that *a*, in cut 2, is very much easier worked than *b* so that in fact the whole contents of the vein can be delivered at the mouth of the tunnel for less than *b* alone, I think I have made my point clear, that in opening these veins we should develop on large enough scale to have at least a reasonable idea of what ore is in the first division of the mine before we undertake the taking of it out. It is not a very costly undertaking, about \$10.00 a foot all around for development work and the necessary office and engineering expenses. Then as fast as the ore is cut and recorded you know where you are and the contents, being silver, are not apt to decrease from the present price. Then if you have 100,000 tons of ore cut and can save \$1.00 a ton by putting in a wire tramway, or \$3.00 a ton by the erection of a smelter — well and good, but cut the ore first.

I see that I have wandered from my subject, but the district has suffered so much from haphazard methods that I may be excused my little lecture on the subject.

The work done during the past year has been chiefly near the south end of Slocan lake, on various creeks running westward, but some very efficient development has been done on the North Fork and at the head waters of Lemon creek. Here we find a very marked increase in gold values, and more or less extensive bodies of milling ores, and we also find several prospects that are being opened slowly by the help of working out and selling the rich ore encountered. There is no doubt that the district is a difficult one to operate in and a strong sense of this will hurt no one who is responsible for the development of any of our prospects. The ore while often rich, sometimes very rich, is of most irregular occurrence. The values being sometimes scattered through the gangue, making the whole vein filling a low-grade ore, sometimes concentrated into a fabulously rich paystreak and again fading into nothing, to reappear farther on.

It is now proved that some of these deposits can be worked profitably by hand sorting. It is also shown to be very probable that there are large enough amounts of low-grade ore to warrant a heavy investment, to install the best possible system of treatment. There will be several companies with ample capital developing on these large veins this season and it is quite possible that work enough may be done to justify the settlement of the treatment question on a comprehensive scale, within the next twelve or eighteen months.

The present season is bound to be a busy one and is quite likely to prove the crisis in the development of the belt. There is much interest being manifested in the district which, as it should be, calls for special care on the part of those who are interested in it. The greatest danger is from careless investment and management. From the cocksure superintendent, who makes a mine fit his pet theory, gathered in ———, "Good Lord deliver us." The exploiter of course is bound to be with us; not an unmixed blessing, but we know him of old. Over-capitalization is as fatal here as elsewhere, and will no doubt ruin some of our best properties. Of course many of the prospects are going to be disappointing; much exploratory work will yield nothing but further knowledge of the country, but there is no doubt that active, conservative management, back-

ed by sufficient capital can reasonably expect satisfactory and highly profitable results.

There were some 18 properties that shipped dry ore from this belt last year, and present indications are that at least twice that number will figure in the returns for 1902.

To summarize:—The dry ore properties are very promising, with rich but tricky ore and with a total loss under present circumstances of all their low-grade ore, yielding in 1901 some \$500,000 gross. Generally speaking, conditions for mining—water, timber, power, etc., are excellent. Most of the mines and prospects are tunnel propositions and ground is seldom hard to work.

The improvement has been marked and steady for the last year or more and while it takes money, time and good management, to make a mine here as elsewhere, the possibilities are brilliant and the probabilities not far behind.

It will be remarked that in the estimates of returns, etc., the ounce of silver is calculated at 50 cents, and on the other hand no allowance is made for the 5 per cent. deduction which the smelter makes on silver values nor for the other small losses which always occur. The results at the present price of silver are quite as clear to the actual returns as a more elaborate method.

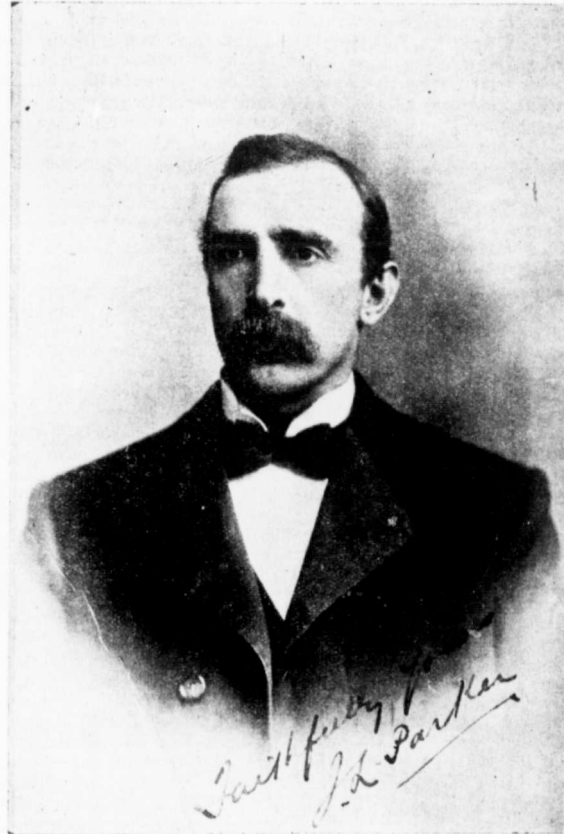
MINING MEN OF THE PROVINCE.

THE subject of our sketch this month, Mr.

J. L. Parker, who recently assumed the management of the North Star mine, at Kimberley, East Kootenay, is a Scotsman by birth, he having been born in Stirling some forty years ago. He was educated at the High school, Dundee, and at Kingswood College, Bath, and later took a final course at Yorkshire College, Leeds, obtaining a certificate in mining, and winning a prize for practical geology. After securing certificates in applied mechanics and machine drawing from the South Kensington science and art department, he became articled to Mr. Hercules Warmald, a mining engineer who had then the supervision of the Earl of Dartmouth's Yorkshire mining estates. Having served five years in the capacity of articled pupil Mr. Parker was appointed assistant to Mr. Warmald, and shortly afterwards received his first important en-

gagement, as mining engineer and surveyor, at the North Staffordshire mines, owned by Mr. W. J. Craig, M.P., one of the foremost mining engineers and mine owners of Great Britain. At the age of 23 he took first place in the Colliery Managers' Examination, at Newcastle-under-Tyne, and was immediately appointed underground manager at Mr. Craig's mines, which position he held for five years. Meanwhile he was offered the post of assistant mine inspector to Her Majesty's government, which appointment, however, he declined. Mr. Parker came to America in 1888 and from that date to 1896 he occupied several important positions in mines

in Alabama, California, Washington and Oregon. He afterwards mined in Butte, Montana, and again later was in charge of No. 3 shaft of the coal mines at Lethbridge, N.W.T. In 1896 Mr. Parker settled in Rossland and in the autumn of 1899 was appointed superintendent at the North Star mine. He resigned this post the following spring to accept an engagement with Messrs. Mackenzie & Mann as mining engineer, with headquarters at Port Arthur, Ontario. From December, 1900, to December, 1901, he was in charge of the Dominion Copper Company's mines at Phoenix, B. C., in whose undertakings Messrs. Mackenzie & Mann are largely interested, as they are also in the North Star Company, to the management of which Mr. Parker was appointed some two months ago. Previously to that, however, Mr. Parker engaged for a short time in private practice at the city of Spokane, Washington, U.S.A. The North



MR. J. L. PARKER, M.E.

Star mine, which is now under Mr. Parker's capable management, has already paid large dividends.

OPERATION OF THE "HOLE-CONTRACT" SYSTEM IN THE CENTRE STAR AND WAR EAGLE MINES.†

BY CARL H. DAVIS, ROSSLAND, B. C.

MR. FRANK H. PROBERT, A.R.S.M., Morenci, Arizona (communication to the secretary):—The management of mines and the system of book-keeping employed, are subjects of great interest to mine

† Trans. A.I.M.E., Discussion on Mr. Davis' paper which was published in our issue of August, 1901.

superintendents, and such papers as that of Mr. Davis cannot fail to attract attention. The Institution of Mining and Metallurgy, London, Eng., has done much within the last three years to promote discussion on the many systems adopted throughout the mining world; and any papers giving individual experience will benefit that class of men who are charged with the economical management of mining properties. It is often said that a "good mine shows a good manager," and more often that mismanagement is the chief cause for poor returns; or, as Mr. A. G. Charleton puts it, in his able paper on "Mining Accounts and Cost Sheets,"[†] "accident may, and often does, electro-plate incompetency and gild 'brass,' a good man in charge of an unpayable property being seriously handicapped in competition with the inferior management of a richer 'bal.'" To a certain extent this is true; but admitting that the most successful superintendent cannot make a mine in the absence of ore, there have been a great many mines closed by reason of defective management. If there were more literature at the disposal of the inexperienced, more men willing to give their experience to the younger members of the profession, I think a great many mistakes of this kind could be avoided.

