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MINING RECORD

ESTABLISHED 1895

VOL. XI.

AUGUST, 1904.

No. 8

BRITISH COLUMBIA MINING RECORD

Devoted to the Mining Interests of the Pacific Northwest.

PUBLISHED BY

THE BRITISH COLUMBIA RECORD, LIMITED

H. MORTIMER LAMB, Managing Editor.

Victoria, B. C., Office, Province Building.
Vancouver, P. W. Charleson, Hastings St.
London Office: 23 Coleman Street, E. C.
Denver, Col.: National Advertising Co.
San Francisco: Duke's Agency.

SUBSCRIPTION TERMS:

Canada and the United States, one year - - \$2.00
Great Britain and Foreign, one year - - - \$2.50

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THE MONTH.

We note the finding in the Province of scheelite, a rare mineral one of the chief uses of which is in the hardening of steel. The specimens containing this mineral were found in the Cariboo district and, being new to the finders, were sent to the Provincial Assayer for identification. We print on another page some particulars relating to this mineral and its occurrence elsewhere. Some small specimens have been placed in the Mineral Museum of the Department of Mines, Victoria.

A first clean-up at the Consolidated Cariboo Hydraulic Company's mine at Bullion has, it is reported, resulted in the recovery of gold valued at \$60,000, an increase of about twenty-five per cent. on last season's aggregate yield. It is possible as the conditions appear to be more than usually favourable, that two more "clean-ups" may be made ere the season closes, and the total recovery for 1904 should then compare to somewhat better advantage with the company's past achievements in this regard, before light rain-falls and adverse weather conditions had so inopportunately restricted operations.

At a meeting of the Vermillion Forks Mining and Development Company held recently in London, the chairman remarked that the Company was probably

the most economically worked undertaking of its class in the city. In support of this contention he stated that during the past fourteen months the total expenditure had been £1,800, of which £716 represented the cost of boring for coal. One seam of coal 28 feet wide had been proved by this means, and the product tested with the most satisfactory results at the Nickel Plate mine. The Vermillion Forks Mining and Development Company is one of many promising undertakings in the Similkameen district, the ultimate success of which is, however, entirely dependent on the establishment of railway connection with market centres. From recent developments there is reason to hope that this great desideratum will not be withheld for a very much longer period.

It is to be hoped that the Hon. Senator Templeman will not be unmindful of the promise made by him at the Convention of the Provincial Mining Association in February last, to the effect that the reports relating to British Columbian mining sections and incorporated in the annual summaries issued by the Canadian Geological Survey, would be printed in separate form and arrangements made for their free distribution among prospectors and others in this Province to whom the information contained therein would often prove of incalculable value. The reports of the Department are becoming of more and more value and interest, as while they still naturally continue to stand as records of purely scientific investigation, yet more attention than formerly appears to be now devoted to what might be perhaps described as practical details; hints and suggestions which might well be frequently turned to profitable account by the prospector and claim owner.

The announcement by cable despatched by the manager of the Cariboo Consolidated to the London office that bed-rock has been reached in the west drift of La Fontaine, and that the gravel there encountered appears to be very rich, is eminently gratifying. There are few undertakings in British Columbia of greater industrial importance than those upon which effort is now being directed in Cariboo to demonstrate the auriferous character of the ancient river systems by deep level mining. The difficulties so far encountered have been enormous though, as

we have seen, not insuperable, thanks to the energy and skill brought to bear. But there yet remains much to be accomplished ere a start is made in actual profitable working. That end which means so much not only to Cariboo but to other sections of the Province where similar conditions obtain, now, however, seems to be within measureable distance of consummation.

The report of the investigations in the Nicola district of Dr. Ellis, of the Canadian Geological Survey Department will be awaited with much interest, for it is believed that this section of country will, once it is rendered more accessible by the extension of the railway system thither, contribute very considerably to the productive wealth of the Province, not only in respect to a large output of copper and gold, but of coal also. Dr. Ellis, however, we understand, proposes to confine himself exclusively to the study of coal resources of the district with a view to ascertaining the width of the seams, extent of the measures and quality of the coal. It is needless to say that when conditions permit of the operation of the Similkameen and Nicola copper-gold mines, the existence of a good coking coal in the immediate vicinity will assist materially in the cheapening of smelting costs; and it is to be hoped therefore that Dr. Ellis will be sufficiently satisfied with the results of his investigations to report favourably in this regard.

Residents in the Omineca district complain, not without reason, of the inadequacy of the mail service provided for that territory. Thus the present mail contract only affords six mails to Hazelton in the year; two of which deliveries are brought in overland during the winter and limited each to fifty pounds weight of letters. A correspondent writing to the *Colonist* on this point remarks that as a result of this arrangement the first steamer delivery this spring amounted to nineteen hundred pounds of mail matter, representing chiefly letters that had been delayed six months in transit. What is therefore required is a full monthly service, necessitating an increase in the present Government appropriation for the service.

All Omineca points within a radius of two hundred miles are dependent upon Hazelton for their mail distribution, and include the mining camps of Manson, Germanson, Vital and Tom's Creek; the Telkna coal and quartz mining camps, and the Bulkley and Kispiox Valley settlements.

A financial writer in the *London Mining Journal* suggests that some attempt is likely to be made to utilize the misfortunes of the Le Roi Company in order to oust the present board and warns shareholders against participating in any action of the kind on the grounds that there is nothing to be gained by a change, the honesty of the present board being above suspicion. *Cela va sans dire*. In only one direction might a change, we respectfully submit, be advantageously made. It is a well known that the present chairman, Sir Henry Tyler, is a very old man, of

nearer eighty than seventy-five years of age. In view of this and the fact that there are younger men available on the directorate possessing undoubted business capacity and standing, and in case of one at any rate, special knowledge in respect to mining conditions in British Columbia, it might be to the company's interest upon Sir Henry Tyler's resignation at the close of his term of office, to elect in his stead Mr. G. S. Waterlow, who has already done much in the interests of legitimate mining, in this country and has himself invested heavily in Kootenay mines.

The consolidation of interests in the Boundary district by the organization of the new Montreal & Boston Company now appears to have been finally arranged, a first cash payment having been made towards the purchase of the Dominion Copper Company's property while the Athelstane and Jackpot claims have also been acquired by the concern. As we stated last month, the company starts more or less severely handicapped on account of an unduly large capitalization, considering the present known value of the properties secured. It is quite possible, however, that this objection may not appear so formidable should the development operations, which we understand are to be extensively carried out at the mines, result satisfactorily. Although we were unable to endorse the promotion as promising well from the investor's standpoint, yet since the consolidation is effected and actual work has commenced, we sincerely trust the undertaking will be successful, and that the company has a long and prosperous career before it.

The winding-up of the North Star Mining Company is a matter of very considerable regret, for there are relatively few instances in British Columbia where mining operations have been carried on upon equally sound business principles. In consequence so long as there was ore to be mined, the North Star paid very handsome profits, the large sum of \$312,000 having been distributed in dividends since the company commenced operations. For the past two years or more, however, the attempt to discover fresh ore-bodies, though scientifically pursued, has unfortunately not proved successful, and upon the recommendation of Mr. S. S. Fowler, the eminent consulting engineer, who recently made an exhaustive examination, the directors have been compelled to advise the abandonment of further effort in this direction, and at a subsequent extraordinary meeting of shareholders a motion authorising the voluntary liquidation of the company was agreed to. By this plan shareholders will receive a final dividend of approximately fifteen per cent. or perhaps more, from a distribution of a substantial cash balance and the proceeds from the sale of realisable property. Meanwhile an interim dividend of 7 cents per share has been declared.

The Slocan *Drill* instances a rather curious point in connection with the crown-granting of mineral claims. Thus the owners of a four-seventh interest

in a mineral claim in the Lemon Creek section applied for a crown-grant for the property, the application being, however, opposed by those holding the remaining three-sevenths' interest. Upon referring the matter to the Minister of Mines a ruling was obtained to the effect that any person having an interest in a mineral claim may crown-grant that interest. The question then is, as the *Drill* puts it, who is now responsible for the work required to be done by the partners in the claim whose interests have not been crown-granted, and can the interest or the claim lapse in the event of the minority interest neglecting to fulfil the legal requirements? Of course the answer to these queries would appear simple enough, namely, that the interests to which title has not been secured are alone subject to the regulations governing the holding of un-crown-granted mineral location. But supposing the owners of these interests fail to live up to the requirements, how can a three-sevenths' interest in a claim, a four-sevenths of which is crown-granted, be re-located or "jumped"?

We publish elsewhere in this issue a valuable paper recently contributed to the Canadian Mining Institute by Prof. R. W. Brock, on the subject of Poplar Creek and other camps of the Lardeau district, which sections the author in the course of official duty visited last summer. The paper, even in its condensed form, for space limitations unfortunately did not permit of its publication quite in full, might well, we imagine, be accepted as a model for bulletins such as our Provincial Department of Mines might periodically issue and afterwards embody in the Annual Reports of the Minister of Mines. Throughout, the tone Prof. Brock adopts in discussing the mineral potentialities of this district is such as might be expected from an impartial but at the same time a scientifically trained observer. He is neither optimistic nor pessimistic in his point of view, and touches on the commercial side of mining in the briefest possible manner and then merely in order to more accurately describe existing conditions. We are glad to learn that practically the same, though a fuller description of the Lardeau district is published in the Summary Report of the Geological Survey of Canada for the year 1903; for information of this character is not only of great practical value to prospectors and mine operators, but serves also to advertise the mineral resources of the country and is thus conducive to development and progress.

In the interesting case just brought to a close of the Centre Star Mining Co. vs. the Rosslund Miners' Union in which the plaintiffs sued for the recovery of \$50,000 as damages for loss and injury sustained by the plaintiffs by the action of the defendants in "maliciously conspiring" to bring about a sympathetic strike among the employees of the Centre Star mine in connection with the Rosslund strike of some three years ago, the jury brought in a verdict awarding the plaintiffs in the action damages to the amount of \$12,500. The amount of damages awarded is, how-

ever, of minor importance relative to the importance of the precedent established in Canada which agrees with a recent notable decision of the English courts, and though, it is stated, the case will be appealed and may be taken ultimately to the Privy Council, there is little likelihood of a reversal of the decision. The verdict in effect makes clear the fact that while the right of the individual worker to go on "strike" is not denied, he has no right to induce or compel a fellow workman who has no actual grievance against his employer to "strike" also. The illegality of this practice thus once for all established, and the knowledge that a labour organization committing the offence renders itself liable to heavy damages, should serve as a wholesome preventative of widespread strike epidemics in the future and induce the professional labour agitator to abandon an employment which now promises to become less remunerative than it has been in the past.

Mr. W. M. Brewer contributes to this issue a brief but interesting account of conditions in the northern mining camps of Atlin in British Columbia and of Whitehorse and the Big Salmon in the Yukon territory. The conclusions at which he appears to arrive are that a promising field for dredging enterprise has been developed in the Atlin district, the success of this industry being assured, the only check to be overcome being a slight and easily remediable disability in the mechanical device for handling heavy boulders. The Big Salmon district is, in his opinion, the richest placer field yet explored, though its area is extremely limited. Mr. Brewer anticipates that the gold production therefrom this year will have a valuation of about \$125,000, representing the work of some sixty men. He is, however, particularly optimistic in speaking of the future of the Whitehorse "copper belt," the present showings of ore, generally of high grade value, there met with, inducing him to predict that eventually the camp will become one of the largest copper areas in the West. Of course much development work must be undertaken before this can come to pass, and capital is badly needed for this purpose. The opportunities for the profitable investment of capital appear to be excellent, provided claim-owners show a disposition to treat with capital in a reasonable spirit. The district is no longer an inaccessible one, and we understand the railway company is prepared to transport ores to the Coast smelters upon most moderate terms.

We have received from headquarters confirmation of the intelligence contained in recent press despatches that the Canadian Smelting Works at Trail are about to commence the manufacture of lead pipe with a view to supplying the Canadian market. In addition thereto experiments are being made in the manufacture of sheet lead without the use of rolls. It is yet uncertain whether experiments on these lines will prove successful, but if so the Trail works will be in a position to supply the market with pig lead, sheet lead and lead pipe of any standard size up to four-inch. This

departure marks, we trust, the beginning of a new industrial era in connection with the development of the mining industry of the Province, whereby instead of exporting our raw materials they will be utilized by manufacturers in the country itself, in sufficient quantities at least to meet the requirements of Canadian demand. Such a consummation would go far towards solving the most difficult problems of the day in respect, more especially, to the profitable operation of lead and zinc mines in the Kootenays. The Trail works is also at present sending considerable consignments of fine silver to China, fine gold to the United States assay office at Seattle, and copper sulphate in limited quantities to Eastern Canada. It is to be hoped, meanwhile, that the early establishment of a Canadian mint at Ottawa will admit soon of the utilization of the silver and gold produced from our British Columbian mines for the purposes of a Canadian coinage.

Heretofore placer gold has held the leading position among the mineral products of British Columbia in regard to aggregate value of production for all years to date. The close of the current year will, however, probably see that chief position taken by the products of the collieries of the Province—coal and coke. At the close of 1903 the aggregate production of placer gold, according to the official statistics of the Department of Mines, was \$65,688,103 and of coal and coke \$63,321,809. Assuming that the value of this year's production of the two minerals, respectively, will be similar to that of last year—and in doing this placer gold rather than coal and coke will gain some advantage, since the latter is more likely to show an increase in value of production than the former—the positions will be reversed, for coal and coke will lead with a total of \$67,654,166, as compared with \$66,748,523 for placer gold. The relative present value of the two minerals will be more strikingly apparent, though, if the value of their production respectively during the last five years, 1899-1903, be taken. In that period placer gold has contributed \$5,727,824, while coal and coke have added \$23,015,709. The former has given an average money value of \$3,136 for every individual day of the period mentioned, while coal and coke have contributed a daily average of \$12,610. It is not generally realized that the coal-mining industry adds thus freely to the realized natural wealth of the Province, but it does, and, what is a gratifying reflection, its average daily quota has been steadily increasing every five-year period of the last 35 years, and is still on the increase.

The past six months has witnessed a very considerable activity in the transfer of prospects and partially developed claims, which in most cases have been acquired, at prices ranging from five to thirty thousand dollars on "working bond" terms. This indication of reviving interest on the part of the "small investor" in British Columbian mining is significant and gratifying. At this stage of our mining development, numerous "deals" on the part of small investors, are even more to be desired and benefit the

industry perhaps to a greater extent than the heavy investment of capital in some individual undertakings. Both naturally are desirable, but the operation of the "small investor" is frequently only preliminary to the advent of the capitalist or syndicate. Thus the development and establishment of the Kootenay industry is largely attributable to Spokane business men and others of comparatively small means, who were the first to recognize the mineral possibilities of the Slocan and Rossland. Since 1901 the demand for prospects has steadily decreased and in consequence prospecting has languished and declined. There is no advantage looking for mineral unless there is a market for one's discovery. The re-appearance of the "small investor" is, however, beginning to stimulate prospecting effort, and in such districts as the Lardreau, which appears to present exceptional opportunities for the profitable investment of capital in small amounts, evidence of a better state of affairs in this regard is already forthcoming. The saying that British Columbia is a mineral area of extraordinary promise, whereof a very small portion has been even scratched on the surface is trite enough, but it is none the less true. The country affords a wonderful field and scope for the prospector, but the vocation at best is a precarious one, in which men will not embark except all the conditions are tolerably favourable.