I have had considerable experience in setting contracts in all classes of rock, and have tried paying per ton of ore sent to the chutes, per ton of rock broken, per cubic yard stoped, and per linear foot of advance in headings; also, the "hole-contract" system. In every case I have found that contracts set on the amount of ground broken in stopes and the linear foot of advance in headings have been most satisfactory, both to the contractors and to the company.

In the mines of Meiseberg and Pfaffenberg, Neudorf, Germany, I gave the "hole" system a thorough trial, but was obliged to return to the more common practice of measuring. In following lodes, or in stoping blocks of ore, the rock varies considerably within a short space according to the quantity of the mineral present and the character of the gangue. These things may be in favor of the contractor or against him, and differences between master and man are bound to occur. A rock very difficult to drill may break well when the hole is completed. By the "hole" system this would go against the contractor; but if paid according to the amount of rock excavated, it might be to his advantage. If the rock is homogenous, the "hole-contract" system works well; but in any case it necessitates a great amount of work and most careful supervision on the part of the shift bosses, who have to indicate the position, approximate depth and direction of the hole to be drilled, measure it, and keep a daily record of the work done. Moreover, where a foreman is responsible for the placing of all holes, the contractor becomes merely a tool in his hands, and his own powers of observation are discouraged. Men who are continually working in one place must become familiar with the nature of the rock, and in my opinion, are far better able to judge where a hole has to be drilled to bring down a certain piece of rock than a foreman who has so much other work to occupy his mind. Anything which encourages close observation and thought on the part of a miner makes him a better workman, by giving him confidence in himself and interest in his task.

Unless there are a number of shift bosses, much time must be wasted by the contractors in waiting for their holes to be marked before commencing work, and to be measured afterwards. If the mines are extensive, it will take a man an hour or two to complete his round of inspection, which must necessitate not only a long wait

for some of the miners, but hurried work on the part of the foreman; and then if the holes are not well placed, or not bored to the proper depth, the contractor has to suffer. Mr. Davis says that if, in a heading, the round of holes is finished before the end of a shift, the difficulty is got over by having spare headings, in which the men can utilise their extra time. Surely the time lost in taking down the machines, erecting others in the spare headings, transferring tools, etc., must go hard with the contractor. But if, on the other hand, the round of holes is not completed within the shift, that shift is lost to the company, as blasting is only done within certain hours; and it is no use to fire holes that are not deep enough, or to fire some of the round and leave others standing.

Again, it is stated that in headings, after the contractors have become familiar with the ground, little direction on the part of the shift boss is needed, the work being practically the same each day. In the event of the foreman discovering a hole which he considered misplaced, who is to blame? — the contractor, or the foreman who, according to the terms of the agreement, has to indicate the position, depth and direction of the holes? These difficulties must arise occasionally; and trouble may ensue.

QUADRUPLE GATE SYSTEM OF MINE VENTILATION.

THE illustration herewith produced on the following page shows the essential features of a system of mine ventilation devised and introduced by Messrs. Harron, Rickard & McCone, of San Francisco, California, some six or eight years ago, and which in operation has been very efficient. This system, which has been adopted for the ventilation of the Key West mine, Mount Sicker district, enables the engineer to drive fresh air into the mine or draw the smoke out by simply manipulating the gates and without stopping the fan, as may be signalled from below. In the cut it will be noted that the blast gates are numbered, and that gates Nos. 2 and 4 are open, and Nos. 1 and 3 are closed, which is the position of the gates when driving air into the mine. By closing Nos. 2 and 4 and opening Nos. 1 and 3, the fan will exhaust or draw the air out. All mine operators will appreciate the importance of drawing the smoke out of the shaft or drift as soon as the blast is fired, and not to blow the smoke out through the shaft and thus distribute the foul air through the entire working. After the foul air has been drawn out, the air current can be reversed and the pure air forced to the point where it is mostly required. Detailed information may be had from the manufacturers, 21 and 23 Fremont street, San Francisco, Cal.

THE PRODUCTION OF COPPER IN THE BOUNDARY DISTRICT, B. C.†

BY DR. ALBERT R. LEDOUX, NEW YORK.

WHILE the general public receives impression of mining as an industry from reports of rich strikes and phenomenal yields, it is probably safe to assert that the industry itself depends upon the low-grade mines. As a rule the rich veins are narrow and uncertain, and railroads looking to permanent returns hesitate to build into a region of "one-man" fissures or

[†] Trans. Inst. of Min. and Metallurgy, vol. v, page 245.

[†] From a paper read before the Canadian Mining Institute.

rich pocket deposits, but hesitate less to invest large sums for construction in districts where large ore bodies promise some degree of permanence from their size alone, even if low in assay.

It may be stated in the outset that so far as my observation goes the mines of the Boundary Creek district belong to the latter class. The ores are very low grade but the ore bodies large, if irregular. Nature has compensated to a great extent for the grade of the copper ore by making it self-fluxing, so that probably nowhere on this continent can smelting be carried on more cheaply, given fair railroad rates and fuel at a reasonable cost.

It is also nothing but simple justice to say that the Boundary is to-day a producing district because of the railroads; that it is doubtful if there is a mine within its borders that would pay except at very favourable

pretty well the characteristics of the Boundary mines and of their ores, and no what may be reasonably expected of some of them, and what has been their record.

Geology.—It is not my purpose to go into the complicated geology of the Boundary district. This has been studied with the usual painstaking accuracy of your geological survey, and I understand that the results are soon to be made public.

From such personal observations as I made it is plain that the district is one of great disturbance; that within very small areas almost every variety of later and earlier igneous rock can be found, with the faulting, crushing, folding, and metamorphosis due to these. This is nowhere more apparent than at Phoenix.

I may venture to generalise with the assertion that the ores of Phoenix camp are almost exclusively altered limestone. On the north side of the ravine which



freight rates and reasonable coke charges. It certainly required considerable courage and considerable faith to build the Columbia & Western railroad, and no one making the trip from the Columbia river to Phoenix can fail to realise at what expense such excellent railroad facilities were supplied to the various camps. But it is not enough for railroads to build into a district such as this; they must be prepared to handle its product at a minimum cost and to bring in the timber, machinery, supplies, and fuel, at the very lowest rates that will pay, if the prosperity of the country is to be established and maintained. There is little or nothing in the way of traffic to be gotten out of the Boundary district, excepting that produced by or relating to the mines.

I ought to say in the outset that my personal observation of the Boundary district has been limited, but from many assays and analyses of its ores; from having handled its entire copper product since it became productive, and from the reports of mining engineers who have carefully examined for me several of the camps other than Phoenix, I feel confident that I know

divides the town, the limestone cap is in place, massive and unaltered save by the pressure which has crystallized it, the outcrops of ore being largely at contacts between intrusive eruptive rocks and the body of the limestone. This is notably true of the outcrop at the Brooklyn mine, where the uplifting of the limestone by the intrusive igneous rock is very marked, and along the vertical crushing zone there has been a second flow of pasty porphyry, forming in the most interesting manner a berchia containing sharp, angular pieces of unaltered limestone and of the older porphyry. I may say here that in using the term "porphyry" I generalise, not having attempted to distinguish the varieties of eruptive rocks, extending vertically or horizontally between the granites and limestones, or filling fissures in the granite itself. These igneous rocks have doubtless received careful classification at the hands of the survey. In the mines on the north side I am informed that the ore bodies exist in irregular masses of great size in unaltered lime, largely resembling caves which have been refilled with the ore-bearing material. The average ore of the best

developed mine showing nearly 500,000 tons in sight, is said to contain 38 per cent. of silica, 16 per cent. of oxide of iron, 15 per cent. of lime, and about 4½ per cent. of sulphur, copper 1.80 per cent., besides gold and silver.