The Atlin district has lately been visited by Mr. Chester W. Purington who, it is stated, was en route to Alaska, under engagement with the United States Geological Survey, to report on placer mining methods and costs in the Alaskan territory. Mr. Purington is a mining engineer of large experience and acknowledged ability, so considerable importance may be attached to his opinions on mining matters. He is reported to have expressed himself as satisfied that the area at Atlin covered by pre-glacial auriferous gravels is undoubtedly large, and that these will prove a factor of much greater permanency, from a placer-mining standpoint, than the post-glacial or very recent gravels occupying the beds of the present streams. Fortunately several financially strong companies are already operating in the Atlin district with plants and equipments suited to varied local requirements and conditions, so that we may expect to have, in the recovery of much gold this season, undoubted evidence of the richness of the ancient river channels thus far prospected and now being worked. But while this will be satisfactory enough for the present it does not necessarily ensure permanence, although there need be little doubt that those who are expending further large sums of money in prospecting the gravels and providing costly plants to work them have already fully satisfied themselves that there exist extensive gold-bearing deposits. Yet it is always helpful to have confirmation by a competent authority, and it is especially desirable where the district immediately concerned is a large one. There is such an enormous area in Cassiar and the extensive gold-bearing country north and east of it, still little known or prospected, that it is a distinct advantage to have bases like Atlin

and the several larger camps of the Yukon from which prospectors may work. This additional assurance of the probable permanence of the Atlin gold-fields is, therefore, welcome, for the more men there are permanently employed and the more gold recovered in that section, the more encouragement will there be for persistent prospecting for other payable fields.

The construction of a second railway to connect Boundary district mines and smelters is now in progress, much to the satisfaction of mine-owners and others directly concerned in securing a reduction in railway freight charges. That a lower rate on ore will result is taken for granted, and this is an important consideration, since in the utilisation of immense bodies of low-grade ore the saving of every cent per ton possible is imperative. But this is not the only advantage that will accrue to the district, for both mines and smelters will also be greatly benefitted by the provision of increased facilities for transportation of Rossland ores to the Boundary smelters and Boundary ores to the Northport works, which interchange of ores will secure to the smelters a better smelting mixture with resultant mutual advantage in the direction of the increased tonnage it will be practicable to smelt at reduced cost. Further, the building of a spur from the Great Northern system to the Granby smelter will make it possible for those works to obtain a coke supply over that railway when necessary. The C. P. R. has undoubtedly been the chief factor in the very considerable development that has taken place in the Boundary during the last four or five years, but a monopoly is never a good thing for those who do not possess it, whether in railway or any other business, so the breaking of this monopoly is gladly hailed in the parts of the Boundary affected by it. That the Great Northern will be encouraged to further extend its lines in the big copper-producing camp of the Dominion is much to be desired.

The Director of the Geological Survey calls attention, in the recently-issued Summary Report for 1903, to the fact that by far the largest proportion of the work of the Survey is directed to investigating and aiding the development of the mineral resources of the country. He claims that results have shown that the various regions for the field of operations of the season 1903 were judiciously chosen, and that the several portions of work done proved to be those most needed to meet present requirements. Our purpose in here noting this claim is not to question it. Indeed the knowledge that experienced and fully competent members of the Survey were last year engaged in field-work in the comparatively little-known Lardeau country, studying its topography and geology; in the Rocky Mountains, seeking a supply of coal near the main line of the Canadian Pacific Railway; in the Peace River region, ascertaining the true character of the land and climate of the upper or western portion of that section, now outlying but which may a few years hence be traversed by a transcontinental railway; in the Yukon, seeking information looking to the provision of a better water supply, upon which

depends the maintenance of a large production of gold in that district in years to come, as well as in investigating evidence of the local origin of the gold of the Klondike area; and in the very necessary work of locating the 49th parallel in the western mountain region between this Province and the State of Washington—this knowledge itself is testimony to the recognition by the Survey Department of the importance of the Pacific slope portion of the Dominion as regards its economic mineral resources. The acknowledgment of this recognition is a pleasing duty and one that we have much gratification in performing. We also acknowledge, with much appreciation, that this season, too, British Columbia and adjacent territory have been allotted a liberal proportion of the members of the Survey, and we look forward to the west benefiting considerably as an eventual result of their arduous labours.

In the summary report of the Geological Survey Department of Canada for 1903 appears a suggestion, made to the Minister of the Interior, by Dr. Robert Bell, Acting Deputy Head and Director of the Survey, which is of especial interest to British Columbia. This suggestion proposes a permanent exhibit in New York City of a collection of the economic minerals of Canada. Dr. Bell's recommendation—for it may be regarded as such—is timely and thoroughly practical. It is as follows: "As much of the capital for the development of the mineral wealth of Canada has heretofore come from the City of New York, and as it would be very desirable to encourage further interest in our mines from this quarter, it may be advisable, considering the small cost that would be incurred, to place a collection of our economic minerals on permanent exhibition in that city. Looking forward to the possibility of this, I conferred with Professor Bickmore of the American Museum of Natural History on the subject, and found that he was very favourably disposed to assist in this proposal. If the matter be followed up, it may result in the establishment of a valuable agency there at very trifling cost. A similar collection is already installed at the Imperial Institute in London under the care of Professor Dunstan, Director, and Mr. Harrison Watson, Canadian Agent. "Already the development of the mineral resources of British Columbia has been materially contributed to by American capital. For instance the most productive copper camp in the Province, and for that matter, in the Dominion,—the Boundary district—owes much of its development to American capital, for the British Columbia Copper Company, owning the Mother Lode mine and the smelter at Greenwood, is a New York organization, while the big mining and smelting enterprise of the Granby Company has received financial aid from the United States towards the accomplishment of its later important results. Numerous other instances of the expenditure of American money in British Columbian mining undertakings might be mentioned were it necessary to narrate them, which it is not, since many of them are well known to mining men of the Province. American enterprise appears to generally be more suc-

cessful in connection with mining in this Province than does British, while at the same time it is not so prejudiced against British Columbia in this connection, so it would seem good policy to encourage in every legitimate way the further investment of American money towards utilizing the enormous mineral wealth this Province undoubtedly possesses. Canada is at the present time obtaining an effective advertisement through the fine mineral display it is making at St. Louis Exposition, and British Columbia will, no doubt share in the substantial benefit that may reasonably be expected to result; but there is no need to rest content with having taken one effective step in the right direction. If Dr. Bell's proposal has not yet been acted upon, it is to be hoped that no more time will be lost in carrying it out than is absolutely necessary. We suggest to British Columbian members of the Dominion Parliament that their influence and efforts may well be directed towards inducing the Federal Government to act promptly, if it has not already done so, in the direction suggested by the Director of the Geological Survey, for British Columbia has much to gain and nothing to lose by the adoption of such a course.

We have received from the Institution of Mining Engineers, England, a printed copy of a paper, entitled "The Smelters of British Columbia," by Mr. W. Denham Verschoyle, read before the Institution at a general meeting held in London last year. While we are always glad to find publicity being given to the mining and smelting industries of this Province, we cannot think that the permanent usefulness of the information afforded is determined chiefly by its accuracy. Mr. Verschoyle's paper is sadly lacking in this respect. It appears to be very much an accumulation of selections from matter that has been published from time to time, made without sufficient information as to its reliability or otherwise to ensure even a general correctness. To this has been added some tables of statistics from the report of the Minister of Mines, and some generalisations and not always accurate conclusions. It has not even the merit of consistency. For instance, the introduction opens with the statement that "Mining in British Columbia is at present in a rather unsatisfactory state," etc., while the same paragraph closes with the contradictory statement that "many of the mines are coming to the front, and the value of the mineral-production is expanding every year at a rapid and satisfactory rate." Then follows a table from which the reader gathers this "expansion" took the surprising form of a decrease of \$2,600,230 in total value of production in 1902 as compared with that of 1901. There is no explanation of the fact, well known to us here in British Columbia but not to the great majority of those in Great Britain to whom Mr. Verschoyle was communicating information supposedly full and intelligible, that though the total market value showed a decrease, the total quantity of mineral produced did the reverse. Other inconsistencies and inaccuracies mar a paper that, in careful hands, might have been a decided benefit to the Province. A few of these will

be mentioned. On page 6 the Granby smelter is shown to have six furnaces; on page 7 the statement is made that "The smelter consists of two double-decked, steel-jacketed furnaces." Again, it is stated that the Mother Lode mine, near Greenwood, shipped during the year 1902 45,000 tons of ore, while as a matter of fact it shipped 138,007 tons. But it would be tedious to follow Mr. Verschoyle through his many inaccuracies, so only two more will be pointed out. Said he "The cost of mining (in the Boundary district) has been reduced as low as \$1.06 and is a generally difficult problem, on account of the large size of the deposits." Our information has been that the cost of getting out and loading on the railway cars the great bulk of the ore shipped by the Mother Lode and Granby mines has been less than \$1. per ton. The other inaccuracy referred to is contained in the following: "It seems not unreasonable to assume that, with competition, coal should be sold at \$1.25 and coke at \$2.50 per ton." In this Mr. Verschoyle has gone one better than Mr. W. Blakemore, who was radical enough to assert that "effective competition would reduce the charge for coal to \$1.50 and for coke to \$3. at the ovens, and possible a little lower." Mr. Verschoyle's method was, doubtless, a laudable one in preparing the paper under notice, but, unhesitatingly admitting this, we cannot but think that he had far better not have prepared it than have submitted it without careful verification of his statements.

Sometime last March, if we remember aright, the *Nelson Daily News* published a letter purported to have been written by a Mr. O. M. Rosendale, describing himself as a consulting Metallurgist and Mining Engineer, of Portland, Oregon, to a Rossland broker. This letter which had to do with the sale of a group of mineral claims, contained certain proposals which could never have emanated from an honorable man of business, and we therefore heartily endorsed the view taken of the matter by the *Daily News*, who described the letter as a "rascally production" and the author thereof "a fakir." Mr. Rosendale now writes us that having returned to Portland after a lengthy absence, his attention has been called for the first time to the paragraph in respect to him in our April issue, and concerning which he waxed extremely indignant. We quote: "In a few words will say, that my answer to the unwarranted attack upon my person, my integrity, and also my veracity will be forthcoming in the courts of British Columbia. I am sure that in no other instance has there been displayed such disregard for established usages among newspapers as has been shown in these articles, originally appearing in the Nelson paper, and gleefully enlarged upon by your article. Neither you or the Nelson paper have even tried to ascertain whether or not the contention you presume to exist were founded on fact or not. I suppose any old charge against me, no even murder excluded, would have served your purposes as well.

"You in British Columbia are wont to dwell upon the yellow journal methods across the line, yet I assure you, not one respectable or if you please sev-

sational, or yellow journal would have gone to the length of your and the Nelson paper cable tow. I am not dictating, neither advising you as to business methods in connection with running a paper, thinking that you are competent enough to do so, yet, permit me to express my astonishment over the fact that you did not try in the least to ascertain from this side, either direct or through some channel of your own choosing, whether or not these accusations were true; especially when you proceed to destroy a man's honorable standing and all that which is nearest and dearest to any man's heart—outside that portion of beings not confined behind prison walls.

"Be assured that I will do all within my power to bring home to you the truth contained in this letter."

In reply to Mr. Rosendale's communication we have informed him that we shall of course be very happy to do all in our power to make amends for any injury done him by our comment on the letter of which he is alleged to be the author published in the *Nelson Daily News*, provided he, Mr. Rosendale, can satisfy us that the conclusions at which we arrived, and the conclusions at which any one after reading the letter in question would arrive, touching the questionable-ness of his methods, are incorrect. To do that it will be necessary for him to prove that he was not the author of the letter to the Rosland broker, and that it was not dispatched at his instance, or with his knowledge and consent.

The report of the Tyee Copper Company, Ltd., for the year ending April 30th, 1904, is eminently satisfactory, and the company is again to be congratulated on the success of its efforts. The Tyee is a promising mine; but there have been other good mines in the Province from which equally good results have not been obtained. Even good mines require good business management. During the year it has been demonstrated that the Tyee, instead of having several small ore-bodies, as was at one time supposed, has one large body of ore traversing the entire length. At the Ladysmith smelter 56,050 tons of ore were treated, producing 5,454 tons of copper matte, valued at, less refining charges, \$678,836. The company's profits on the year's operations were stated in the summary report of the directors to have been £25,390, out of which the directors recommend the payment of a second 5 per cent. dividend, thus making 10 per cent. paid during the year. But this statement is extremely misleading, though easily enough explained. Thus in addition to the earnings of £25,390, the large sum of £22,125 was placed to reserve, £9,500 was expended out of revenues upon mine and smelter betterments, £3,090 was written off for depreciation, and these and other items increase the actual earnings of the company during the year to over £65,000 or rather more than 30 per cent. on the issued capital. At the recent annual meeting some of the shareholders present objected to the manner in which the accounts had been set forth, criticizing in particular the large sums written off for depreciation. We can understand the feelings of these gentlemen, who doubtless anticipated that the

value of their share holdings would have been appreciated had the directors pursued a less conservative course. But after all the function of a Board of Directors is not to influence stock market quotations, and we have nothing but the highest praise for the business like and prudent policy that is being followed in the present instance. Shareholders should meanwhile not forget that the undertaking in which they are embarked is still young, that the future of the mine, in which there is but a year and a half's supply of ore at present developed, is not assured beyond that period, and they should then recognize that far from there being reason for complaint in the manner in which earnings have been apportioned, those responsible for the financing of the company have displayed commendable judgment. Had the same policy been followed by other mining companies, both British and Canadian, operating in the Province during the past ten years, the industry would now be in a very different position.

In a circular letter issued to the members of the Executive Committee of the Provincial Mining Association, the president, Mr. John Keen, makes the following statements: ". . . The Government are indisposed to aid us in our endeavours to clear the Mining Acts of such ambiguities as have been by the courts declared to exist therein. The Government have gone so far as to declare that it is not their policy to even amend the mining Laws by legislative enactment to meet isolated cases which may be brought before the courts of the Province, thereby showing that legislative errors must be rectified by the courts rather than by the Legislature. In the Kootenays, this Executive action has caused considerable discontent and unrest, and this has, in its turn, caused capital to be indifferent about our resources; for the protection given to those who would develop these resources is of too doubtful a character to encourage the development and exploitation of our mineral wealth and the permanent investment of capital. In other words, the Government say—in effect—'pay your fees for the licences, but go to the courts to obtain the property we licensed you to acquire; and, at the same time, please understand that we do not guarantee quiet enjoyment of the title.'" In some quarters these statements have been stigmatized as "too strong," "too sweeping," or if true, then injudicious. They are either true or untrue. If true, then the truth should be proclaimed without reservations, or fear or favour. That has always been the policy the *MINING RECORD* has endeavoured to follow at any rate. The evidence on which these charges—for they amount to charges,—is based, is seemingly both direct and indirect. The Government has certainly displayed no disposition to act on the recommendations, good, bad or indifferent, of the Provincial Mining Association. On the contrary, a direct refusal has been given to the request that remedial legislation be introduced to correct a peculiarly pernicious instance of bad law-making. If the mining industry were in a more prosperous condition these relatively small matters would

be of little moment. There were bad and unjust mining laws, a thousand times more arduous than our B. C. laws, which merely require a little overhauling to make them good, in force in South Africa before the war, but capital flowed in in a steady stream in spite of bad laws and inequitable taxation. But a very little unfortunately just now is sufficient to keep capital out of British Columbia, and the Tange case may easily enough be cited as an instance of the inadequacy of our law to protect the purchaser of mineral property. It is possible Mr. Keen in the final paragraph quoted, intends some reference to the policy pursued by the Government in the issuance of oil licences in East Kootenay. If so, we do not agree with his conclusions. In issuing these licences, it was impossible for the Government to tell, for reasons that are quite obvious, whether one or more applicants had applied for the same location, and consequently quiet enjoyment of title could not be guaranteed. Here plainly were questions for the courts to decide. Meanwhile the Province would derive great benefit if it were possible for the Mining Association to work with the Government and not seemingly against it. But if there is a lack of sympathy and a spirit of antagonism, the fault, we think, does not lay with the Mining Association.