In all these claims on the north side of the ravine the ore is frequently cut off unexpectedly by vertical dykes or horizontal floors of porphyry in a way which would be the despair of those whose duty it is to develop the property, were it not for the great size of the bodies when found. On the south side of the gulch of Phoenix I venture to affirm that the mountain was originally divided by a strong dyke of fine-grained felsite, which crops out boldly in the railroad cut where it crosses the Victoria claim, and is traceable for 4,000 feet to the south, crossing the *Ætna* and disappearing on the War Eagle. This dyke has not been cross-fissured by any subsequent geologic action, so far as can be observed by its appearance on the surface and at depths attained at present, or by the result of exploration with the diamond drill which has penetrated it for several hundred feet at various depths and different directions from the westerly side. It seems to me probable that on both sides of this main dyke, which forms a sort of wall, and for a thousand feet or more to the east and to the west, the limestones originally overlying the granite, shattered by innumerable disturbances and cross-fissured by secondary intrusions, have been mineralised and entirely altered by the solutions following up the main igneous dyke and spreading, until nowhere that I could observe was the limestone left unaltered, so practically all of the original limestone that was not eroded has been mineralised to a greater or less extent. There is everywhere a notable quantity of calcite, a secondary re-deposit of the lime.

To the east of the dyke which divided the Phoenix hill the same general characteristics are noted which I have outlined above, being observed on the Gold Drop and Snowshoe claims, and on the Monarch, except that on the Knob Hill, Ironsides, and other westerly claims there is a large altered oxidized zone, in which the copper is carried by magnetic iron oxide, while on the easterly side the iron cap is not so extensive.

The Ore.—I have already stated that the ore of the mines on the north side of the gulch of Phoenix is said to contain on an average 38 per cent. of silica, 16 per cent. of oxide of iron, 15 per cent. of lime and 4½ per cent. of sulphur, there being little change between the surface and lower ores so far as the chief constituents are concerned. This is about the composition of the lower ore from the south side, although many other conditions are distinctly different. The upper ores are largely oxidized and, as stated, consist of massive magnetic iron ore carrying copper sulphide and gold; this surface ore changing at an average depth of perhaps 25 feet to ore more nearly resembling that of the Brooklyn the iron being largely combined with sulphur, or sesquioxide, rather than in the higher oxidized form. By mixing these surface ores with those from lower levels an ideal mixture is obtained, enabling the furnaces to produce directly a 45 to 50 per cent. copper matte, carrying practically all of the gold and silver which the ore contains.

I have said something about the characteristics of these ore deposits at or near Phoenix, but nothing concerning the quantity of ore which may be depended upon. Of course "available" ore depends on cost of treatment and price of its valuable constituents. With adequate railroad freights and fair charges for coke it is probable that there are reasonably in sight in the Phoenix camp to-day several million tons of ore, which with copper at 12½ cents per pound could be

treated successfully. In Deadwood camp the ore deposits are also enormous, averaging over 130 feet wide and so situated that surface working can be prosecuted by quarry, a single drill dislodging a train load of ore in a day. But the problem of mining the lower levels or all these mines without excessive cost of timber or the permanent abandonment of one-half or one-third of the ore, necessarily left in pillars, must be causing serious thought. The tonnage that can be extracted from the Mother Lode is also up in the high figures, and cheap smelting a welcome fact.

There have been numerous published guesses as to the grade of these Boundary creek ores, and this, after all is the vital point from which all the others depend. On the north side of the Phoenix ravine the large amount of ore developed is estimated to run about 1.80 per cent. copper, \$2.40 per ton in gold, and 25 cts. per ton in silver. The workable ores from the south side of the Phoenix ravine contain on an average copper 1.70 per cent., gold \$1.60 and silver 33 cents per ton. The ore from the easterly side of the main dyke, dividing the Phoenix camp, as represented by the Snowshoe, Gold Drop, etc., probably runs by the car load, as shipped, about 1.60 per cent. of copper, \$1.50 in gold and 30 cts. in silver. The run of the mines in the Greenwood camp, as shown by the smelter returns, is probably 1.60 per cent. of copper, \$1.80 in gold, and 50 cents silver.

I may say that I have had unusual opportunities for ascertaining what are the facts. In arriving at these figures I have not been obliged to depend on statements of managers. The entire product of the Granby Consolidated Mining, Smelting and Power Co., and of the British Columbia Copper Co., passed through the hands of my firm, Ledoux & Co., and from the freight records it is readily ascertainable from how many tons of ore came the matte and blister copper which we have handled. The statements given me of ore mined tally with those of the railroad company representing ore delivered to the smelters, and the statements of the superintendent as to the grade of this ore tally closely with those figured from the copper matte handled by us in New York, checked again by my personal investigations on the spot.

I was accorded every facility in several cases both for ascertaining the ore in sight and the relative assays of the product from different claims. The Granby Co., especially, has kept complete records of all shipments from each claim, not only because this was a proper business policy, but because prior to the recent consolidation of the various interests now included in the Granby Co., the Knob Hill, Ironsides, Victoria, and other claims, were owned by separate corporations, so that it was necessary to render separate statements of the ore shipped from each claim. It may therefore be taken as a safe estimate that the very large amount of ore available in the Boundary district will vary from 25 pounds to 35 pounds of copper per ton of 2,000 pounds, with from 25 cts. to 40 cts., of silver per ton, and from \$1.50 to \$2.50 per ton in gold. It may be stated that there are some mines, like the B. C., near Eholt, whose ores as shipped contain considerably more copper than the above, but the figures I have given are well within the limits for the average.

Costs.—Next to the quantity and grade of ore, the all-important question is, how cheaply can the values from these Boundary ores be extracted and marketed?

I may say that one of the objects of my last visit was to enable me to assure prospective buyers of the product of the smelters that they could safely depend upon the tonnage contracted for, and need not fear a sudden stoppage from lack of ore. There had been various rumours prevalent in New York, such as that only the

surface ores were being mined; that these surface ores were richer than those lower down; that when depth was attained costs of mining would prohibit shipments; that the costs of mining were necessarily excessive considering the grade, because the ore was sorted by hand; that only surface ores were self-fluxing, etc.

It is easy to disprove the statement that only surface ores have been treated, because the records at the smelters show from what portion of the working, as well as from what particular claims, shipments were made. For instance take the Knob Hill mine as an example. During the year there were mined:

From the surface	6 per cent.
" " 200-foot level	57 "
" " 250-foot level	19 "
" " 300-foot level	18 "
	100 "

Taking the Ironsides and Knob Hill together for the years 1900 and 1901, the figures show that 74 per cent. was from below ground and 26 per cent. from surface ore, varying with the time of year. In the summer time a great deal more ore was taken from surface workings than from beneath; in the winter time surface mining was largely interrupted. The cost of mining these large ore bodies in the Boundary has varied from \$1.66 per ton to \$2.10 per ton, the first mentioned figure being the more recent. It is a difficult problem, as I have already hinted, and the one uncertain element in the prosperity of this district, how to handle the very large ore bodies without the risk of caving and ruining the mine, on the one hand, or the necessary employment of excessive amounts of timbering, or leaving in the mine large blocks of pay ore as a support. The management of the companies have been studying the problem and the Granby Co. have commenced ore handling with steam shovels, and propose to still further decrease the cost of mining by stripping from the surface down to the present level of the railroad track, and by the introduction of the caving system for lower workings.

Smelting Costs.—It has been seen that cost of mining in the district, even with high wages to miners, is very low, the conditions being most favourable. I come now to the all-important statement of these smelting costs.

The Boundary ore being self-fluxing, indeed rather basic in character, allows the admixture of a certain quantity of silicious ores from the Republic camp or other districts whose ores carry gold and silver, and the sulphur being low permits of smelting without preliminary roasting. With the advent of railways from the south the Boundary smelters can procure more dry silicious ores at profitable rates. It may also be stated at this point that the freedom of the ores from bismuth, arsenic and antimony, renders it easy to obtain a ready market for the copper product.

In considering the cost of smelting it is also necessary to take into account the losses in slag and otherwise. I was allowed to sample the slag dumps and to take portions of weekly slag samples which had been preserved in the laboratory. Before the establishment of bessemerizing the slag loss of the Boundary smelters averaged copper 0.46 per cent., gold 12 cents per ton, and silver 3 cents per ton. With a consumption of about 11 per cent. of coke, and with freight charges as they exist to-day the cost of smelting at the most favourable location in the Boundary district, after charging against the smelter the cost of marketing the product must be considerably over \$2.00 per ton. Adding the present cost of mining, the total outlay for mining and smelting must be less than \$3.66 per ton.

With the introduction of caving and steam shovels at

mines, and the bessemerizing at smelters; with further reductions in cost of freight and fuel, sure to come with or without the advent of competing railways, I unhesitatingly affirm that the copper ores of Boundary should be mined, smelted, and their contents marketed with profit at 12 cents in New York, and as railway extensions make other ores available that can be purchased cheaply, the profit should increase. But there must always be, as elsewhere, many shipping mines too small to justify their own individual smelters and mutual co-operation and a broad business policy should allow them all to prosper.

COMPANY MEETINGS AND REPORTS.

CANADIAN GOLDFIELDS SYNDICATE.

AT the meeting held last month the directors submitted the following report:—

During the year 1901, mining in British Columbia was carried on under most trying conditions, namely: Serious labour troubles, excessive freight and treatment charges on lead ores, and the remarkable fall in price of both lead and copper. That the industry has been able to survive these troubles and difficulties, is but an additional proof of the wonderful extent and richness of the mineral deposits of that Province.

In December, 1900, the English price of lead was £18 per ton. The present price is £10 16s. or considerably below the average price of the last twenty years. Present indications are that the price will again advance within the next few months.

One great drawback to the profitable mining of silver and lead ores, has been the fact that the smelters charged an excessive freight and treatment rate, and shipped all of the smelter product out of the country to be treated in foreign refineries. The Dominion government have recognised the burden under which the industry was labouring, and have gained a measure of relief (altogether too little in my opinion) in the way of a bounty for the production of pig lead from ores mined and smelted in Canada, extending over a period of five years. This has induced the C. P. R. to begin the erection of a lead refinery in connection with their smelter at Trail, B. C., which they expect to have ready for operating about the middle of May, 1902. The British Columbia smelters have announced a reduction in freight and treatment charges of from \$3 to \$4 per ton on silver-lead ores, taking effect January 1st, 1902.

It will thus be seen that the situation has materially brightened within the past few weeks. I confidently expect to see it still further improved and expect in the early spring to see the St. Eugene concentrator operating to its full capacity, earning dividends for the stockholders of the St. Eugene Consolidated Mining Company, Limited, in which the Canadian Goldfields Syndicate, Limited, are interested to the extent of 640,000 shares.

In spite of the adverse conditions referred to, we have been able to pay our stockholders two dividends or three per cent. each during the year 1901, amounting to \$35,746.68. These dividends were earned before the price of lead went down to the present low figure.

Slocan Sunset.—The bond on the Sunset property, near Whitewater, B. C., which was taken in June, 1900, was thrown up on March 31st, 1901. Continuous development work had been carried on in the interval and about 53 tons of high-grade ore was taken out and shipped. The ore was very bunched and finally pinched out, so the bond was thrown up. It is to be regretted that the Sunset property in no way justified the report made by the company's mining engineer. His connection with our company ceased on April 1st, 1901.

Commonwealth Group.—But little work was done on the Commonwealth group during 1901. Owing to the adverse conditions previously referred to I deemed it advisable to curtail our operations. A tunnel was driven 126 feet on the Commonwealth vein; a new trail made to the upper workings and a comfortable cabin 16 x 20 feet, erected near the mouth of the upper tunnel. The new tunnel cut through the top of an ore chute about 40 feet long and from 2 to 4 feet wide, of a good grade of ore, but the tunnel had not reached the ore chute towards which it was being driven, when work was suspended for the season. The Canadian Goldfields Syndicate, Limited, own 400,000 shares out of the 700,000 issued shares of the Commonwealth Mines, Limited, leaving 800,000 shares still in the treasury of the company.

The True Blue.—Work on the properties of the True Blue Copper Mines, Limited, near Kaslo, B. C., has been steadily carried on since March, 1901, with very gratifying results. A good ore chute of very high-grade copper ore, is now being opened up on two levels. The pay ore chute in the upper level is 16 inches wide but on the intermediate level it has widened out to 4 feet. The crosscut tunnel has intersected the vein on the third level showing it to be 15 feet wide, but the ore chute has not yet been reached. The cabins on the property have been repaired and put in good condition; a large ore-sorting house has been erected at the mouth of the lower tunnel; a new trail has been made

from the property to Kaslo, and four of the claims have been surveyed and applications filed for Crown grants. Two car loads of high-grade copper ore are now en route to the smelter, and the smelter returns will be known within a few days. There are at least ten car loads of similar high-grade ore blocked out in sight. All of this has been accomplished on an expenditure of \$7,500 of which the Canadian Goldfields Syndicate, Limited, has only furnished \$5,000, the balance being the proceeds of the sale of 50,000 shares of True Blue stock to the business men of Kaslo. Further development work should be done on the True Blue group, as the property is now one of proved merit. I believe that our investment in the True Blue Copper Mines, Limited, will not only recoup us for our loss in the Slocan Sunset, but will make us a substantial profit. It will be necessary, however, to have further funds to carry on the work in order to put the property on a paying basis, but the present good showing of ore apparently justifies going on with the work. As soon as the returns have been received from the ore now en route to the smelter, an opportunity may be presented the stockholders of the Canadian Goldfields Syndicate, Limited, to purchase shares of the True Blue Copper Mines, Limited, at 5 cents per share, to the amount of 250,000 shares. This would provide a fund of \$12,500 which will be spent exclusively on the further development of the True Blue group and I believe will result in putting that property in a position to justify the erection of an aerial tram and the beginning of regular shipment. The aerial tram would result in a saving of about \$4 per ton in the marketing of the True Blue ore. It will be remembered that the True Blue Copper Mines, Limited, is incorporated under the laws of British Columbia with an authorised capital of \$150,000, divided into 1,500,000 shares of a par value of 10 cents each. Of this about 750,000 shares have already been issued leaving 750,000 shares still in the treasury of the company. The Canadian Goldfields, Limited, own 390,000 shares, or little over 50 per cent. of the issued capital of the company. It is highly desired that the Canadian Goldfields Syndicate, Limited, and their friends should continue to hold control of the True Blue Company, so as to direct its management and protect our large valuable interest.

Sunset No. 11.—No work was done on this group of properties during 1901. I am of the opinion that an arrangement can be made with English capitalists to take over our Rossland properties, forming an independent company with ample working capital. I am working on the details of such a plan and in a short time will submit the whole matter to your consideration.

Jennie and Eldon.—No work has been done on either of these claims during 1901.

St. Eugene Consolidated Mining Co., Ltd.—Our holdings in this company still stands at 640,000 shares of the par value of \$1.00 each. Owing to the low price of lead, and the fact that none of the Canadian smelters could handle the output, the St. Eugene concentrator was only operated for about five months in 1901. During that time about 11,000 tons of silver lead concentrates were shipped, mostly to Antwerp. The St. Eugene Consolidated has paid two dividends amounting to \$210,000 and at the end of their financial year had a cash balance on hand of \$125,359.67. The Canadian Goldfields Syndicate, Limited, received \$38,400 in dividends from the St. Eugene Consolidated; while our holdings in that company only cost us \$145,448.23. It will thus be seen that the investment was a highly profitable one, as it yielded us a return on our investment of over 25 per cent. for 1901. Development work has been steadily carried on all through the year, and there are now over 200,000 tons of ore blocked out in sight in the mine. A shaft has been sunk for a distance of one hundred and forty feet (or over sixty feet below the level of Moyie lake), and there is no water to bother or interfere with the work. A level is being driven 125 feet below the collar of the shaft and in a short time the big ore chutes already opened up in the tunnels above, will be developed on this new level. This will practically double the amount of ore in sight. These ore chutes have already been proved to a depth of 300 feet by diamond drills, so it is merely a question of doing the work to block out the ore. The St. Eugene Consolidated continues to justify the claim made for it—that it is one of the biggest lead mines in the world. The concentrator has been still further improved so that it now has a capacity of 425 tons a day. Owing to the improved conditions it is confidently expected that the St. Eugene Consolidated will resume shipments at an early date.