Those who are of opinion that the Provincial Government and Legislature have little practical sympathy with the mining industry and, consequently, show no disposition to assist it, may feel a trifle envious of those engaged in mining in the State of Victoria, Australia, where, in opening the State Parliament recently the Governor of Victoria, in the course of his address to the Legislature said, "It is intended to provide plant to carry on boring operations in various parts of the State for prospecting for gold and coal. It is also intended to extend the provisions of the Mines Development Act and to provide loans for the assistance of companies and parties developing auriferous areas." State aid to mining is no new-fangled notion in Australia. For many years Victoria has assisted, by a Government annual appropriation, *bona fide* underground prospecting, such monetary aid having been first recommended by a board or council appointed for that purpose. Not a few times have good results ensued that otherwise would not have been secured; nor was the repayment of the money thus advanced by the Government an unheard-of thing, when the company or parties assisted made a financial success of the venture that had received the timely help to enable it to be carried through to success. In other directions aid is freely given to mining by one or the other of the Australian Governments (we are not referring to the Federal or Commonwealth Government)—State reduction works, schools of mines, mining publications, etc. New Zealand has during 18 years to 1903 expended 36,114 pounds (more than a yearly average of \$10,000 over the whole period) in aiding schools of mines, and other like useful expenditures might be cited. What a contrast to the attitude of the British Columbia Legislature generally, and the Provincial Govern-

ment particularly, towards the mining industry of the 'Mineral Province' of the Dominion. It is consoling, though, to think that neglect to foster the mining industry cannot be perpetuated indefinitely. The mining sections of the Province are steadily becoming more populous, so that there is little doubt the industry will eventually be aided in deserving directions.

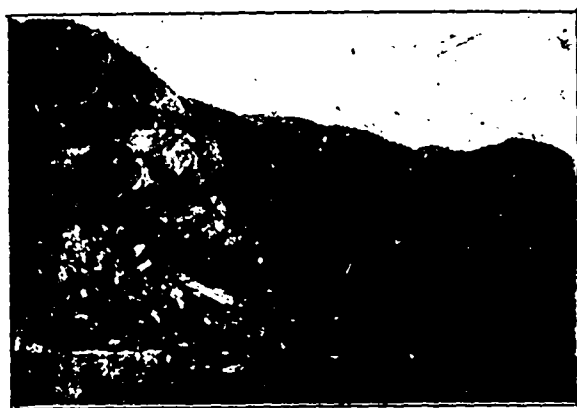
The withdrawal of the reserve in the case of mineral-oil and coal lands in the Flathead Valley district of East Kootenay, has resulted already in the organization of companies and syndicates to exploit this promising territory. Of these the first, we believe, to incorporate under the laws of the Province, is the Flathead Valley Oil Lands Development Co., capitalized at \$250,000, whose prospectus is now before us. The objects of this company are those of acquiring "prospepecting licenses, prospecting for oil, and buying and selling oil lands" in the district in question, arrangements having been made to acquire licenses over 1,280 acres of oil lands on Akamina Creek and over 2,500 acres of lands on Squaw Creek, which enters the Flathead River north of Sage Creek, the locators of these areas having agreed to accept shares in the company in exchange for their rights thereto. The company also contemplates the acquisition of other lands in Sage and Calder Creeks as well as the securing of at least ten claims, involving an acreage of 6,400 acres, and by the sale of portions, the promotion of dependent companies, or by the application of its own funds, to vigorously prosecute the development of its holdings. It is for this purpose the above options have been secured, and others are now being negotiated. The prospectus points out that as the country is developed, the company's resources for the acquisition of valuable property and its profitable exploitation will increase and, provided the territory does not entirely disappoint reasonable and well-grounded hopes, its profits should be increasing every year in a very remarkable degree. However, the first discovery of oil, whether it is found on the lands being acquired by this company or not, will greatly enhance the value of these lands, and will enable the company to dispose of them on advantageous terms, as well as to retain a large interest in the oil industry of British Columbia to be established, it is hoped, through the development of the Flathead Valley. In subscribing for shares in this or any other company formed to exploit the oil resources of the Flathead Valley the investor is manifestly taking large speculative risks. All that at present is known in respect to oil occurrences in East Kootenay, is that the indications are remarkably, we might say pungently, promising, and that an eminent authority, the late Dr. Selwyn, supported since by other testimony, encourages the supposition that a development of the oil resources of the district may be profitably undertaken. The fact has yet to be established, and the investor in the shares of the development companies now being formed is speculating on that likelihood, and the assurance that if oil is found in commercial quantities his investment will be an extraordinarily remunerative one. In the case of the pre-

ent company, the moderate capitalization, the fact that the directors are men of integrity and good business standing, and that claims in the very centre of the supposed oil lands have already been secured, are factors contributory towards a successful issue.

THE NICKEL PLATE MINE AND OTHER PROMISING CLAIMS AT CAMP HEDLEY, SIMILKAMEEN.

(By Geo. E. Winkler.)

IT is beginning to dawn on the western mining world that there has been "something doing" in the middle Similkameen during the past few years, and mining men are asking questions regarding the new camp on Twenty-Mile Creek in which close on



Stamp Mill, Smelter Flat and portion of Hedley City.

two millions of dollars have been unostentatiously spent by one of the richest corporations on the continent in the purchase and exploration of mining properties and the erection of a plant suitable for the treatment of the ores that are being mined.

It is to answer this growing spirit of inquiry in a more adequate manner than has yet been attempted, that this article has been written.

During the summer of 1898 when Copper and Kennedy Mountains (twelve miles south of Princeton) were attracting attention by reason of the large bodies of copper ores found there, a few of the prospectors passing up the Similkameen Valley were sufficiently interested in the red iron-stained walls of the Twenty-Mile Canyon to turn aside and investigate the mineral possibilities of the mountain above.

Some of these were so fortunate as to pan "colors" from the oxidized iron showings they discovered, and a number of locations were made within a few weeks. Brodhagen staked the Red Mountain, Scott the War Cloud and Rollo, Johnson and Jacobson the Copper Cliff and Mound, and Wollaston and Arundel the Nickel Plate group.

It is the last mentioned property which has done most to bring the camp into prominence owing to its purchase from the locators by Mr. K. Rodgers, acting

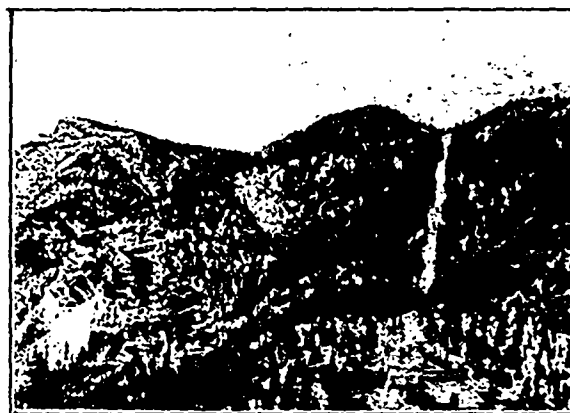
for the Marcus Daly estate, *alias* the Amalgamated Copper Co., *alias* the Standard Oil Co.

The original group of three claims—the Nickel Plate, Bulldog and Sunnyside—were bonded a few months after being located, for the sum of \$60,000. Meanwhile the company for which Mr. Rodgers is agent has been steadily acquiring locations during the past five years until it now owns sixteen full claims and fractions, besides interests in other properties still partially owned by their discoverers. The principal development has taken place on the Nickel Plate ground, where approximately 4,000 feet of work has been done, mostly in tunnelling and drifting.

The mineral-bearing area of the camp appears to be confined to rocks that probably belong to the Palaeozoic period, consisting of metamorphosed sedimentaries (in which limes predominate) much tilted in places and traversed by eruptive dykes or porphyry and andesite. The most valuable ore bodies seem to be in close proximity to the limestones, and as a rule occur in an andesite containing garnets, although quartz veins carry high gold values in a few instances.

The gold is almost invariably found in association with arsenical iron pyrites (mispickel) and a considerable proportion of it is usually free. Copper pyrites occur quite frequently, often associated with pyrrhoite. Specimens running as high as 10 per cent. in nickel have been found in the Nickel Plate, but the ore does not average enough in this metal to make its extraction important. A little cobalt is also occasionally met with. Except on one or two properties silver values are invariably low.

The Nickel Plate vein is about 8 feet wide and dips



Stamp Mill and Tramway.

to the northwest at an angle of nearly 40 degrees, the strike of the ore being north and south.

This large mineralized zone has been explored by two main tunnels from which numerous drifts have been run in various directions. It is conservatively estimated to average between \$12 and \$15 in gold, of which 90 per cent. can be saved on the plates, by cyaniding, and in the concentrates. The lower tunnel is close to 1,000 feet long and gives a depth from the surface of 300 feet. Through it the ore blocked out in the upper workings will be sent, and

also that which is broken down in the glory hole. The two tunnels and the glory hole are connected by a shaft 105 feet deep.

Running in about the same direction, but standing nearly vertical, is a 5-ft. vein which cuts the main ore body and continues down beneath it. This is termed by the miners the "gouge" vein because of its soft nature. It is extremely rich in places and specimens showing free gold are often met with: assays from it frequently run into the thousands when picked samples are tested. Its average grade is between \$60 and \$75 to the ton.

On the Sunnyside claim, belonging to the Yale Mining Co. (the name under which the owners of the Nickel Plate group have incorporated), two tunnels have been driven on separate veins, one of which was discovered in making a rock cut for the tramway, the graders unknowingly using a rich grade of ore to make the road-bed. The Sunnyside leads are somewhat smaller than the big Nickel Plate vein, though the ore is said to be slightly richer. The vein filling differs from the Nickel Plate in being of a more calcareous nature.

The Copper Cliff and Mound, purchased by the Yale Mining Co. in 1902 for \$52,000, have large showings of ore averaging about \$10 in gold and copper which have been exposed by open cuts. The possession of these two claims, like the Exchange and Iron Duke fractions adjoining, for which \$30,000 was paid, became necessary to the company because of their position. In order to treat the vast quantities of ore which the work of the past few years has placed in sight, the company commenced the construction of a forty-stamp mill and cyanide plant, near the junction of Twenty-Mile Creek with the Similkameen River, during the winter of 1902-3. This plant has recently been completed and is now in operation. It is driven by water taken from Twenty-Mile Creek by a three-mile flume capable of carrying 800 miner's inches. The fall from the penstock to the mill is 260 feet, and to the compressor plant at the creek bottom, 400 feet.

The ore is transferred from the mine—about 4,500 feet above the mill—by means of a three-mile gravity and electric tram. At the head of the gravity portion of the line, which is almost half-way between the mine and the mill, an ore bin capable of holding 700 tons has been built, into which the ore is dumped when hauled from the mine by the electric motor cars. It is then loaded into skips holding five tons each and sent to a station above the mill. From this point it is run through a chute to the crushers. The first is a 10x20 crusher which crushes to 2 inches, and the second is 6x20 and crushes to half this size. Both crushers are of the Farrell type and made by the Jenckes Machine Co. The crushed ore is carried by a belt conveyor to a second conveyor running at right angles which distributes the ore along the bin. This bin holds 1,700 tons.

A three-foot Cassel water wheel supplies power for running the conveyors and rock crushers. Through automatic Challenge feeders the ore is fed to the batteries. The pulp runs over 12-ft plates and onto 6-ft. Frue vanners, of which there are 16, the concentrates

being delivered to a bin below the vanner floor, while the balance of the tailings go to the cyaniding tanks. A 9-ft. Pelton wheel furnishes power for the batteries and a 24-in. wheel for the vanners.

The cyanide plant is the largest in the province, and is under the superintendence of Mr. A. H. Brown, who has had experience in treating the arsenical ores mined in Hastings County, Ontario. The tanks are 34 feet in diameter, 6 and 10 feet deep. There are 12 leaching tanks, 6 slime tanks, and 3 gold tanks.

One side of a forty-drill compressor is being installed below the mill with which to supply compressed air to the mine, and in the same building an electric dynamo is located. It is a 100-k.w. auternator with revolving field and supplies a 3-phase alternating current at a pressure of 2,200 volts. A sub-station at the head of the gravity tram line contains a motor-generator set which converts a 2,000 alternating 3-phase current into a 550-volt direct current for electric tram use.

The tunnels are wired and lighted with electricity, a red light system being used to show when the current is on the trolley wires. There are two telephone lines, one for operating the gravity tram, and the other for private use between the mill offices and the mine. In addition to lighting all its own buildings, the company furnishes the business places of Hedley requiring them, with electric lights at very reasonable rates.

Large and comfortable offices have been built near the mill, also warehouses, a blacksmith shop, a carpenter shop, and an assay office. It is reported to be the intention of the company to shortly enlarge its mill by adding another 60 stamps and a smelter will probably be erected about the same time. Concentrates will be made at the rate of 15 tons or so a day by the stamps now dropping.

The Dominion Government recently arranged to give the company a long lease on a portion of the Indian reserve between the stamp mill and the Similkameen River containing 145 acres. It is stipulated that this land shall be used only for mill and smelter purposes.

The only other company that has operated in Camp Hedley is the Kingston Mining Co., owning the Kingston claim on the west side of the Nickel Plate Mountain. On this property a tunnel has been driven 100 feet on the hanging wall of a 30-ft. vein whose outcrop can be followed between 300 and 400 feet. It is mineralized with chalcopyrite and arsenical iron which assays between \$15 and \$20 to the ton. The Kingston Mining Co. have suspended operations for the present owing to lack of funds.

Above the Kingston and adjoining it are the Rollo and War Cloud claims belonging to P. Scott and R. Boeing. These claims have similar showings to the Kingston, exposed mainly by open cutting, and carrying about the same values.

The Climax and I. N. L. claims are located in the same vicinity and belong to Geo. Cahill, J. F. Campbell and M. K. Rodgers. On the I. N. L. a 3-ft. vein has been stripped for 300 feet which runs \$40 in gold.

Below the Kingston are the Toronto and Galen claims owned by P. Scott, on which a large body of ore

has been traced for 1,000 feet or more. It appears to be a parallel lead to that on the Kingston, though of greater extent and lower in grade, averaging \$7.50 to \$8.00 in gold and copper.

Up the Twenty-Mile a short distance, on the Duffy group, are some fine showings of yellow copper in a

copper. The surface croppings of ore are from 70 to 80 feet in width and the dyke in which they occur can be followed for 1500 feet or more.

Some distance above the Duffy group and nearer to the Nickel Plate is the Red Mountain claim owned by Brodhagen, Murphy and Green. This claim has a



Flume up the Twenty-Mile Canyon.

lime dyke. A considerable amount of development work has been done on these claims, and where the greatest depth has been reached by tunnelling, it is noticeable that the copper values decrease while gold values increase. The matrix also changes with depth to rock of an andesitic character. Assays taken from the face of the longest tunnel show \$18 in gold and

surface showing of ore running from \$2 to \$15 which is exposed for between 700 and 800 feet, and is over 50 feet in width. A large number of open cuts have been made in ore of a massive nature, containing phyrrotite, iron pyrites, arsenical iron and chalcopyrite. The property is well situated for economical working as it could be explored entirely by tunnels.

The lead is a conspicuous landmark, appearing at a distance as a big red band across the face of the steep mountain side.

Near the Red Mountain the Windfall claim, owned by Geo. Cahill *et al*, has a large showing of ore on which a tunnel has been driven.

Between the Windfall and the Nickel Plate, Jos. McDermott and E. Tennesen have recently uncovered a fair sized vein running \$40 in gold on their claim, the Edwin Fraction.