YMIER GOLD MINES, LTD.

The report of the directors of the Ymier Gold Mines, Ltd., for 1901, submitted at the meeting on the 6th prox., stated that, after charging against revenue £2,345 for development, and writing off £3,578 for depreciation on machinery, etc., a net profit of £45,232 has been realised, which, added to the balance brought forward, makes a total of £86,201. Of this amount £40,000 has been distributed in dividends, £2,542 is absorbed in income tax and directors' commission and the balance £43,659, has been expended upon developments, machinery and other capital expenditures. During the year 69,505 tons of ore were treated, which, added to 35 tons of crude ore shipped direct to the smelters produced a net average value of \$7.96 per ton, as against \$8.88 in 1900 thus showing a decrease of 92 cents per ton, of which 41 cts. was due to the fall in the prices of silver and lead and 51 cents to the grade of the ore. It will be satisfactory to observe that this slight reduction in the grade of the ore treated has been practically offset by a saving in the working expenses in spite of the fact that the freight and

smelting charges have been somewhat higher. As the small rich bodies of carbonate ore found in No. 1 level have now become exhausted, it follows that the average grade of the ore becomes somewhat reduced. The engineer, however, reports that it is probable that other rich bodies will be met with as the 4th and lower levels will be opened up. Adopting a very conservative basis of calculation Mr. Fowler estimates the ore reserves actually opened up at the end of the year at 134,000 tons. Owing to the satisfactory results obtained from working the small cyanide plant the installation of a large plant sufficient for treating the whole of the tailings from the mill was proceeded with, and this plant commenced operations on the 6th March last. It is fully expected that substantial profits will be derived from this source—the tailings hitherto having been a waste product. The policy of the board has always been directed to the introduction of every possible means for reducing the working expenses of the mine, and Mr. Fowler, in his report, recommends the carrying out of further works, which should have a very beneficial effect on the revenue. The directors consider that they are fully justified in carrying out these important recommendations now that the vein has been proved at a depth of 1,000 feet, and for this purpose they propose to increase the capital by 20,000 shares. This additional capital will enable these and other economies to be effected without depriving the shareholders of the direct benefit of the profits as they are earned.

ST. EUGENE CONSOLIDATED.

The following is a statement of the financial affairs of this company, covering the operations for the year ended 30th September, 1901:

ASSETS.		
Mines and mineral claims	\$3,200,000 00
Cash in Banks—		
Bank of Toronto (Rossland).....	\$105,741 45	
" " (Toronto).....	4,093 00	
		109,834 45
Machinery, buildings and equipment—		
Compressor plant.....	\$13,954 24	
Boiler plant.....	6,477 57	
Concentrator plant.....	42,862 88	
Air lines.....	11,693 24	
Tramways.....	11,911 31	
Machine drills and fittings.....	5,121 97	
Mine buildings.....	14,440 15	
Offices and other buildings.....	13,698 68	
Flumes.....	19,708 78	
Cars and rails.....	10,135 86	
		150,004 68
Stores on hand.....	27,168 41	
Toronto office furniture.....	307 23	
Accounts receivable.....	10,465 87	
Capital stock discount.....	134,100 00	
		\$3,631,880 64
LIABILITIES.		
Capital stock.....	\$3,500,000 00	
Accounts payable—		
War Eagle Con. M. & D. Co.....	\$2,145 97	
T. G. Blackstock.....	4,375 00	
		6,520 97
Profit and loss.....	125,359 67	
		\$3,631,880 64

PROFIT AND LOSS ACCOUNT.

To Cost of mining and development—		
Labour and supplies.....	\$213,129 95	
Compressor labour.....	5,090 16	
Compressor supplies.....	7,309 06	
Machine drills and fittings.....	7,492 36	
Tramway expense.....	5,411 41	
Salaries.....	8,106 64	
Office expense.....	2,388 01	
Assay office expense.....	1,825 93	
Surveying.....	1,180 79	
Concentrator expense.....	34,236 93	
Sundry expense.....	1,628 93	
		287,889 86
To Amount written off for depreciation—		
In plant, etc.....	20,019 12	
To Travelling expenses.....	511 50	
Interest and exchange.....	2,522 70	
Legal expenses.....	436 88	
Mine accidents.....	113 00	
Taxes.....	12,210 02	
Insurance.....	1,185 50	
Consulting engineer's fees.....	1,100 00	
Auditor's fees.....	155 00	
Trail smelter examination expenses.....	2,670 79	
Managing director's salary.....	4,375 00	
Capital stock discount.....	14,900 00	
		\$384,962 80

To Dividends Nos. 1 and 2	\$210,000 00
Balance carried forward	125,359 67
	335,359 67
	\$684,322 47
By Balance brought forward	124,909 03
Ore sales (20,020 tons)	556,040 11
Rents	3,351 58
Transfer fees	21 75
	\$684,322 47

LEGAL DECISIONS AFFECTING THE MINING INDUSTRY IN BRITISH COLUMBIA.

(Specially Contributed.)

MANLEY V. C.

IN this case it was held on appeal to the Full Court, affirming Mr. Justice Walkem (Mr. Justice Drake dissenting) that the defendant who knew of error in the description of compass bearing, and issue of certificates of work of a mineral claim, and who, on failing to effect a purchase of the claim in dispute located the same ground, and having obtained certificates of work applied for a Crown grant, was not misled by the errors in description, as he knew where the claim was, and that the irregularities in plaintiff's title were cured by section 28 of the Act. That section is the important one, enacting that certificates of work are to be deemed conclusive.

Under is some doubt as to what irregularities this section will cover, or under what circumstances it may be invoked.

CALLAHAN V. GEORGE.

This case decided in 1898 was recently reported. It is to the effect that the marking out of mineral claims by using mounds of stone instead of legal posts 4 feet high and 4 inches square, as required by the Act, is not a sufficient compliance with the Act. That the posts intended are wooden stakes or posts of the dimensions required, and any other mode of marking out the claim is calculated to mislead. That the system of wooden posts has been universal in the Province for 30 years, and prospectors naturally look out for posts. That although the requirements of the Act may be imperfectly carried out, the courts will not permit the formalities and restrictions imposed by the Act to be abolished and others substituted.

BLEEKIE ET AL. V. CHISHOLM ET AL.

Is an old case recently reported. It holds that, as in the last case, the provisions of the Act as to location are imperative, and a location where the location line was not placed as near as possible on the line of the ledge or veins was held bad, as against another claim covering the same ground.

CATO.

LARDEAU DEVELOPMENTS.

By J. McLENNAN, A.R.S.M.

A VERY hopeful feeling prevails in the Lardeau as regards the prospects for the coming summer, this feeling being based mainly upon the rapidly approaching completion of the Lardeau railway, which will greatly modify the conditions hitherto existing in the district.

Work on this branch has continued steadily (though with a reduced force of men) throughout the winter, and there now only remains about six weeks work in order to extend the line to Gerrard, at the foot of Trout lake. It is expected that trains will be running before the middle of May and a steamer will then be put on the lake to make connection with Trout Lake City. The C. P. R. Co. in the fall of last year built a freight shed at this latter point to accommodate the ore produced during the winter, and two temporary buildings have since been erected the first having proved of insufficient capacity. Altogether about 900 tons of ore are now lying at Trout lake and of this the Silver Cup mine is responsible for about 700 tons and the Nettie mine for the remainder.

These two properties are the only ones which have yet shipped any ore during 1902, but small forces of men have been kept at development on several other claims in the district.