Adjoining the Nickel Plate group on the north is the Humming Bird group of four claims, owned by J. J. Marks. A 25-ft. shaft has been sunk and several open cuts made, close to the Nickel Plate line, exposing a large body of ore giving assays as high as \$28 in gold. Sufficient work has not been done as yet to satisfactorily determine either the extent or grade of this promising showing.

On the Snowflake group, also belonging to Mr. Marks, a tunnel has been driven 190 feet on a vein of arsenical iron from which good assays are obtained.

Probably the most attractive of the undeveloped properties in the camp is the Golden Zone group owned by Marks, Brodhagen and Murphy and situated four and a half miles north of the Nickel Plate mine. The claims in this group were located on a 4-ft. vein of white quartz running \$5 to \$15 in gold and silver. In tracing this lead by shallow shafts and open cuts the locators discovered what at first appeared to be two separate veins running in the same direction and differing from the white quartz in that they carried great quantities of arsenical iron. Later work, however, would indicate that the largest of these arsenical showings is in reality a continuation of the white quartz vein, the lead having widened to fully 20 feet and improved greatly in grade. The smaller vein is clearly a parallel one and at its eastern end assays from \$30 to \$120 in gold and \$1.60 in silver, for a width of 4 feet averaging between \$80 and \$90. The two veins are within 70 feet of each other. The arsenical showings are over 1,000 feet from the outcrop of the white quartz vein where first discovered.

The arsenical iron in these veins is of an extremely massive fine-grained nature and throws off a peculiar greenish stain which seems characteristic of this iron where it carries high gold values in Camp Hedley. When decomposed on the surface it is almost blood red in colour, and a small quantity of this oxidized material washed in a gold pan shows a long string of fine colours. A sample of this oxidized ore taken from the 20-ft showing assayed \$87 in gold. Work has been confined principally to the surface, the deepest shaft being down 50 feet on ore running \$10 to the ton. This sinking was done before the finding of the richer ore further along the vein.

There is plenty of water for the operation of a large stamp mill close to the property and the building of a road six or seven miles to connect with the Nickel Plate road from Penticton would render it possible to bring in machinery.

Four miles east of the Nickel Plate the Blue Diamond group of four claims has been staked by Jno. Lodge and W. McDonald on a 2½-ft. quartz vein in

granite and porphyry. The ore shows ozurite, melachite and chalcopyrite and is said to run between \$60 and \$70 in gold and silver. A tunnel has been driven 90 feet on the vein. The property is one of considerable promise and has the advantage of being within a few hundred yards of the Nickel Plate wagon road.

Between the Blue Diamond and the Nickel Plate are the Boston and Pittsburg claims, owned by the Stumps estate. The Boston has a lead bearing pyrrhotite and arsenical iron which is 150 feet wide and carries \$12.50 in gold. This property was bonded in May, 1902 by M. K. Rodgers for \$30,000 and about \$10,000 was spent on it, but the disappearance of the owner caused some difficulty and the bond was not taken up. A continuation of the Boston vein is found on the Greenwood claim adjoining, which belongs to D. Woods. The Greenwood ore averages \$15 in gold.

Some distance south of the Boston and east of the Nickel Plate, T. J. Gorman has recently discovered a 40-ft. vein of arsenical iron on the Eldorado group. This ore resembles closely that of the Nickel Plate, native gold being visible in some specimens of it. The group was located some years ago on a showing of pyrrhotite carrying a little yellow copper and giving assays as high as \$14.30 in gold. The recent find of arsenical pyrites greatly increases value of the property.

The Yorkshire Boy adjoining the Eldorado group has a 6-ft. vein of pyrrhotite and yellow copper assaying from \$2 to \$52. It is owned by A. Aberdeen.

Southwest of the Nickel Plate group the Horsefly claim, owned by Wollaston and Arundel, has a 5-ft. vein of arsenical iron assaying \$24 in gold which has been exposed mainly by open cutting. This lead pans gold freely on the surface.

Up the Similkameen River a few miles from the Nickel Plate Mountain and on the opposite side, H. C. Pollock has located the Maple Leaf group on two white quartz veins carrying gold in arsenical iron. One lead has a 2-ft paystreak running \$20 to \$30 in gold, and the other has two paystreaks assaying somewhat higher. Both veins are between 6 and 8 feet wide. A 55-ft. tunnel has been driven with the object of cutting one of the veins at depth.

NOTES ON THE SEPARATION OF GOLD, SILVER AND PLATINUM.*

(By H. Carmichael, Assayer to the Government of
British Columbia.)

As I had occasion to examine a number of black sands for the platinum group of metals, I made a careful search amongst the leading text-books on assaying and analysis for methods which would aid me; the records of the different chemical societies were also examined, but the data obtained from these sources were of the most meagre description and n :

*Reprinted from the Journal of the Society of Chemical Industry, 31 December, 1903. No. 24, Vol. XXII.

very reliable. As an aid to devising some rapid and efficient method of analysis the following experiments were made, which largely speak for themselves:—

Osmiridium.—The separation of the osmiridium group from the noble metals does not present any special difficulty if little silver be present. The ore or black sand is fluxed in a crucible in suitable manner and the lead button cupelled; the resulting bead is rolled out and boiled with dilute sulphuric acid (1 to 10), letting the acid gradually grow stronger; then, after washing, by boiling with nitric acid, again washing and dissolving in *aqua regia*, the osmiridium group alone remains, with perhaps a trace of silver chloride, which may be removed by solution in ammonia. The separation of gold, silver, and platinum presents some difficulty, as the following experiments will show:—

Separation of Platinum from Gold.—Alloys of the composition shown in Table I. were made by wrapping the metals in sheet lead and cupelling. As the experiments gave negative results as far as method of separation was concerned, a series of alloys were made as shown in Table II., gradually decreasing the proportion of platinum to gold.

A number of experiments were made with the alloy, with the same result as that given. After finding that platinum would separate out with this low ratio of platinum to gold, a number of experiments were conducted to ascertain how a higher ratio would separate. The result of one of these experiments is given in Table III.

With 10 mgrms. to the same amount of gold some of the platinum was left in the cornet, so that 7 per cent. of platinum to gold seems to be the highest ratio that can be successfully parted.

400 mgrms. of added silver were found to part as successfully as 500 mgrms., and at the same time to give a more compact cornet, not so liable to break up.

The action of mass seems to play a part in this separation, as 7 mgrms. of platinum, added to 100 mgrms. of gold, parted successfully, but when double the quantity of both metals was taken, as in the alloy of 14 mgrms. of platinum to 200 mgrms. of gold, the cornet did not part; but by increasing the gold to 300 mgrms. it did part. A number of experiments were then made with a view of separating the silver from alloys of gold, platinum, and silver. The results are given in Table V.

A series of alloys of silver and platinum without any gold were also parted, both in nitric and sulphuric acids, but no satisfactory results could be obtained. A separation of platinum from a gold and silver alloy was also attempted by precipitation as potassium chloro-platinite. This, however, presents many difficulties; the alloy is for practical purposes insoluble in *aqua regia* owing to silver chloride being precipitated on the cornet and preventing further action. This difficulty may to a certain extent be overcome by first parting in sulphuric acid and then taking out the last of the silver with nitric acid, washing, and dissolving in *aqua regia*. To precipitate platinum with potas-

sium chloride requires that the solution be fairly concentrated; in doing this it is difficult to prevent the gold chloride from decomposing and precipitating metallic gold. Potassium chloride is to be preferred to ammonium chloride in precipitating platinum, owing to its being slightly less soluble in alcohol.

I desire to express my thanks to Mr. D. E. Whitaker, Government Assistant Assayer, for his aid in carrying out these experiments.

TABLE I.

Alloy.	Result.
Mgrms. Gold..... 100 Platinum.. 100 Silver.....1,000	Cupelled, rolled, and boiled in strong HNO ₃ . Platinum did not part properly.
Gold..... 100 Platinum.. 100 Silver.....1,200	Cupelled, and parted in strong HNO ₃ : resulting cornet weighed 113.5 mgrms., showing 13.5 mgrms. of platinum retained by cornet. Duplicate, same result.
Gold..... 100 Platinum.. 100 Silver.....1,500	Cupelled, and parted in strong HNO ₃ : cornet weighed 113.5, showing 13.5 mgrms. of platinum retained by cornet. Duplicate, same result.
Gold..... 100 Platinum.. 100 Silver...2,000	Cupelled, and parted in strong HNO ₃ : cornet weighed 112.5 mgrms., showing 12.5 mgrms. of platinum retained by cornet. Duplicate, same result.
Gold..... 100 Platinum.. 100 Silver.....5,000	Cupelled, and parted in strong HNO ₃ : cornet weighed 95 mgrms., showing that a loss had occurred.

NOTE.—In the last experiment the platinum had not all parted out, giving a dull gray colour to the gold cornet; the cornet was also partly broken up and the particles floated as a fine powder on the parting acid. A loss was occasioned in this manner, and also perhaps by the amount of nitrous oxide evolved in the solution of the large amount of silver.

TABLE II.

Alloy.	Result.
Mgrms. Gold..... 100 Platinum.. 20 Silver..... 300	Cupelled and parted first in 21° B. and then in 32° B. HNO ₃ : resulting cornet weighed 102.7 mgrms., showing 2.7 mgrms. of platinum left in cornet. Duplicate, same result.
Gold..... 100 Platinum.. 15 Silver..... 400	Cupelled, and parted twice in 32° B. HNO ₃ : resulting cornet weighed 101.2 mgrms. Duplicate weighed 100.2 mgrms.
Gold..... 100 Platinum.. 10 Silver..... 300	Cupelled, and parted first in 21° B., second in 32° B. HNO ₃ : resulting cornet weighed 100.5 mgrms. Duplicate weighed 100.4 mgrms.
Gold..... 100 Platinum.. 10 Silver..... 500	Cupelled, and parted in first 21° B., second in 32° B. HNO ₃ : resulting cornet weigh'd 100.2 mgrms. Duplicate, same result.
Gold..... 100 Platinum.. 5 Silver..... 500	Cupelled, and parted first in 21° B., second in 32° B. HNO ₃ : resulting cornet weigh'd 100 mgrms., showing that the platinum had all been removed, except perhaps an unweighable trace.

TABLE III.

Alloy.	Result.
Mgrms. Gold..... 100 Platinum.. 7 Silver.... 400	Cupelled, and parted first in 21° B., second in 32° B, HNO ₃ : resulting cornet weighed 100.2 mgrms.

TABLE IV.

Alloy.	Result.
Mgrms. Gold..... 200 Platinum . 14 Silver.... 800	Cupelled, and parted in 21° B. and 32° B HNO ₃ : resulting cornet weighed 200.3 mgrms., showing 0.3 mgrm. of platinum retained; cornet broke up in parting. Duplicate was parted in 21° B., still more diluted and did not break, and weighed 200.3 mgrms.
Gold..... 300 Platinum. 14 Silver.... 900	Cupelled, and parted in 21° B. and 32° B HNO ₃ : resulting cornet weighed 300 mgrms. This would show that as a larger quantity of platinum has to be parted gold must be added in increasing ratio.
Gold..... 200 Platinum . 10 Silver.... 600	Cupelled, and parted in 21° B. and 32° B. HNO ₃ : resulting cornet weighed 200 mgrm.

TABLE V.

Alloy.	Result.
Mgrms. Gold..... 100 Platinum . 100 Silver ... 500	Cupelled, and parted in strong H ₂ SO ₄ : resulting cornet weighed 204.7 mgrms., showing 4.7 mgrms. of silver left behind Duplicate, same result.
Gold ... 100 Platinum . 100 Silver.... 500	Cupelled, and parted in strong H ₂ SO ₄ ; then in strong HNO ₃ : resulting cornet weighed 204 mgrms. Duplicate weighed 200.6 mgrms.
Gold ... 100 Platinum. 5 Silver.... 300	Cupelled, and parted in dilute H ₂ SO ₄ : resulting cornet weighed 105.5 mgrms. Duplicate weighed 105.2 mgrms.
Gold.. ... 100 Platinum.. 5 Silver.... 300	Cupelled and parted in dilute H ₂ SO ₄ : resulting cornet weighed 105.4 mgrms. Duplicate weighed 105.4 mgrms.
Gold.. ... 50 Platinum.. 5 Silver.... 300	Cupelled, and parted in dilute H ₂ SO ₄ , washed and parted in strong HNO ₃ : resulting cornet weighed 55.3 mgrms. Duplicate weighed 55.2 mgrms.
Gold..... 25 Platinum.. 5 Silver.... 300	Cupelled and parted in dilute H ₂ SO ₄ , washed, and parted in strong HNO ₃ : resulting cornet weighed 30.3 mgrms. Duplicate cornet weighed same.

NOTE.—This last experiment showed 0.3 mgrm. of silver retained or 0.1 per cent., which was the best result obtainable, while it is not entirely satisfactory; a close assay could probably be made by running through a proof alloy under similar conditions and deducting the surcharge of silver found from the regular assay.

POPLAR CREEK AND OTHER CAMPS IN THE LARDEAU DISTRICT*

(By Prof. R. W. Brock, Kingston, Ont.)

THE term Lardeau District will be used to embrace the strip of country extending south-eastwards from the northeast arm of Upper Arrow Lake and Fish River to the head of Kootenay Lake. A low valley extends through the centre of the district from the northeast arm to the Duncan River and Kootenay Lake, occupied for the greater part of its length by Trout Lake and the Lardeau River.

The district lies in one of the most rugged and picturesque portions of the Selkirk Mountains. The altitude of the mountains gradually increases going northward and eastward from the head of Upper Arrow Lake, from about 8,000 feet to perhaps 11,000 north and east of the Duncan River.

DEVELOPMENT OF THE DISTRICT.

The Lardeau district has been recognized as a mineral district for some time. Claims were located near Comaplix on the Northeast Arm as far back as 1888, and the Lardeau itself was prospected and staked ten years ago. From that time on prospecting has continued and the development and opening up of the district has gone slowly forward. But the district has not received as careful attention from either prospectors or mining men as its mineral indications would warrant. Several causes have contributed to this, the rugged nature of the country, its isolation and consequent distance from smelters have made it impossible to handle anything but the richest ores; prospectors decided that it was a silver-lead district only, and searched for nothing else. The depression in the silver-lead markets had a strong retarding influence on the young undeveloped district. Many claim owners in view of the high assays obtainable and regardless of the great cost of mining and transporting the ore, held their claims at prices that were prohibitive in an undeveloped district where so many natural difficulties had to be overcome. However, the district is now easily accessible and in many parts well opened up with roads and trails which greatly facilitate prospecting. A number of claims are now developed and provided with facilities for handling and in some cases treating, their ores on the spot. With the successful operation of these, and the recent discoveries of rich gold ores on Poplar Creek this summer, it is to be anticipated that the district will soon receive more attention from both prospectors and mining men.

GEOLOGY OF THE DISTRICT.

In the nature of the rocks and the character of the ores, the Lardeau has many points of resemblance to the Slocan District. The statement sometimes made that there are none but sedimentary rocks in the Lardeau is far from being correct, although sedimentary rocks are probably more widespread.

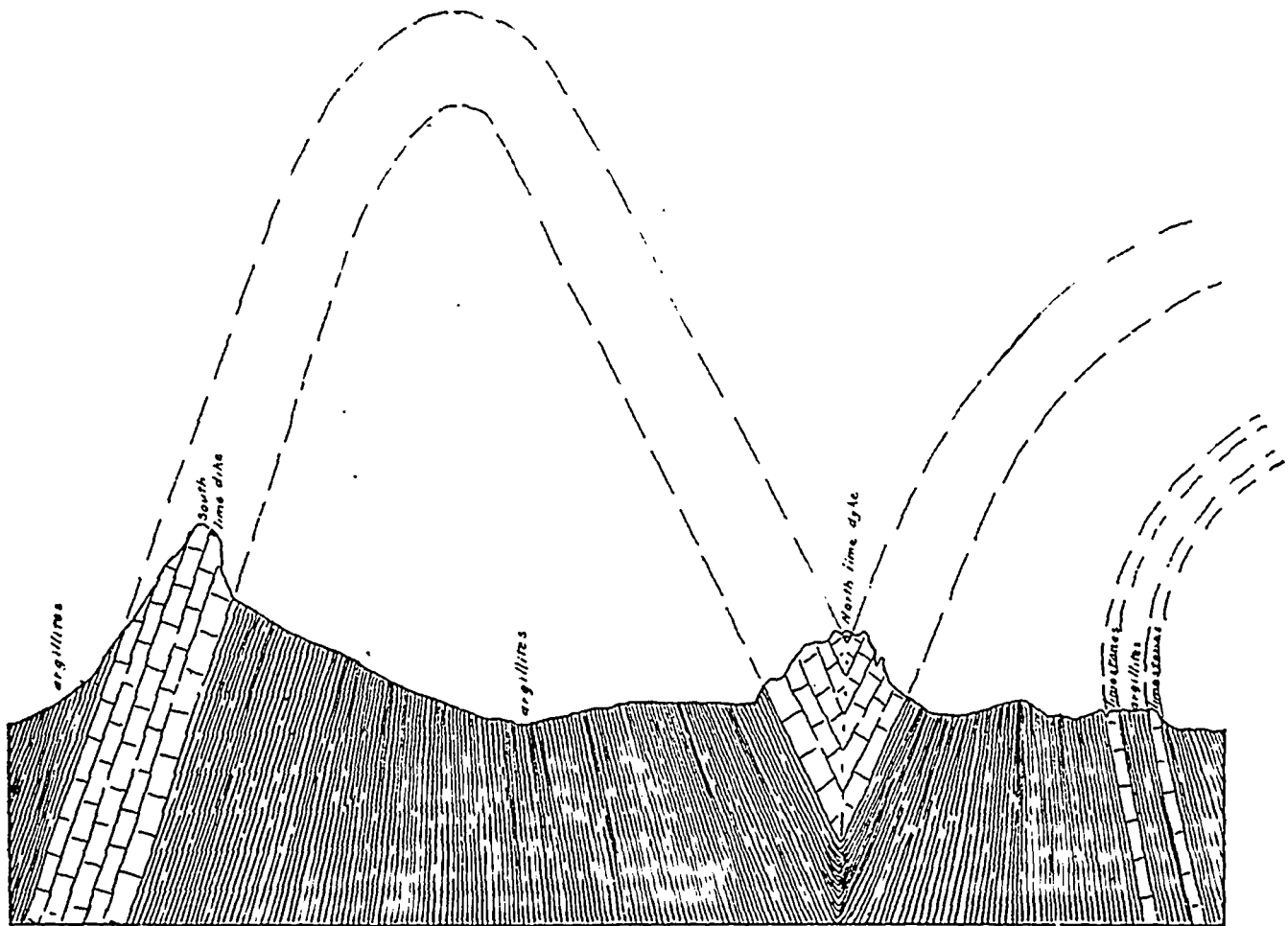
*Condensed from a paper contributed to the Canadian Mining Institute by permission of the Acting Director of the Geological Survey of Canada.

The latter consist of argillites, limestones and sandstones and conglomerates, altered by the mountain building process to phyllites, generally carbonaceous, sericite and chlorite schists, calc-schists, crystalline-limestone and quartzites, or squeezed quartz porphyries. At one or two points volcanic tuff may be recognized and some of the schists may represent altered ash rocks.

In these sedimentary rocks, often interbanded but sometimes cutting across them at low angles, are dykes and masses of diorite or gabbro porphyrites and possible augite porphyrites, but these rocks are

and in its geological relationship it is clearly seen to be an intrusive rock; microscopic examination points to its having been in all probability a diabase originally, and in this paper it will be referred to as a diabase or diabase schist. Along the south-western border of the district a white acid granite, intrusive in all the other rocks, occurs. In places it is a normal granite, in others a hornblende granite.

Aplite and pegmatite dykes are numerous at many points, even at some distance from the granite outcrops. The granite is very fresh in appearance and has escaped most of the metamorphism that the older



Section showing folding and lime dikes on ridge south-east of Porcupine Creek.

usually so altered by dynamic metamorphism that their original nature cannot be determined with precision. They are now usually in the form of green chloritic schists. Intrusive in these preceding rocks, though often interbanded with them, are small dykes of a rock which is now generally a rusty weathering schist consisting of various secondary minerals of which serpentine, quartz, sericite and carbonates are the most prevalent. In an extreme form of alteration it consists of sericite, carbonates and some limonite; the carbonates may be present in such quantity that the rock effervesces violently with acid, and might thus be mistaken for a limestone. In less altered samples,

rocks have suffered from.

STRUCTURE OF THE DISTRICT.

Since there are few well-marked horizons, and since the eruptive rocks interfered with the regular sequence of the stratified rocks, it is difficult to make out the structure of the district. Faulting adds to the complexity of the problem. Throughout the greater part of the district the rocks are tightly folded along an axis of approximately 280 degrees.** At many points

**The bearings in this paper are magnetic. The local variation of the compass is about 25° east. That is, for true astronomical bearings add 25° to the reading of the instrument.

the folds are compound, the anticline consisting of numerous small anticlines or synclines (anticlinorium).

The axes of the folds are pitching northward in the northern part of the district.

Trout Lake Valley appears to be on the south-westerly limit of a large, slightly overturned anticline. A conglomerate occurs here which might be used as a key horizon for working out the structure, but it was not noticed elsewhere. At the head of Gainer Creek the structure is revealed by the so-called "Lime Dike." The first (most south-westerly dyke) is formed by the outcropping of a limestone band in the southwest limit of an oppressed anticline. A subordinate anticline or syncline with the arch eroded lies immediately north of this, the basin of the syncline still remaining, forms the second dyke.

A few miles to the southeast, on the ridge east of Cariboo Creek, the minor fold is a syncline. A second structural feature of great regularity and importance is the jointing of the rocks at right angles to the strike. This, with the bedding planes, cuts the rocks into rectangular blocks. These two structural features, the north-westerly—southeasterly strike and high dip and the north-easterly—south-westerly jointing planes determine the chief topographical directions to the valleys and ranges conforming to these directions.

THE ORE DEPOSITS.

Three more or less clearly defined zones of mineralization may be recognized. First—A south-western belt on the slope to the southwest of the main valley running through the district, bounded on the southwest by the granite mass but with undefined north-eastern border. Second—A somewhat sharply defined central belt commencing at Fish River and extending south-eastward across Pool Creek, Beatrice and up Northern Mountain across Lardeau Creek and along Silver Cup Mountain, crossing Lardeau River about Tenderfoot Creek, and running down the southwest bank of the river across Poplar Creek, and thirdly, the lime dike belt, extending from McDougal Creek in Fish River across Boyd, Lexington Creek and the head of Pool Creek, and along the divide between the Lardeau and Duncan River basins.

FISH RIVER CAMP.

This camp, situated in the lower part of Fish River, was located as a silver-lead camp, but at present the principal development is confined to gold leads. Cambridge, the centre of this district, is situated on the central mineral belt. A somewhat narrow band of phyllite cut by the diabase schist, lie here between rather broad bands of the chlorite schists. The green chlorite schists, so far as observed, are without mineralization, but the lime dike belt to the north carries silver ores, mostly galena blende tetrahedrite and a little pyrite and chalcopyrite. Some of these deposits are high-grade, but some, as the Alma on Pool Creek, are largely low-grade.

Claims were located on the Central belt for silver lead. In 1900 an inexperienced prospector discovered a quartz vein with some specks of galena on the lower

slope of Lexington Mountain, between Pool Creek and Fish River, which he located for silver lead. Assays revealed a high gold content, and a number of gold claims were staked in this lead.

On the Eva claim the main lead has now been traced from Fish River south-eastward for about a mile, and it probably extends to Pool Creek. The lead consists of two veins lying in and along two fault planes which dip about 80° away from one another, connected by numerous cross veins and stringers. The direction of the lead is 120°, cutting the formation at a low angle. The country rock is a spotted phyllite consisting of sericite, calcite, quartz and probably feldspar and iron ore. It is cut by the diabase schist here highly altered. The vein matter is quartz, calcite, feldspar, siderite and sericite, carrying some sulphides and free gold. The sulphides are principally pyrite, sometimes well crystallized, a little galena blende. Gouge along the faults has confined the vein material between these lines. In places the vein consists purely of vein matter, sometimes banded and with divisional planes parallel to the walls or to the stratification of the country rock. Sometimes the vein holds intrusions of country rock more or less replaced by vein-stone; in other places the quartz is deposited in thin bands along the lines of stratification. The rock between the two main veins is often impregnated with vein material, besides being traversed by numerous cross veins. Such rock may assay \$2.50 per ton. The quartz will pan almost everywhere but the values are not evenly distributed.

Gold visible to the naked eye occurs in solid quartz, in seams in the quartz and along the selvage of the veins, generally in small scales or nuggets which are sometimes dusted through the rock in particles as fine as needle points. It is often concentrated along the walls or around inclusions in the vein.

As such points are often carbonaceous, the carbon may have been responsible for the enrichment (acting as a precipitant). The veins are usually higher grade when a cross vein joins the main vein. Zinc blende is said to be a good indicator of values. Pyrite is sometimes very rich. Galena may or may not carry gold values. About 2,200 feet of development work has been done. The rocks and ore on the Oyster Criterion group resemble those of the Eva. The replacement of the country rock by vein material is very plainly seen.

The vein-stone, consisting of quartz, straited or unstraited feldspar, carbonates and sulphides form stringers between the laminas of the phyllite. This vein material then eats into the rock forming cloud-like masses, and the grains of the rock gradually lose their identity; finally they are completely changed to vein matter, sometimes with nuclei of the phyllite remaining. Thus all stages may be met with in the lead between solid vein-stone and reticulating veinlets between blocks of country rock. The gold is often concentrated round these inclusions so that the mottled portions of the veins are often rich.

Three main veins are recognized: the Eva gold vein: the Criterion vein, and the galena vein. The dia-

gram will show the relationship between these veins.

The Eva and Criterion veins, if they maintain their direction, should intersect on the Oyster ground. Reasoning from analogy, when they intersect, increased values may be found, and probably cross veins and other veins be met with. The galena vein, besides the lead sulphide, carries blende and iron or copper pyrite rather heavily developed in a quartz gangue. The veins vary in width from a few inches to a number of feet.

On the Beatrice, near the head of Mohawk Creek, a quartz vein with some sericite and calcite occurs in a highly carbonaceous phyllite. Blende is perhaps the commonest sulphide. It is veined by tetrahedrite. Galena also is found of later formation than the tetrahedrite. Pyrite and chalcopyrite occur intimately mixed, veining the zinc blende, and apparently formed later than the tetrahedrite.

FERGUSON CAMP.

Ferguson is the mining centre of Lardeau Creek. The central mineral belt from Camborne crosses from the Beatrice to the Lardeau slope, continuing over Great Northern Mountain, the spur of Ferguson Mountain between the forks of Lardeau Creek and up the slope of Silver Cup Mountain to its summit. On this belt a number of claims have been located. A considerable section of the lime dike belt is also tributary to Ferguson, but on account of difficulties of transportation little work is at present in progress on the most promising claims in this belt.

The Nettie L. is situated on a spur of Ferguson Mountain, about 5,100 feet above the sea, or 2,100 feet above the towns. The country rocks are carbonaceous phyllites or slate. Some quartzitic rocks already referred to occur in the neighbourhood together with dykes of the diabase schist. The average strike of the rocks is about 280° but varies somewhat on account of folding. A synclinal fold seems to be here developed, whose symmetry is disturbed by faulting. The dip and strike at any point will therefore depend on its position in the fold.

About 6,000 feet of work have been done in two claims opening up three leads, known as the main, the cross leads and the big quartz vein. These veins are for the most part independent of the strike of the rocks. On the Ajax claim adjoining the Nettie L. to the east, and belong to the same company, the lead opened up appears to follow the bedding of the rocks in seams and reticulating veinlets. The rocks here are folded into a canoe-shaped syncline. The strike changes from easterly with a northerly dip, to northerly with a westerly dip. Successive portions of the ore following the beds turn northward from their original course. The ore consists of quartz heavily mineralized with tetrahedrite, galena blende and some copper and iron pyrites. When weathered, wire silver is occasionally found. Zinc blende has been the first of the sulphides to be found. It is replaced and veined by tetrahedrite. Copper pyrite veins the latter; galena is newer than the copper pyrites. Some quartz and calcite have been developed after the sulphides. Sericite is found sparingly in the quartz gangue. The

vein matter may form a solid mass or may occur as numerous reticulating veins or stringers in the rock. Replacement of the country rock by vein material has often occurred. Beside the silver and lead values some gold is obtained from this ore.

The Silver Cup mine is also to the south of Lardeau Creek near the crest of the Silver Cup Mountain. About 5,000 feet of work has been done on the property, mostly in the Silver Cup and Sunshine claims. The country rocks consist of carbonaceous slates or phyllites, with the usual strike and dip, and dykes of the altered rusty weathering diabase schist, which while almost parallel to the slates, sometimes cuts them.

Two main leads occur running almost parallel to the formation. One of these is "blind." Connecting these parallel leads are numerous cross veins, one of which makes a large body of ore. The veins present the same characteristics as the Nettie L. vein. The ore is localized in chutes of lenticular form, some of which are of large size—one slope being 275 feet long. The chutes occur where cross fissures meet the leads. Sometimes some of the numerous slips form apparent walls to the lead, but vein matter is usually found beyond such walls. So far the ore is confined to the slate band between two parallel dykes of the diabase, although the latter rock has been mineralized with pyrite.

The character of the ore is similar to that of the Nettie L.: argentiferous tetrahedrite has been taken out in blocks up to 18 inches in diameter. Some of the richest tetrahedrite yet found has been obtained in considerable quantities in the deepest workings, 600 feet below the highest, indicating that the values are not the result of mere superficial alteration and enrichment of the vein. The first grade ore carries \$12 per ton in gold in addition to its silver and lead values.

Since these Nettie L. and Silver Cup ores have up to the present been shipped to the smelters at Trail or Nelson, the costs of smelting or mining having amounted to about \$50 per ton, so that only the richest ore could be handled. Consequently large dumps of second grade ore have accumulated.

To treat these and other low-grade ores in the mines the Silver Mill at Five-Mile has been constructed.***

The Triune mine is situated a short distance south-east of the Silver Cup, separated from it by a gulch and a small ridge. The tunnels enter the face of a cliff under a small glacier. The mode of occurrence and character of the ore is very similar to that of the Silver Cup. Indeed from the course and dip of the Silver Cup lead it is highly probable that the Triune is on the extension of the same leads. There is, however, this difference, the northern vein sometimes traverse the southern diabase dykes, and the southern vein occurs outside this dyke, with the dyke as a sort of hanging wall.

In the upper part of the mine, near the bed of the glacier, the ground is frozen throughout the summer.

***A description of this mill was published in the MINING RECORD for November, 1903, p. 857.

On account of this peculiar situation this mine has not been worked in winter, and only the richest ore can be classed as first grade ore. This mineral belt extends over Silver Cup Mountain, the Cromwell and other claims being situated on it. It probably runs along the range past the head of American and Haskins Creeks, but on account of the snow it was impossible to trace it up.

Some quartz claims carrying free gold have been found on this range, some containing feldspar and bearing a resemblance to acid facies of pegmatite dykes.

The lime dike series of rocks which extend along the headwaters of the tributaries of Lardeau and the west fork of the Duncan River, is also well mineralized. Veins occur both in the slates or phyllites or in the limestone itself. The Badshot, Mohican, Black Prince, Ophir Ludi and numerous other claims occur in this series of rocks.