The Lardeau Smelting and Refining Co. has erected a small smelter close to the town of Ferguson. The plant, which is the first of its kind erected in British Columbia, was built by the Vulcan Smelting and Refining Co. of San Francisco, and is now practically completed and ready for operation. It consists of a 26-inch water jacketed furnace of a smelting capacity of about 30 tons per day, and presenting several novel features of construction. The most important points of difference from other plants, is in the method of producing the draught, and in the movable crucible employed. The upper part of the furnace is supported on transverse beams and does not come in contact with the crucible, which is entirely separate and movable on rails so that it can be quickly taken out and replaced by another when any repairs become necessary. The truck supporting the crucible is provided with screw-jacks by

which it may be raised or lowered bodily. The draught is an induced one, being produced by the admission of a steam jet into the bottom of the flue which goes off from the top of the furnace, the suction being such as to draw in air through the annular space above the crucible and through the smelting charge in the furnace.

By varying the amount of steam admitted, and also the space between the crucible and the rest of the furnace it is claimed that perfect control can be exercised over the smelting operations.

The volume of air admitted being large and heated by passing over the molten matter in the crucible before entering the smelting zone of the furnace, gives rise to conditions favourable for pyritic smelting, i.e., the ores need not necessarily be roasted before charging into the furnace.

A thirty horse-power boiler is provided for the generation of the steam necessary, and a complete assay outfit has also been installed. This practically completes the equipment as it stands at present, no crushing or sampling machinery being yet arranged for.

It was expected that the furnace would have been blown in immediately on completion of the plant, but this has not yet been done and operations have been suspended until summer. The reasons given for the delay, are the difficulties in the way of procuring suitable fluxes, especially limestone, with snow on the ground. The question of fluxes indeed does not appear to have been given due consideration before the smelter site was decided on, but it is to be hoped that the difficulty will be overcome when the snow is gone, and that the plant will then have a fair trial. Very conflicting opinions are expressed as to the probable success or non-success of the scheme, but there seems little doubt but that if properly managed, much of the medium grade pyritic ore of the district can be profitably treated. Whether it can successfully compete with the larger outside smelters in the treatment of the high grade lead ores, however, remains to be seen, and is by no means certain.

During the last few days it is reported that the Silver Cup mine owned by Sunshine, Ltd., has been sold to Mr. W. B. Pool and associates. The price involved is not known, but is believed to have been considerable.

Rumours of the sale of the Triune mine are also current, but nothing definite can yet be learned of this.

CORRESPONDENCE.

WILD-CATTING AND GOVERNMENT INTERFERENCE.

To the Editor B. C. MINING RECORD.

SIR:—I have been a subscriber to the MINING RECORD for some years and have noted that you are always ready to right what is wrong. There is one matter which I consider affects the mining interests of British Columbia is very wrong. I refer to wild-cattling. Anyone that has lived in any mining district for a few years in British Columbia, can state numbers of cases where companies have been started and good money been thrown away and nothing got out of it, simply because outsiders have been foolish enough to put in their money on the say-so of some smooth talker. But there are promising prospects in the Province which would in many cases develop into mines, and while the wild-catter can obtain money in dribbles, on account of these wild-cattling practices it is difficult to secure sufficient capital for legitimate enterprises.

Now, I should like to know why the government should not devise some method of protecting the public against wild-catters by the appointment (say) of inspectors in each district who would issue monthly reports in which the extent of development work and the nature of the ore body on all claims within their territory would be described. The public could then compare promoters' statements with official returns and be thus enabled to form reasonably correct conclusions.

Anything rather than this everlasting fleecing of the public. There are hundreds of good honest prospectors in this Province who have good showings, and I am sure they would be happy to see something done in this matter and the sooner the better. I am sure it would be appreciated if you would invite people who are interested in the welfare of the country to express their opinions on the lines of my suggestion, through the MINING RECORD.

Kereomeo, B. C.

PROSPECTOR.

LOCAL TREATMENT OF ZINC ORES.

To the Editor B. C. MINING RECORD.

SIR:—A paragraph appeared lately in British Columbia newspapers relative to shipment of zinc ore from this Province to Belgium for treatment. Why cannot this ore be treated within the borders of British Columbia? In Europe there are several forms of furnace in use for the extraction of zinc from its ores, and among these may be mentioned the following:

1. The English furnace, which is now seldom used, because of the expense of working.
2. The Belgian process, which is a fairly satisfactory method, and one largely used on the continent of Europe.

3. The Silesian process which has some important points of superiority, as compared with other methods. By the English process 50 tons of coal are required to extract two tons of metallic zinc from five tons of ore.

In the Belgium process less fuel is required, to yield the same amount of zinc.

The Silesian process requires about twelve tons of coal to produce one ton of zinc, the labour costing at the rate of about \$15.00 per ton of zinc extracted. The Silesian furnace is quite simple in construction, being in the form of rather a flat arch, lined with fire brick, and bound together with iron rods. At each side of the furnace chamber are six or more alcoves or recesses, separated from one another by a slab of fire brick, but open on the side next the fire. In front of each recess, is a door opening towards the outside of the furnace, and securely luted with fire clay when the furnace is in use. At the rear end of the furnace is an opening into the flue or chimney, while below the furnace are compartments corresponding to each recess above, in which the tubes from the retorts terminate.

The earthenware retorts have long tubes or "nozzles" attached to the front of each, and bending down to the compartments below the furnace where dishes are placed to receive the zinc that is distilled from the ore.

Either "blende" or "calamine" may be treated in these furnaces, and the danger of loss of zinc is very slight.

The ordinary charge for a twelve-retort furnace is about 700 lbs. of calcined ore and 400 lbs. of coal, to which is added 100 lbs. of dross skimmed from the zinc obtained in previous meltings. The retorts are filled and the refuse extracted from the outside, and a furnace can be kept in uninterrupted operation for a year without repairs.

Zinc ore containing silver and lead can readily be treated in the Silesian furnaces, and there does not appear to be any reason why British Columbia zinc ores cannot be treated in the Province, and merchantable zinc obtained in sufficient quantity and of a quality to meet local demands.

W. F. BEST.

JOINT-STOCK COMPANIES AND THE PUBLIC.

To the Editor B. C. MINING RECORD.

SIR:—The publicity of the operations of incorporated mining companies is greatly to be desired in this Province, without this it is not surprising that the public have so little taste for the investment of funds as a legitimate enterprise, in fact to judge by the laxity of B. C. mining stocks transactions, it appears that investment has narrowed down to manipulators and a few unsophisticated dabblers.

The way many of our British Columbia properties have been handled has led many people who once invested considerable to leave mining stocks severely alone; they have come to learn that if they are not on the directorate, or in close touch with the management, that it is no use venturing their capital. Now this state of affairs, for the good of the individual and for the country in general, should not be allowed to exist, and every measure taken to restore confidence, as the management of public mining companies don't give to their shareholders, through the medium of any publication, a detailed account of their doings, and progress from time to time at short intervals, so as the shareholders can know how their own property is progressing. I maintain that the law should be enforced so as to compel the management to issue at least monthly statements, say, to the mining recorders or gold commissioners in their respective districts, of all developments carried out and stating full particulars as to the width of ledge, if any, values, and any detail of interest.

As undesirable as it may seem to have our mining laws altered, yet something must be done to inspire confidence in the business of legitimate mining, and protect the public who have and would invest in this same enterprise.

In other countries, notably parts of Australia and Malay, where I have had facilities of judging and have been intimate with the working of this law, it has effected a decided revival in investment in mines on a good solid basis; as there the fortnightly or monthly progress, as the case may be, in its entirety is published, under a strict penalty for falsification, consequently the investor can see and learn for himself exactly in what position his stock and interests stand. He is kept keenly alive to the value and merits of his holdings and can govern himself accordingly; likewise also the intending investing public, whether winning or losing, have the satisfaction of at least knowing they had a fair and square transaction placed before them to go into.

In this Province it is vastly different. A shareholder not residing in the vicinity of the mine he has invested in, which of course is as a rule practically impossible in the majority of cases, cannot know the first thing of the merits and demerits of the mine as the development progresses, except by chance or a casual reference to some, in some stray clipping, and whether authentic or not he can rarely find out, and fortunate is he who gets the scantiest information of the doings of most of the operating mines. What do you get in the papers as a rule published in that division? Nothing, from month to month, and why, because the management gain nothing by giving publicity until probably they want to sell out and let the investing un-ophisticated public in again, if it weren't that there are more fools born every day it would soon work its own remedy.