Ores very similar to those of the Central Belt occur in Trout Lake and Lardeau River Valley, particularly on the slopes to the south. From the position and number of locations this may be considered as forming a third mineral belt.

The claims near the valley enjoy the great advantage of being near transportation facilities, permitting a lower grade ore to be shipped, as the freight and smelting on ore delivered on Trout Lake is from \$15 to \$18 per ton.

The Lucky Boy claim, northwest of Trout Lake City, shipped ore last summer and several other claims were being developed.

THE POPLAR CREEK DISTRICT.

The basin of the Lardeau River below Trout Lake is now usually referred to as the Poplar Creek District, since the excitement and rush into the district this summer was caused by discoveries about the mouth of Poplar Creek.

The district is not altogether new to prospectors; some of the most highly-prized claims, such as the Goldsmith, were staked ten years ago and abandoned, and some prospectors have been at work ever since.

The rocks of this lower part of the Lardeau Basin are similar to those found in the upper, and consist of greenstones and green schists, slates and phyllites with a few limestone bands and dykes of the yellow weathering diabase and the schist formed by its deformation. The veins occur on a belt of slates and diabase, dykes which crosses the Lardeau River from the northwest, above Tenderfoot Creek, and extends south-westward nearly parallel to the river across Rapid, Poplar and Cascade Creeks. On account of the snow the Silver Cup belt could not be followed southeast across the Silver Cup Mountain, but there is little doubt that the Poplar Creek belt is its southeastern continuation. Thus the lime dike series is seen up Lake Creek showing the rocks to be angling toward the river. In Rapid Creek boulders of a conglomerate similar to that found in Trout Lake, afford pretty good evidence that this band is to be found up Rapid Creek, that is, it has crossed the valley and is now away to the south-west. The veins are similar in character to those of

Fish River and Silver Cup Mountain already described, except that at Poplar Creek arsenic pyrite is occasionally found. But the introduction of a new mineral at a particular point in a mineral belt is no rare thing. In this part of the belt veins are very numerous. In some places they form a network. They usually conform to two principal directions. One set runs about 290 degrees, that is, almost parallel to the formation, though its dip may vary from that of the rocks, and the second set cross-cuts the formation running nearly north and south. The claims which have received most attention, up to the time of my visit, were the Lucky Jack, Swede Group (Goldsmith) Gold Park on Poplar Creek; North Star on Rapid Creek, the Maggie May and Handy groups near the railway at Tenderfoot.

The Lucky Jack is situated on the west side of the railway about one-quarter of a mile below Poplar Creek crossing. The main vein is exposed in the hillside about 100 yards from the track, standing out like a wall from the more easily weathered country rock. The vein is quartz two to five feet wide standing almost vertical with a strike of 338 degrees. A number of other veins occur on the property, but these have mostly the more westerly strikes.

The quartz is milky to water, while carrying a little arsenopyrite which holds free gold, galena and pyrite, with, in places, very coarse free gold liberally splashed through it in bunches, masses, fibres and plates. Gold occurs in the pure quartz, in the sulphides, surrounding the sulphides in inclusions of country rock, or, along the walls, fine gold invisible to the eye is also found. This vein has afforded some magnificent specimens, some of the finest ore found in the Province. The values are not evenly distributed; often no gold is visible though even here the quartz is said to pan.

The occurrence of sulphide and inclusions of rock appear to be favourable indications of values. The arseno-pyrite is often rich in free gold.

On the Gold Nile and Goldsmith claims, 1,400 feet above the valley and south of Poplar Creek, are a number of veins varying from a few inches to several feet in width. They are mineralized here and there with spathic iron weathering to limonites, galena and pyrites.

From one of these veins on the Goldsmith the richest specimens yet found at Poplar Creek were obtained. One such specimen was estimated to weigh five pounds, of which about half was estimated to be gold.

The country rock here consists of slate and diabase schists. In the latter is a vein heavily mineralized with galena and blende, copper and iron pyrite said to carry very high values, mostly in gold.

On the Crown King, just to the southeast, decomposed country rock, containing stringers of quartz which I panned, yielded heavily.

On the Spy Glass claim about twelve miles up Poplar Creek, the lead occurs in glassy mica schists. Here there is a quartz lead several feet wide, with bands of pyrite containing a paystreak of 6 to 8 inches heavily mineralized with blende, tetrahedrite, galena, copper and iron pyrite. Native silver is quite abund-

ant in it and argentite is probably present. Free gold is reported to have been found. This ore runs high in silver, and, it is said also, in gold.

Other claims, such as the Gold Jack group, North Star group, while the first is developed, present no new features and will be passed over.

Regarding the degree of success which will attend operations at Poplar Creek it is as yet too early to predict. This discovery of gold is certainly an important one. The veins are numerous and strong, and apparently persistent with depth. In places some of the veins are of very exceptional richness. As deep as they have been tested the character of the ore remains unchanged. The auriferous ground extends over a large area. Small stringers of quartz, such as that on the Crown King, will pan heavily. The galena vein on the Goldsmith has very high values somewhat evenly distributed.

A large quantity of what should be good pay ore is already exposed, and some very rich spots have been found.

In many respects the ore reminds one of the Cariboo in Camp McKinney, which yielded good results for years.

But information was not available on which to base an estimate of the run of mine. The values are not, and cannot be expected to be, evenly distributed, and the effect the leaner ores will have on the mill run has to be determined by actual test. If gold values should decrease somewhat with depth these deposits would conform to the general rule that free gold is concentrated in veins by surface agencies. The prospects are that some of the veins will yield highly satisfactory results, and the district as a whole merits and will no doubt receive careful exploitation.

But the success of mining enterprises depends not only on the values and extent of the ore, but on the business management. It is manifestly unfair to ask a mine to pay satisfactory dividends or over capitalization of any kind, and it is to be hoped that mistakes of this kind made in other districts will not be repeated here.

SUMMARY.

Ores, as we have seen, occur in these belts in the Lardeau, one southwest of the valley, one central from Fish River to Poplar Creek, and one along the Lardeau Duncan divide. Outside of these belts some mineralization occurs but the main deposition, as far as observed, has taken place along these lines.

The ores occur largely in the phyllites, to some extent in the limestone, and in places in the rusty weathering diabase schist, but no mineralization of importance was observed in the green schist or the gabbroidal rocks.

The mineral zones have the following characters in common: the presence of bands of stratified rocks and the occurrence of dykes of the diabase schist, by which indeed the zones may be recognized. The veins usually occur near, along or within these dykes. The veins have two principal directions nearly parallel to the general strike of the rocks and nearly at right angles to it. The veins have largely the characters of

the composite fissure type, their direction being largely determined by that of fissures in the rock, but replacement of the country rock has been an important process in addition to fissure filling. In places, and to some extent, the bedding planes of the country rock have been utilized by the mineralizers. The veins have been filled by aqueous mineralizing solutions which have brought up their load of mineral matter from below. The character of the ores is not directly dependent upon the nature of the country rock.

The relationship between the diabase schist and the ores seem to have been largely physical, determining the direction of circulation of the solutions, although perhaps the carbonates and iron of the dykes might have been reached chemically with these ores bearing solutions. The deposits may possibly have a relationship to the pegmatites, accompanying the granite intrusion. The magma from which these were formed became more and more aqueous and acid as distances from the parent mass was gained and the vein material is often rich in feldspar as well as quartz. According to economic mineral contents the veins may be divided into two groups, the silver-lead vein, rich in metallic sulphides, and the gold vein, poorer in these sulphides, but carrying free and combined gold. Except with respect to relative amounts of sulphides these two groups of veins are very similar. Both are characterized by quartz, carbonates, sericite, feldspar and the same or very similar sulphides. But the relationship between the two classes of veins is not clear. The galena vein in the Criterion at Fish River is later than one of the quartz veins but may be older than the second.

The veins are found on the highest summits and in the deepest valleys. The largest number of locations have been made on the summits, but this is to be explained by the better exposures to be found there, the prospector being there unhampered by wash or vegetation.

The values are not evenly distributed, but are localized in chutes. There is often a concentration of values round carbonaceous inclusions or carbonaceous wall rocks. Zinc blende and tetrahedrite are indicative of good values. Chutes are often found at the intersection of veins. Other indications of values will no doubt be noticed when further development has been done. It is particularly desirable that a criterion for recognizing pay quartz when gold is not visible to the naked eye should be found.

There is every indication that the veins are as persistent at depth as they are horizontally. So far as developed, the values in the silver veins have not altered in the lower workings. Since tetrahedrite, the rich silver mineral, is one of the earliest formed minerals in the vein, there is some ground for the hope that it will extend to some depth. Free gold is found at the greatest depth yet attained in the quartz claims.

WHERE TO PROSPECT.

Although all of the ground at Poplar Creek itself is staked, there remains a good deal of territory to be prospected, particularly for gold. The belt from Rapid

and Tenderloin Creek to Silver Mountain is still largely free ground and should be examined, and from Silver Cup Mountain to Camborne it should also be prospected for gold. Free gold was found in the fall in the Winslow Claim across the divide from Silver Cup Mountain. It is not certain that the belt is auriferous throughout, and this point should be settled by actual examination. Whether this belt extends south-eastward from Cascade Creek below Poplar is not known. The southwest belt between the valley and the granite contact, in which the Spy Glass occurs, is of some promise, and is mostly open for prospecting.

The lime dike series might also be re-examined for gold. Numerous quartz veins similar to those in the gold camps, occur in it under similar conditions, and it is quite probable that some of them are auriferous.

Quartz veins and some galena veins occur between Fish River Camp, the Columbia and Revelstoke, but little is known of this district. The quartz veins seen by the writer appeared rather lean, but a closer examination is necessary before this area can be pronounced to be barren, and so far as known, prospecting might be attended with success.

From what has been said it is evident that in the Lardeau we have a young district of considerable merit and promise. The initial difficulties attendant upon its isolated position and mountainous character are now largely overcome, and no doubt certain portions of the district are now receiving a careful testing. If the results of this are as satisfactory as they promise to be the rapid development of this district may be predicted.

THE GENESIS OF THE GOLD-DEPOSITS OF BARKERVILLE (BRITISH COLUMBIA) AND THE VICINITY.*

By Austin J. R. Atkin.

THE gold-bearing area of Cariboo (British Columbia) is roughly confined, within a radius of twenty miles of Barkerville, to the band of varied crystalline rocks known as the Cariboo Schists, generally assigned to the Lower Palaeozoic group. The veins follow the strike but not the dip of the rocks, the gangue is similar to that associated with the nuggets in the placers, and the reefs show very little or no oxidised ore. While all the reefs carry gold in greater or less quantities, none have been found rich enough to account for the placer-gold. It is the opinion of the author that the placer-gold has probably been derived from the enriched outcrops of the veins which once existed above water level. Such enrichment is due to two causes—firstly, the leaching-out of pyrites leaving the less soluble gold in lighter, honeycombed quartz; and, secondly, to actual enrichment by precipitation. This may be due to the solubility of gold in solutions of ferric sulphate, derived from the decomposition of the pyrites. While the en-

riched zone was being formed, the weathering of the surface kept removing the leached outcrop, and constantly exposing fresh surfaces to atmospheric influences. To the weathering of these outcrops the rich placers are attributed. Some of the nuggets in the latter show no signs of attrition, as though they had been carried to their present position enclosed in a soluble matrix which was afterwards removed. The denudation of the reefs and the deposition of gold in the gravels appear to have taken place in Tertiary times.

DISCUSSION.

Mr. H. W. Monckton asked whether gold had ever been found in a calcite reef.

Mr. Bedford McNeill, A.R.S.M., said the paper was a very interesting example of the generally-accepted theory of "secondary enrichment" as applied to a particular ore-occurrence. Naturally, one would have preferred to have visited the locality before discussing the paper. Our present views were mainly the outcome of the comparatively recent work of Posepny and others; but, given low-grade auriferous iron pyrites and given descending oxidising waters, there was no doubt that the chemical changes alluded to did take place. In this connexion, the experiments mentioned by Mr. T. A. Rickard,** as having been commenced by Daintree in 1871 in Dr. Percy's laboratory at the Royal School of Mines, should not be overlooked. A number of small bottles, each containing solution of chloride of gold, were taken, and to each a crystal of the more common metallic sulphides was added, such as pyrites, galena, blende, &c. At the time when Daintree died, a few years later, no results could be discovered; but one of the bottles was removed to Dr. Percy's private laboratory, and there in 1886, or fifteen years after the commencement of the experiment, a cluster of minute crystals of gold was discovered upon the smooth surface of the iron pyrites. In the case of the New Gusters and adjacent mines in Colorado, with which the speaker was connected some twelve years ago, the ore-occurrence presented at that time many points of great obscurity, but, as since pointed out by Emmons, Rickard, and others, if the theory of a secondary or zonal enrichment were applied, these difficulties largely disappeared. As regarded the New Gusters mine—galena was most abundant from the surface down—say, to 300 feet—the ore carrying 8 to 50 per cent. of lead, 9 to 30 ounces of silver, with a trace of gold. At a depth of about 180 feet copper pyrites with stromeyerite came in, and continued down to about 700 feet, the assays being: Copper 5 to 15 per cent., 25 to 700 ounces of silver, one-tenth to 3 ounces of gold. At about 600 feet solid bodies of iron pyrites were discovered, which continued to the deeper workings, carrying 1 to 3 per cent. of copper, 4 to 20 ounces of silver, and two-tenths of an ounce of gold. Bornite was met with between 700 and 1,200 feet, carrying 18 to 25 per cent. of copper, 60 to 175 ounces of silver and ¼ to 1½ ounces of gold. Free gold, which was

*Abstract published in the London *Mining Journal* of a paper read before the Geological Society of London.

**Trans. Am. Inst. Min. Eng. Vol. XXII. (1893) p. 313.

never seen above the 700-ft. level or in any other instance, was found associated with the hornite below the 700-ft. level. The workings were suspended at about 1,500 feet. With reference to the previous speaker's remark, it might be stated that calcite was not unknown as a matrix of gold; and A. G. Lock had stated that most of the rich quartz-reefs at Gympie (Queensland) contained abundance of calcite in strong veins and patches, often richly impregnated with gold. A fine specimen from these showed actual veins of fairly-large gold specks, irregularly distributed through white opaque calcite.

CONDITIONS IN NORTHERN MINING CAMPS.

(By W. M. Brewer.)

TO attempt to give a full and detailed description of the territory tributary to Atlin and Whitehorse in a brief article is impossible, therefore I shall content myself with dealing generally with the conditions in regard to the mining industry in these localities as they at present exist.

Activity in the Atlin district at the present time is centered in placer and dredging operations. From a mechanical point of view the dredging plant recently installed is in every detail nearly perfect. The power house situated below the falls on Pine Creek, furnishes ample horsepower to generate electricity sufficient to run several dredges of the same type and is complete in every particular from the concrete foundations upwards. The electrical plant at the dredge is of the most modern design, the voltage transmitted direct from the power house is 22,000, which is reduced by a series of step-transformers to 1100 volts, that being the power transmitted to the dredge. The machinery on the dredge is operated by four motors, the largest being 100 horsepower which runs the buckets, of which there are ninety-two, each having a capacity of $3\frac{1}{2}$ cubic feet. Of the smaller motors one operates the revolving screen into which the buckets discharge, another the pump which supplies the water for the screen and sluice boxes, and another operates the lighting plant. The total power required is 150 horsepower.

Of the gold-saving ability of this plant it is impossible yet to speak definitely because no clean-up has been made and at the time of my visit the dredge was working in a bed of boulders and gravel about four feet above bed-rock and at a depth of about thirty feet below the surface. It may be found necessary in order to handle the boulders successfully, (many of them being of a very large size) to re-arrange the buckets by inserting in place of some of them very strong grab-hooks designed after such a pattern that the teeth can be thrust under a boulder and thereby afford a better purchase than is obtainable by the smooth lips of the buckets as at present designed. It rarely occurs that newly installed machinery works as smoothly as does that of this dredging plant, which had been in operation less than a month at the time of my visit. The pond or pool in which the

dredge itself stands is thirty feet deep and supplied with continuously flowing water taken from the Deck's ditch, which is one of the longest on Pine Creek.

On Pine, Spruce, McGee, Boulder and several other creeks greater activity has been shown during the past season than at any former period, especially is this the case on Spruce Creek, where a larger number of individual mine-owners are working than is usually the case in placer diggings which have worked continuously since 1899. The reason for this is that it has been found very profitable to mine the hill claims by drifting. On most of the other creeks, hydraulic companies are operating under very favourable conditions, as the supply of water has been more regular and greater than usual.

With regard to quartz properties in this district, there is but little activity at present, the owners of nearly all of them, being also interested in placer claims, are naturally devoting all their energies to taking out gold while the conditions are so favourable.

A comparatively new and un-known section of country extending north-westerly from Atlin and a portion of which lies in British Columbia, the remainder being in the Yukon, is receiving considerable attention by quartz miners during the present season. Several well defined and persistent veins of quartz carrying gold, silver, copper and sometimes lead values have been discovered in this mountainous section. Some of the claims located have been bonded to outside syndicates and are being developed. The results so far obtained are very satisfactory and as several of these are located at a comparatively short distance from navigable water, the district should in the near future prove an attractive one, especially as the grade of the ore so far found has been sufficiently high to warrant the opinion that it can be mined, shipped and treated at a profit.

Most of my attention during the past few months has been devoted to the Whitehorse copper belt and the quartz ledges centered in the Big Salmon country which is tributary to the Hootalinqua River, a stream navigable for stern wheel steamers for at least forty or fifty miles above its mouth. This river empties into the Thirty-Mile River about twenty-five miles below the lower end of Lake La Berge, and about eighty miles northerly from Whitehorse, the head of navigation on this series of lakes and rivers which form the Yukon below the mouth of the Pelly.

On the Whitehorse copper belt, the development work which has been done up to the present time has demonstrated that the opinion formed by myself of the camp in 1901 and before any serious attempt had been made at its development was a correct one. The ore bodies evidently maintain their continuity to considerable depth and occur under very similar geological conditions to those on Texada Island. Although the greatest depth attained on any of the Whitehorse properties is only 150 feet following the dip of the ore, yet at that point all the indications show apparent persistence for a much greater depth. The lack of capital to enable property owners to

prosecute development rapidly is at present the chief obstacle in the way of progress.

That but relatively few sales of properties have been made in this district is to a great extent the fault of the claim-owners themselves, rather than to any lack of promise of the mineral area itself, for I feel perfectly safe in stating that I believe that this district will eventually contribute very considerably to the copper production of Western Canada.

The Big Salmon country until the last few months has merely been exploited for placer gold and the present year promises to prove the "banner" season since the discovery of the camp in 1901. The difficulties which presented themselves in former years with regard to water supply, handling the boulders, and determining which portions of the creeks were the richest have been very largely overcome by strenuous efforts put forth by a few claim-owners who had confidence in the richness of the ground and sufficient experience in placer mining to devise means and methods suited to the conditions with which they have to contend.

Some little attention has been given to prospecting for quartz and as a result some very extensive ledges have been found in the mountains on the divide between the south fork of the Big Salmon and the Hootalinqua Rivers. The ledges to which my attention was called during my recent visit occur in a schist formation and where the width can be estimated along the outcrop it exceeds 100 feet, while the ledge can be traced nearly the entire length of seven 1,500-ft. claims. The ore carries values in gold, silver and copper with a silicious gangue and has every appearance of being suitable for concentration. At one point nearly four hundred feet of cross-cut tunnelling has been done, about sixty of these being fifty feet below the outcrop and the balance a hundred feet below the upper tunnel. This lower tunnel has not been run far enough to expose the ore body.

Of course remoteness and inaccessibility are the first criticisms that suggest themselves to anyone not familiar with the country, but when it is considered that the section in which these ledges occur is only about twelve miles from navigable water on the Hootalinqua River and that the grade between the points is an easy one and down hill, also that the transportation company (the White Pass and Yukon) recognize how desirable it is that every reasonable concession be made operators who earnestly attempt to develop the country, these criticisms fail to carry the weight which they otherwise might.

CINNABAR-BEARING ROCKS OF BRITISH COLUMBIA.*

(By G. F. Monekton.)

THE quicksilver-bearing zone of British Columbia may be two miles wide, and has been traced for a length of 30 miles. Its trend is north and south. Isolated occurrences of the metal are known eight miles east and west of this zone. The

quicksilver occurs as sulphide of mercury, generally known as cinnabar. The zone, referred to, crosses Kamloops Lake, three miles above the lower end of it.

The region is geologically much disturbed, and the formation of the remarkable rent in which the lake lies is ascribed by the late Dr. G. M. Dawson to faulting, due to volcanic phenomena. It is a difficult matter to arrange the different dikes, beds of ash, and sedimentary deposits in their proper order, and Dr Dawson stated of one of his sections of this area that it was "little more than diagrammatic and hypothetical."** At this point, where the more important of the quicksilver-bearing rocks should approach the lake, and be visible in the bluffs, their places are taken by intrusive basalt, porphyry and andesite, and it is not until a point is reached, which is some distance back from the lake that the main rock of the hills can be seen. The whole country bears out the comprehensive description of the puzzled miner who said that it was "love, busted and swung around, and then hoisted and broke and shook." It was perhaps in compensation for its hard usage, that the authorities have endowed it with one of the finest climates and some of the most magnificent scenery in the world. The writer has had the advantage of studying this district intimately after some £15,000 had been spent on underground work, and a considerable sum expended on cutting trails round the steep sides of the hills which exposed many rocks hitherto invisible, opportunities which the writer of the Canadian Survey reports had not. The quicksilver-zone begins at the eastern edge of the Nicola rocks, which are of Triassic age. This series is composed of volcanic rocks, with some limestones, conglomerates and argillites, and a limestone (No. 1), which lies at a considerable depth in the series, crops out on the eastern side of a synclinal fold on the north side of Kamloops Lake. This bed contains some cinnabar, but it is not yet of importance. Where it crops out on the western side of the same synclinal in an Indian reservation it is also known to contain cinnabar. About half a mile east of the outcrop of No. 1 bed is dolomite (No. 2) carrying cinnabar. This stratum is 300 feet thick, and appears to underlie No. 1 bed, from which it is separated by intrusive rocks. This is followed by volcanic materials, and the basal conglomerates of the Coldwater or Oligocene series, which are in turn overlaid by a massive bed of dolomite (No. 3) with which are interrelated some thin beds of black shale and gray argillites resembling arkose. This dolomite is about 300 feet wide and is overlaid by sheets of basalt and porphyry and some conglomerates, which latter swell out higher up the mountain. These are followed by another bed of dolomite (No. 4), and beyond a fault No. 3 reappears and is the principal producer of cinnabar. Beyond this the bed-rock on the line of the section is concealed for half a mile by surface-soil, but judging from outcroppings further south this space is filled by volcanic ash and lava. This brings us to the Tertiary ashbeds at Copper Creek, which limit the cinnabar-bearing zone on the east. The basal

*Trans. Institution of Mining Engineers.

**Canadian Geological Survey Report, Kamloops, p. 162B.

conglomerates of the Oligocene lie unconformably upon the Nicola series, and dip to the east. They vary greatly in width, as such beds often do.

On the south side of the lake, the only difference appears to be that the thickness of the volcanic accumulations between No. 3 and No. 4 beds is not so great, and some tuffs of the Nicola series underlying No. 2 bed come to the surface. Cinnabar is found in all the dolomites, and also in veins of dolomite cutting through decomposed volcanic rocks, also in volcanic ash and conglomerate, and at one point in granite, but only the dolomites have produced workable quantities at present. Judging by pieces of drift which have been found the first two and fourth dolomites will eventually take a prominent place.

From his use of the word "zone" in reference to these dolomites, Dr. C. M. Dawson was apparently under the impression that they were not sedimentary deposits, but when he examined the district, they were largely covered by surface-soil, and since that time some 4,000 feet of drifting has been done on No. 3 bed alone. This and surface prospecting have convinced the writer that these are all ordinary beds of limestone *in situ*, which have been altered to some extent and faulted. They are traceable to the south of the lake, 14 miles to the Toonkwa Lake, and northward 10 miles to Criss Creek, where they pass under later flows of basalt, and emerge again six miles further north on the Deadman River, where they are again covered up.

It is not easy to trace each separate bed for this distance, as they are frequently traversed, along their side by dikes and overlaid sheets of lava, but the series as a whole can be followed with ease, and further prospecting will render it possible to define them at all points.

It is important to note that the cinnabar always occurs in the dolomite near porphyry, thus on the Briar mine (Rosebush of Dr. Dawson) the porphyry is from 10 to 50 feet away. On a claim south of Kamloops Lake, it is on the contact. On the Toonkwa about 30 feet distant. On Sebastian Creek it occurs in a seam of dolomite separated from the main bed by porphyry. At one point on Criss Creek it is only five feet from porphyry; at another on the contact; and in a third case is in a narrow seam of dolomite, between porphyry and conglomerate. This would tend to show that the deposition of the cinnabar was due to the heat generated by volcanic action, at a period subsequent to the deposition of the dolomite. In many cases, notably at Hardie Mountain, the fissures of old hot-springs may be seen. One may, therefore, gather that the formation of these deposits took place over a long period of cooling, subsequent to the era of volcanic action which resulted in the accumulation of 5,000 feet of strata in the Tertiary period.

More work has been done on the property owned by the British Columbia cinnabar mines at the mouth of Copper Creek than on any other. About £10,000 in all has been expended on this mine. The first work resulted in the extraction of about 150 tons from which 114 flasks worth about £900 were obtained. The management then decided to mine low-grade ore

and to treat it on a large scale, and for this purpose a 25-ton Granza coarse ore furnace was built. Several hundred tons were treated in this, but the results not being satisfactory the works were closed down in 1897. Of this plant it may be said that it consists of a shaft-furnace, in which the ore charged through a vertical shaft, sifted gradually down over a series of inclined shelves. The mercury which is reduced from the ore during its descent is carried off in fumes to the condensers. The pipes through which it passes are earthenware. The first two condensers are iron, and are succeeded by a brick one, and this by eight earthenware condensers, the lowest of which is wood. The mercury can be drawn off by doors at the bottom of the condensers. Water is kept pouring on the condensers by means of spray-pipes. Various causes are assigned for the failure of this plant. It is usual in furnaces of this kind to provide a fan to draw the fumes through in condensers but this was omitted. It appears that the ore fed was very low-grade, and it was fed too late, some pieces being nearly a foot long. The fuel available was not good, being chiefly pitch-pine, which has a tendency to make a sudden heat instead of an even temperature. The supply of water was not sufficient especially in view of the poor quality of the fuel. The ore previously treated successfully, was passed through a modified Bavarian furnace, in which two cast-iron retorts were built in and arched brick furnace. The ore, being broken small and mixed with charcoal, was placed in iron pans and inserted in the retorts. The quicksilver passed through iron pipes into condensers under water. The charges were withdrawn at intervals and replaced by others. The labour cost is large on this plant, and the total expense amounted to £1 per ton. This would be a small matter where the ore could be picked to a high grade as this could. It is unfortunate for the district that this plant was dismantled, as it would have enabled prospectors to treat their ores on a workable scale. The ore, at present showing on this mine, consists of three high-grade streaks on the Briar mine, and some lower grade material to the west of it. Most of this has been uncovered since the stoppage in 1897. There are also some less important and untested outcrops. It is a pity that Dr. Dawson's advice to trench across the veins was not adopted as it might have resulted in finding more ore. The cinnabar is contained in quartz-veins and associated with antimonite. Bornite and hematite are occasionally found.

The mines of the Hardie Mountain Mines, Limited, were developed in part by a local company and recently by an English company, which spent £4,000. The development was apparently being done with the intention of preparing for work on a large scale later on, and but little of it was done in ore. There is one high-grade streak on this property, which appears promising, but as a rule the ore at this point is low-grade and would need to be handled on a considerable scale. Cinnabar is found in conglomerate and tuff here. No ore from this mine has yet been treated on a working scale.

Some work has been done on other claims on this

mountain, and on Criss Creek a good deal of prospecting took place in the bed of the stream where it is crossed by the dolomites. The mineral has also been found on the slopes of the mountain, where the dolomites appear on Deadman River, but not as yet *in situ*. At the Toonkwa, 19 miles south of Kamloops Lake, cinnabar is found in the dolomite, not in veins of quartz, and it is sometimes accompanied by antimonite. Sometimes it occurs at this point in high-grade streaks, but much of it is found in a zone several feet wide through which it is disseminated. Some of the solid streaks, from the Briar and Toonkwa mines, are two inches wide. As a seam of solid cinnabar two inches wide may seem small, the writer may point out that if the ore were to be picked to represent a vein one foot thick, an inch of cinnabar would represent £14 a ton on the vein of 12 inches, taking an average price. This affords a basis for comparing it with other minerals. In this district, the cost of extracting such ore would be £1 4s. per ton and the cost of treatment would vary from 5s. to 15s. per ton according to the size of the furnace. Quicksilver being one of the most difficult metals to follow, a further allowance of, say, £5 should be made for development.

In reference to this difficulty in following the ore it may not be amiss to quote Prof. S. B. Christy, who had special facilities for studying the new Almaden, the most famous of Californian quicksilver mines. "The quicksilver deposits of California are characterized by great and persistent irregularity, which makes the mining of these ores much more difficult than that of other metals. The Almaden is a striking example of this irregularity. It has often occurred in the history of this mine that there was no ore or scarcely any in sight. Very frequently large bodies of ore will almost completely run out and there will be visible in the face of the works only a slight colouration of the vein matter which indicates that there is any ore left in that particular place, and by following this little string of ore very carefully it may lead to a large deposit." The new Almaden was £320,000 in debt in 1870, and on the point of being abandoned, but in the following twenty years produced over £3,000,000.

Besides the occurrences mentioned, cinnabar has been found in many places in the district, some of which are a little outside the main quicksilver-bearing zone, but these are at present of no importance, although its occurrence in a bed of dolomite north of Cherry Creek, ten miles east of Copper Creek may be said to offer possibilities of other large deposits as this dolomite extends many miles south of Kamloops Lake. The fact that the higher part of the mountains is much covered with lava-flows and deep surface-soil is a stumbling block to the prospector. The liberal conditions of British Columbian mining laws have also militated against the development of this form of mining as they have enabled parties to hold large areas without working them in hopes of selling for high prices. This hope, however, has been falsified and the only holders now are miners who are slowly developing their properties. There is plenty of room in the district for prospectors, both to work abandon-

ed claims and to search for new croppings of ore. It may be said that the area of the dolomites alone which are exposed is not less than ten square miles, hardly any of which has been tested. The great need of the district at present is a furnace to give working tests. The only alternative is to ship ore to Great Britain which is only practicable with very high-grade ores.

For information regarding some parts of the district the writer is indebted to Mr. A. J. Colquhoun, who has made a special study of cinnabar and its occurrence.

PARADISE MINE, WINDERMERE DISTRICT, NORTH-EAST KOOTENAY.

(By E. Jacobs.)