Now to prevent this and what we want and must demand in this Province, to restore confidence in our mines as investments (which cannot be denied there is a woful lack of), is an honest monthly or bi-monthly report from the manager, to be returned to the recorder of his district under severe penalty for neglect or fraud, stating the progress from last report of all development; stating full particulars, width of vein, values, etc., and all information of value, of all public and incorporated and operating mines. I should say legislation embodying a clause compelling this return ought to be instituted and brought into operation and working order.

This would eliminate or tend in a great measure to prevent the manipulation of stock to suit the inside ring at the expense of the public and give the shareholder at least a chance to learn something of his own property, (which surely he has a right to) and could thereby govern himself, whereas at present in most cases he is woefully ignorant, and cannot obtain satisfactory information even by correspondence with the company's officials.

The number of mines, or so-called mines, which have been so manipulated by the directorate whereby large profits are made at the expense of the investing and subscribing public who, by the way, are the very people that pay for this development and expense of operating, is very large and cases ever recurring and fresh in most of our memories.

This, I maintain, can all be rectified in a good measure and an effort ought to be made, and at once, to bring the business of mining which is the mainstay of our Province, to a legitimate basis and encourage the further development of the vast mining resources of this Province, with very little effort the honest publication of all these reports in the reliable mining papers of our Province, would in due course restore public confidence and cause a large inflow again of capital, which is the essential required for the development of one of our greatest resources.

These reports so compelled to be sent in to the recorders would be eagerly collected by all the mining publications—which is the very thing they are continually after and cannot obtain, and published gladly enough too, and would be eagerly sought after by the multitude of investors who would then become conversant with their mines, operations and prospects, and not have to be continually groping in the dark, as at present, and chance, by sheer luck, to make anything out of his investment.

There can be no possible objection by the honest operator to any measure enacted along these lines, and any objection that would be registered would be made by the manipulator, who operates his mines to suit his own ends regardless of the public interests to the detriment of the whole industry and success of our Province, and he is just the very man we want to get after and to stop his practices.

W. A. BAUER.

PATENT OFFICE REPORT.

MR. ROWLAND BRITAIN, Patent Attorney, Vancouver, sends us the following list of patents granted to British Columbians during the month of April: Messrs. Letson & Burpee, of Vancouver, a U. S. patent for improvements in Soldering Machines.

E. A. Marshall, of Granville street, Vancouver, a Canadian patent on an improved method of Sealing and Securing the Covers of Jars. This patent is adapted to the requirements of the potted fish and meats which Mr. Marshall is putting up in Vancouver for the British markets.

G. A. Roedde, of Vancouver, a U. S. patent on Temporary Binder.

A. D. Bentley, Vancouver, a U. S. patent on his Improved Ventilator for cooking vessels.

As a matter of interest, the Siemens & Halske Electric Co., of Chicago, were the assignees of no less than 58 separate U. S. patents during one week, on Electric Meters, all by the same inventor.

CATALOGUES, CIRCULARS AND TRADE NOTICES.

HOLMAN AIR COMPRESSORS.

THE following description of an air compressor recently installed by Messrs. Holman Bros. of Camborne, Cornwall, at the Levant mine, St. Just, Cornwall, will be of interest to many of our readers, as this machinery is nearly identical with compressors of the same type supplied by this firm to the Lenora and Tyee companies of Mount Sicker. The new compressor consists of two high-pressure air cylinders, each 25 1-2 inches in diameter, with 5 feet stroke, one on the right hand side of the engine and one on the left hand, driven tandem from each side of a four-cylinder cross-triple expansion condensing engine. The high pressure steam cylinder is on the right hand, and the intermediate pressure on the left hand, with the low-pressure cylinders one behind each of these. The size of the steam cylinders high pressure is 17 inches in diameter, intermediate pressure cylinder 27 inches, and the two low pressures each 30 inches, all with a stroke of 5 feet.

The fly-wheel is 17 1-2 tons weight, and is built up in two halves, and mounted upon a crank shaft made of Siemens-Martin steel. The condensing apparatus is of a vertical jet condensing type, driven through the medium of a rocking lever from the cross-head on one side of the engine. The engine is arranged to work either condensing or non-condensing, and to start in any position. The boiler pressure is 150 lbs. per square inch, air pressure 80 lbs. per square inch. The high

pressure and intermediate steam cylinders have Meyer's expansion gear adjustable by hand. The low pressure cylinders have each a single side valve of the trick type. To work the valve gear of this four cylinder steam engine there are only four eccentrics, making the engine one of the simplest with regard to the moving parts of the valve motion for an engine of this description. The whole thing is of massive construction, having been specially designed for the work intended. The total length of the compressor is about 60 feet 3 inches wide. There are two steam receivers (efficiently drained by steam traps), one between the H. P. and I.M.P. cylinders and the other between the I. M. P. and L. P. cylinders. The compressor is for compressing air for working machinery on the mine including rock drills. The material and workmanship and finish of the engine is exceedingly high class. There are two Lancashire boilers, each 30 feet long by 7 feet diameter. The volume of free air this compressing engine will deal with is from 3,000 to 3,500 cubic feet per minute.

THE PELTON WATER-WHEEL COMPANY.

The Pelton Water-Wheel Company of San Francisco and New York have recently equipped the Sullivan Group Mining Co., of Marysville, B. C., with water-wheels to develop power for running their mines. The Pelton Company report numerous water-wheel plants installed by them recently in British Columbia and Alaska, among which might be mentioned plants furnished:—The Vancouver Engineering Works; Enterprise Mines, Nelson, B. C.; Alaska-Treadwell Gold Mining Co., Douglas Island, Alaska; Juneau Electric Light & Power Co., Juneau, Alaska; Payne Con. Mining Co., Cook's Inlet, Alaska; Rambler-Cariboo Mines, Ltd., Kaslo, B. C., and several others nearing completion at the company's shops.

"MODERN METHODS."

We are in receipt of a copy of Modern Methods Catalogue, No. 28, just issued by the Link-Belt Machinery Co., of Chicago, Ill., illustrating and describing types of Link-Belt elevators and conveyors for handling any class of raw and manufactured product; link-belted, special carrier chains, sprocket wheels, rope sheaves, pulleys, shafting, shaft bearings, gearing, friction clutches and general mill supplies. This catalogue also fully describes the new continuous bucket electric elevator dredge, referred to in the March issue of the MINING RECORD.

HAND AND POWER PUMPS.

Messrs. Ramsey & Co., Ltd., of Seneca Falls, N. Y., have recently brought out a 53rd edition of their illustrated catalogue dealing with hand and power pumps, and hydraulic and pumping machinery for all purposes. This edition is very handsomely bound in red and gold cloth and contains upwards of two hundred and sixty pages of descriptive matter.

MINING RETURNS AND STATISTICS.

BOUNDARY DISTRICT.

ORE shipments from the Boundary district from January 1st to May 24th, 1902, have been distributed as follows:—

Granby Mines, Phoenix	138,412
Snowshoe, "	660
Mother Lode, Deadwood	54,636
Winnipeg, Wellington	785
Golden Crown, "	625
No. 7 Mine, Central	310
Jewel, Long Lake	1,140

ROSSLAND.

Le Roi returns for April: 26,093 tons of ore were shipped to the Northport smelter, containing 8,689 ozs. of gold, 18,079 ozs. of silver and 706,224 lbs. of copper, gross value, \$268,911; average value \$10.30 per ton.

Le Roi No. 2: The manager cables, Rossland May 4th.—"Shipments last month amounted to 6,375 tons; contents, 3,687 ozs. gold, 9,546 ozs. silver, 175 tons copper. Returns from ore after making deduction of all smelting charges amount to \$66,333. Cost of mining may be taken at \$21,333. Profit for last month, \$45,000 (equivalent sterling, £9,278)."

SLOCAN.

Ore shipments from the Slocan for the five months to end of May, aggregate approximately 12,500 tons, of this 1,800 tons has been mined in the Slocan City Division.

LARDEAU.

Shipments from this district for the year to the 17th May, have been 1,117½ tons valued at \$162,887.

LE ROI—THE MINE MANAGER'S MONTHLY REPORT.

The secretary of the Le Roi Mining Co., Ltd., has issued the manager's report for March as follows:—For the month ended 31st March the smelter gave the Le Roi mine credit for shipping 24,428 tons, dry weight, containing gross values as follows:—

7,522,529 ozs. gold at	\$20.00 = \$150,450 or \$6.13
16,037.82 ozs. silver at50 = 8,821 or .36
715,716 lbs. copper at12 = 85,886 or 3.50

Average per ton 245,157 \$9 99

Mine Expenditure.—The expenditure for the month on mine account was \$88,151. The cost of breaking and delivering ore on railroad cars for the month was \$2.96, and the cost including all mine expenditure other than that charged to mine machinery and surface improvements, was \$3.58.

Northport Smelter.—The expenditure for the month was \$227,125. The following statement will give details of ore received at smelter during the month and their contents:—

	Dry tons.	Ozs. Au.	Ozs. Ag.	cu. wt.	Lbs.
Le Roi Mining Co.	24,529	7,522	16,038	715	416
Public Ores	6,235	3,831	9,053	349	453
Total	40,764	11,353	25,091	1,065	1,669

The tonnage treated during the month was as follows:

	Tons.
Roasted ores	24,875
Raw ores, Re Roi	148
Raw ores, Le Roi No. 2	3,440
Raw ores R. G. W. Mines	404
Concentrates	57
Total	28,924

There were shipped during the month 15 lots of matte valued at \$172,512.

The estimated profit for the month on the gross value of the ore shipped from the mine was \$244,997, equal to a value per ton of \$9 99. From this deduct freight and treatment at \$6 per ton, \$147,172, leaves \$97,825; which, less mine expenditure, \$87,768, leaves a total estimated profit of \$22,221; of which the estimated profit to mine is \$9,957, and the estimated profit to smelter \$12,264.

LE ROI NO. 2.

Report for month ended 31st March:—The total tonnage of ore shipped from the mines amounted to 5,170.4 dry tons, which came from the different stopes in quantities as follows:—

IOSIE MINE.

	Tons.
East stope, 200-ft. level, east	342
Annie stope, 500-ft. level, west	2,157
Sill floor, Annie chute, 600 west	360
Sill floor, Annie chute, 700 west	340.4
No. 1 stope, Poorman tunnel	678
No. 2 stope, Poorman tunnel	444
Poorman winze stope, east, surface tunnel	9
Total	4,330.4

NO. 1 MINE.

	Tons.
West stope, 200-ft. level	66
West stope, 200-300-ft. level	615
Intermediate, 300-400-ft. level	129
East drift from 300 drift west	30
Total	840

GROSS VALUE IN THE 51,170.415 DRY TONS SHIPPED.

3,208,304 ozs. gold at \$20.00 = \$64,166.08 or \$12.41 per ton.
8,269,960 ozs. silver at .54 1-8 = 4,466.12 or .86 "
312,154,000 lbs. copper at .12 1-8 = 37,848.67 or 7.32 "

Making the total gross value .. \$106,480.87
On the average value per ton .. \$20.59

Stoping Operations.—Sill floors were commenced on the 600 and 700 foot levels of the Josie mine preparatory to commencing stoping operations on the Annie chute above these levels. The tonnage of ore extracted from these levels is shown above.

OUTPUT.

The output for the month averaged about 165 tons per day, being a slight increase over any previous month since the mine commenced shipments to the smelter.

Review of operations for six months ended 31st March last:—The output has been maintained at an average of 155 tons of ore per diem. The grade of the ore has steadily improved during the past six months, and notwithstanding the fall in price of copper the grade of ore has been such that a profit of \$5.44 a ton has been realized, which can be considered satisfactory, since the fall in the price of copper represents a loss of \$2.00 a ton when compared with earnings during the year ended 30th Sept., 1901. All machinery, both on surface and underground, has been maintained in first-class order, and is capable of being worked

to full capacity. The mine is in good condition, all the workings being in first-class order. Operations during the past six months have shown that, as the stopes were opened up, larger bodies of ore have been revealed than were anticipated at the commencement of the year.

RECENT DIVIDENDS.

Among the more recent dividends paid by British Columbia mines are those of the North Star, which declared an eighth dividend of $1\frac{1}{2}$ cents per share, and the Rambler-Cariboo which has paid four dividends of 1 cent. per share already this year, or altogether about \$148,000. The North Star has now paid in profits to its shareholders \$373,000. The Ymir Mines, Ltd., distributed a dividend in March, the total distribution being thus swelled to \$280,000; the Sunset mine in the Slocan paid a third dividend of \$6,000 in April, and the Crow's Nest a ten per cent. dividend.

THE METAL MARKET.

BUSINESS during the month has been fairly satisfactory. The low price of silver has brought out orders and steadied the market. The metal is now quoted in New York at $51\frac{1}{8}$ to $51\frac{3}{8}$. Copper is firm, American manufacturers being very busy, while in Europe business is improving. It is meanwhile reported that the large producers have sold their product for the near future, and it is believed that buyers have not yet filled their entire requirements. Prices have consequently improved, Lake copper being quoted at $12\frac{1}{8}$ to $12\frac{1}{4}$; electrolytic at $11\frac{3}{4}$ to $11\frac{7}{8}$ and casting copper at $11\frac{1}{2}$ to $11\frac{3}{8}$. The lead markets have also been active, although there is little change in prices, which are quoted at $3.97\frac{1}{2}$ @ 4.05, St. Louis; 4.05 @ 4.10, New York. London quotations, however, are slightly higher, at from £11.15s. to £11.18s. 6d. Spelter is quoted at 5.15 St. Louis, 4.35 New York.

THE LOCAL STOCK MARKET.

THE market this month has been less active and few transactions are reported. The sensational fall in Le Roi shares appears to have discouraged local speculation in Rossland mines to a considerable extent and Centre Star declined to 32, but since recovered to 30. Cariboo-McKinney is very weak at 20 asked, 17 bid, while St. Eugene is quoted as low as \$1, and Sullivan has declined from $9\frac{1}{2}$ to $7\frac{1}{2}$. Crow's Nest, however, has again advanced and is quoted at \$1.25, while North Star has also risen several points. Fairview corporation having recently sold as high as 6, and Dominion Consolidated at $6\frac{1}{2}$. There have also been deals in Winnipeg at $4\frac{1}{2}$ and 5. Republic camp securities have fallen considerably, but upon the completion of the branch line of the Great Northern railway in the course of the next few weeks a rapid recovery is expected.

Of Slocan stocks American Boy has been in great demand and has sold from 6 to $6\frac{1}{2}$; Dardanelles at 3 to $3\frac{1}{4}$; Rambler-Cariboo has sold during the month as high as 86, but in consequence of the snow-slides in the vicinity of the mine the management decided to suspend operations for a period and this has caused the stock to decline to 81 asked and 75 bid. Some movement in Mount Sicker stocks has taken place and owing to the erection of two smelters the outlook for this camp is very bright.

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Provincial Secretary's Office.

His Honour the Lieutenant-Governor in Council has been pleased to make the following appointment:—

May 10th, 1902.

PETER HERMAN, of Port Essington, Esquire, to be a Deputy Mining Recorder for the lower portion of the Skeena Mining Division, with sub-recording office at Port Essington.



Mineral Act Amendment Act, 1898.

Notice is hereby given that under the provisions of 143 of the Mineral Act, His Honour the Lieutenant-Governor in Council has been pleased to make the following order:

That paragraph two of section 5 of the Mineral Act Amendment Act, 1898, be so interpreted that should any free miner perform assessment work on his claim during any one year to the value of one hundred dollars or more in excess of the amount required to be done in any one year by the Mineral Act, the right thereby given such free miner of recording a certificate of the work done to the value of each one hundred dollars, so as to cover his assessment work for an additional year in respect of each one hundred dollars in excess, shall be exercisable only at the time of record of the certificate of work in respect of the amount required to hold the claim during the year in which such excess shall be performed.

And it is further ordered that this Order shall come into force on the first day of June, 1902.

J. D. PRENTICE,
Clerk Executive Council.

Provincial Secretary's Office, 15th May, 1902.

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