IN last month's MINING RECORD there appeared a brief note to the effect that between April 1, 1901, and December 31, 1903, there had been shipped to Trail from the Paradise mine 1,610.49 tons of ore of a gross value of \$76,910.61. From a descriptive article on this property, published in the MINING RECORD for October, 1901, it is learned that the Paradise was located in August, 1899, and was bonded to Messrs. H. C. Hammond, Toronto, and R. Randolph Bruce in June, 1900. What is now known as No. 4 tunnel was driven about 70 feet during the winter of 1899-1900, but systematic development work was not commenced until June, 1900. Other mineral claims were acquired later, the Paradise Group now consisting of some ten claims situate in Paradise Basin, at the head of Spring Creek, a small stream flowing from the north into Toby Creek at about 20 miles from the junction of the latter with the Columbia River. Paradise Basin is at an elevation of about 7,000 feet, and it is connected with Wilmer, on the Columbia, about 80 miles south of Golden, by a wagon road.

The Paradise mine was visited last summer by the Provincial Mineralogist, whose report on it was published in the Report of the Minister of Mines for 1903. The formation in the vicinity of the mine is stated to consist of shales, slates, sandstones, etc., with occasional beds of limestone, all very much contorted and folded, with numerous small faults, but as a whole not seriously broken. From the basin the mountain rises to the east, at an angle of about 30 degrees, for a height of 800 to 1,000 feet, measured to the lowest part of the divide.

At the No. 1 tunnel, about 650 feet above the basin (see page 289), there had been found outcropping a vein or zone filled with red oxides of iron and lead carbonates, with some galena. This lead had been driven on: a tunnel and incline follow the ore, and these are, therefore, somewhat irregular in plan. There are several hundred feet of workings, including raises and drifts extending above this level. The general width of the lead is estimated at about four feet, underlying which is a layer of clay or gouge, in some places 12 to 18 inches in thickness. This vein was

traced diagonally down the hillside, and, at 125 feet vertically lower, No. 2 adit tunnel was driven in on the lead for a distance estimated at about 500 feet. From this second tunnel level connection was made, in ore, with No. 1 tunnel, and a winze was sunk about 150 feet, also in ore. This winze is now below the No. 3 level, which is to be run "blind," or from the winze and not opening to the surface. When the description quoted from was written the level had been opened out from the winze and the first cross-cuts made. The vein filling at that depth was found to be similarly oxidized to that seen in the upper levels. Some 250 feet vertically lower than No. 2, on the outcrop of the lead, the adit tunnel known as No. 4 had been run in. This followed the lead. The ore in it was not so abundant, but at about 1,000 feet in from the portal, it was not yet under the main ore bodies met with in the upper workings. It was intended to begin systematic cross-cutting on this level during the spring now closing, but no advices have been received as to progress made to date.

From the foregoing it will be seen that the lead has been traced in depth to the fourth level, and for a length of about 1,000 feet. The workable ore is proven to the third level, and there is good reason to believe that it will soon be proved to the fourth level also. The lead matter is associated with silicious lime (analysis about 20 per cent. silica, 25 per cent. lead carbonate and 25 to 30 per cent. iron). The lead is either a replacement of a stratum in the shales, originally largely or wholly composed of lime, or the lime has been deposited from adjacent lime beds, in and with the lead matter, in a foliation of the shales.

The ore shipped to the smelter averaged, as shown by smelter returns, about 50 oz. silver and 60 per cent. lead. No attempt has been made to mine second class ore, yet there were on the dump, taken out in the course of development, some 4,000 tons of ore estimated to run about 35 oz. silver and say 35 to 40 per cent. lead. In the mine workings much ore is actually "in sight," and the occurrence of more is demonstrated almost to a certainty. A rough calculation, made last summer, gave, if not of ore actually "blocked out" certainly of "probable ore," about 50,000 tons, which quantity, there is every reason to expect, has been largely increased by subsequent developments.

The owners of the Paradise mine contemplate the erection of a lead smelter at the foot of the mountain, below the basin. A survey for an aerial tramway from the mine to the proposed smelter site has been made, but the construction of this tramway will not be proceeded with until after more work has been done at the fourth level of the mine. It is estimated that with such a means to bring down the ore a saving of at least \$1 per ton in cost of transportation would be made. The ore is nearly self-fluxing, so, with so com-

paratively large a tonnage available it would appear



Looking up Paradise Basin, Windermere Mining Division.

good policy to erect a blast-furnace.

A POPULAR MINE SUPERINTENDENT.

IN last month's issue of the *MINING RECORD*, in expressing regret at the resignation of Mr. W. Yolen Williams from the superintendency of the Granby Company's mines at Phoenix—a position he has filled with distinguished success for over five years—we referred to his popularity, and the high esteem in which he was held by his employers, the miners working under him, and his fellow townsmen. This testimony has since been substantially borne out, for on the departure of Mr. Williams from Phoenix at the end of June he was presented with a valuable diamond ring in feeling testimony of the regard of over four hundred mine employees, together with the following address:—

"W. YOLEN WILLIAMS:

"Sir. We, your co-workers and co-employees of the Granby Consolidated Mining, Smelting and Power Co., cannot see these associations sundered without expressing sincere regret that that time has come.

"Your uniform courtesy, kindness, consideration and manliness, at all times and under all circumstances as our superintendent, has won from us very deep respect and keen regard, which increasing years has but intensified.

"In whatever place or kind your future duties lie, our best wishes attend you. We hope you will have good health, a long and useful life, find many new and worthy friends, and that in future years you can look back upon your work with as much pride as surrounds your achievements here in Phoenix, in developing from an almost trackless forest one of the most noted and greatest mines in Canada.

"We ask your acceptance of this present as a slight token of regard and as a symbol of an endless chain of friendship.

"Phoenix, B.C., June, 1904."

On the same day a deputation of leading residents of the town, headed by the Mayor, waited on Mr. Williams to bid him farewell on behalf of the citizens who, he added, had subscribed to provide a suite of office furniture for the office Mr. Williams is about to open in Spokane and establish there a practice as a consulting engineer.

SCHEELITE IN BRITISH COLUMBIA.

(By E. Jacobs.)

SPECIMENS of scheelite (calcium tungstate) from Cariboo were received some time since at the Provincial Assay Office for determination, and a specimen of it has since been on exhibit in the Mineral Museum of the Department of Mines. This is a comparatively rare mineral and its occurrence has only twice been reported. Mention of the other instance was made, in the Report of the Minister of Mines for 1903 (p. H 138), by the mining recorder for the Slocan City mining division, who, in his note on the Meteor claim, Springer Creek, said: "This property is unique inasmuch as a mineral named scheelite was found in small quantities. It occurs in the quartz in lenses varying from two to three inches in width and one foot to three feet long. About 500 pounds were taken out after it was identified. This is the first time this mineral has been met with in this Province, if not in the Dominion."

Following the custom of the Mines Department, the Provincial Assayer informed the finders of the Cariboo specimens submitted to him for identification of the nature and uses of the mineral, and it is understood they are now ascertaining whether it occurs in such quantity as will pay to work.

Scheelite is technically described as being tetragonal, also massive; lustre, vitreous; colour, white, pale yellowish, brownish, greenish, reddish; transparent to translucent; hardness, 4.5-5; specific

gravity, 5.9-6.1; unlike calcite and other minerals resembling it, in its high specific gravity and non-effervescence with acids.

Scheelite is known to occur in New Zealand. At Donaldson's Golden Point mine, Macrae's Flat, Otago District, scheelite has been worked commercially, the output of this mineral having been shipped to England and Hamburg. The mineral is here found associated with the gold-bearing quartz. The Inspector of Mines, Dunedin, N.Z., in his report for 1902 of the Otago District made the following reference to the saving of scheelite at this mine: "Mr. W. Donaldson recently visited England in connection with the



Mr. W. Yolen Williams, for the past five years Superintendent of the Granby Mines.

scheelite industry, and brought back with him a new Woodbury shaking-table, which has been installed in place of the Frue vanner formerly in use. The sample of scheelite which comes off this table is of very fair quality, and with slight improvements Messrs. Donaldson expect to obtain good results from it. One advantage is that a larger quantity of material can be treated."

In 1902, replying to a New Zealand correspondent, who reported having "a 4-ft. quartz lode that, in addition to about 0.65 gold per ton, carries about 23 to 25 per cent. scheelite. It is possible to grade the ore up to 70 or 75 per cent. of scheelite, which again on assay yields 78 to 81 per cent. of tungstic acid," the *New York Engineering and Mining Journal* stated that "there is no demand for scheelite in New York as other ores of tungsten are preferred by buyers. In would not pay to ship this ore from New Zealand to the United States, as already there is more tungsten ore there than can be used. There is some demand for scheelite in Great Britain and Germany, so possibly a market could be found there." Later the Tungsten & Rare Metals Company, of London, England, wrote to that journal: "We think it may be of interest to your correspondent to learn that the price paid for scheelite ore, f.o.b. Hamburg or London, has recently been between six shillings and seven shillings (\$1.50 and \$1.75) per unit of tungsten trioxide contained in the ore. The ore should contain about 65 to 70 per cent. tungsten trioxide, and be as free as possible from any injurious constituents, such as sulphur, phosphorus, tin, etc. The makers of Tungsten metal give the preference to wolfram, and also hubernite, as these two minerals afford advantages in manufacture. On the other hand, a good scheelite can be utilized for the manufacture of sodium tungstate, for which a good demand has sprung up of late. With regard to tungsten, we think we are correct in stating that tungsten for the manufacture of self-hardening tool steel (by far the greatest outlet for the metal) is generally preferred in the metallic state, in the form of a fine uniform powder testing from 95 to 98 per cent. metallic tungsten. The present price in England is about £160 (\$800) per ton."

THE PAYNE MINE.

MANAGER'S REPORT.

Brief mention was made in last month's issue of the *MINING RECORD* to the annual meeting of the Payne Company. We have since received a copy of the manager's report from which the following information is taken. After referring to the development work of the year, which resulted most satisfactorily, Mr. Garde in this report makes the following comparative statements: There were milled last year 64,548 tons of galena or 205 tons per 24 hours, against 30,028 tons, of 101 tons per 24 hours last year, an increase of 45 tons per 24 hours. Of the above total, 5,686 tons was concentrating ore, while the balance consisted of old dumps and fillings. Last year the concentrates averaged 69 per cent. lead with 103.8 ounces silver, while this year the average has been 68.8 per cent. lead with 129 ounces silver. This is an improvement of considerable importance, when considering that the mill tailings assayed less than $\frac{1}{2}$ of 1 per cent. lead and one ounce silver. The average price per ounce of silver was 56 $\frac{1}{2}$, or 71 $\frac{1}{2}$ cents higher than

the previous year's average. On the other hand the average price of lead dropped from \$1.63 to \$1.48 per cwt. A total of 1,105 tons of zinc, plus 140 tons of an iron by-product was produced during the year, a total value of \$13,479. Seven hundred tons of this represented separated zinc-blende,



No. 4.

No. 2.

No. 1 tunnel.

View down Basin, Paradise Mine—Windermere, N. E. Kootenay. (See article page 286.)

and 600 tons of this ore together with 250 tons of 43 per cent. concentrates were sold. The raw zinc ores after magnetic separation are brought up to a shipping grade of 53 per cent, carrying from 10 to 12 ounces in silver. A favorable contract for the entire output up to January 1st, 1905, has been

entered into with European smelters, and bulk shipments to Antwerp are being made at a freight rate of \$13 per ton. In the course of the ensuing year it is expected, while the capacity of the works will be increased and costs reduced, a still higher grade of zinc will be produced. London price of spelter, which has remained steady for some time at £22 per ton is favourable, and generally speaking, the future for zinc is most encouraging. The earning power of the mine has been materially increased by the production of this valuable by-product.

In connection with the zinc plant an iron by-product is obtained from the magnetic separating machine, for which a market has been found with local lead smelters. This product has all the qualities of an excellent flux. It contains about 7 ounces of silver, beside 50 per cent. of combined iron and manganese. It is being produced at the rate of about two tons per day and nets approximately \$3 per ton.

The bounty granted for five years to the lead miners by the Dominion Government, which at your present rate of production equals a yearly bonus of \$12,000—will offset the low prices of lead. It is, however, to be hoped that the Government will grant still further assistance to the miners by a bonus on the production of zinc in a similar manner, to offset the high cost of transportation of zinc ores to the markets in foreign countries.

With the present prospects for opening up valuable ore bodies in tunnel No. 8 at the Payne mine together with the means now available for handling and treating all silver-lead and zinc ores mined, the outlook for the property is decidedly favourable.

A YEAR'S DEVELOPMENT AT THE TYEE MINE.

MR. E. C. MUSGRAVE, the mine superintendent, in his annual report to the directors, states that work during the past year was confined to winning ore from the stopes at the 100-ft. and 165-ft. levels, and to exploration work on the 100-ft., 165-ft. and 300-ft. levels, while a small amount was done on the 400-ft. level.

Development Work.—While the development work at the 300-ft. level has not given as satisfactory results as was hoped for, at both the 100 and 165-ft. levels valuable discoveries of ore have been made, and it is expected that during the coming year the work that has been started at the 400-ft. level, and work which will soon be begun below that level, will result in finding further ore-bodies. The work done during this year has proved that instead of having a series of detached lenses, as was always supposed to be the case, the mine has in the upper levels one huge ore-body branching out in different directions through the schists, from the 165-ft. level. This ore-body appears to be distinct from the Lenora body (a portion of which runs into the Tyee ground), and it has now been proved over a length of 1,000 feet for a depth of 160 feet, and widths varying from 5 to 40 feet. Having proved this to be the case is a very encouraging sign, as the chances for such a large ore-body repeating in depth are much more favourable than if there were a series of detached lenses.

100-ft. Level.—The main drift at this level has been continued for a distance of 259 feet, and 149 feet of cross-cutting has been done from it. The only discovery of ore made on this level was that part of the ore-body on which No. 6 stope has been worked.

165-ft. Level.—The drift was continued for a distance of 337 feet, and 603 feet of cross-cutting was done from it. Early in the year the drift ran into ore, and on a cross-cut being made, thirty feet of ore was passed through, and from this cross-cut No. 4 stope (165-ft. level) was broken out. Later in the year a cross-cut was started from the sill floor of this stope and driven for a distance of 350 feet, which brought its face 380 feet from the main south wall. At 140 feet from the wall the north ore-body was met with, and after passing through this, the cross-cut passed through the ordinary schists of the lode, with two small intrusions of dia-

base; when at 300 feet from the wall it passed into diabase, in which it remained to the end. A small amount of work was done on the north ore-body, but although there were small pockets of rich ore in it, the bulk of it, at this point, was found to be too low grade to be of commercial value, so work on it was stopped. Another cross-cut was started 150 feet further east, and although it was carried far beyond the point at which the north ore-body should have been met with, had it lived to the east at this level, no sign of it was met with. This north ore body, besides having been struck in several places in the Tyee ground, has been worked to the western boundary of the Tyee in the Lenora mine, and to the eastern boundary of the Tyee in the Richard III., and as rich pockets have been found in it, large enough to yield a large tonnage of ore, both in the Lenora and Richard III., they doubtless occur in the Tyee and will be found in future workings.

300-ft. Level.—The drift at this level was run for a distance of 972 feet, and 440 feet of cross-cutting was done from it. With the exception of small stringers, no ore was found at this level. The probable reason for this was that the schists throughout were broken and twisted in every direction, by a movement subsequent to the formation of the ore-body, and it will be necessary to get below this line of movement before finding any large body of ore.

As the drift passed below the large ore-body of the upper levels, and showed no evidences of ore (the stringers having been found in the cross-cuts) a raise was put through to the 165-ft. level.

This raise, after having been carried up to a height of 85 feet, encountered ore, and remained in it, till it holed through.

A drift was run from the raise, eastward, from the point at which the ore was first met with, for a distance of 125 feet. This was in ore for the entire distance, and there is 12 feet of ore in the present breast.

400-ft. Level.—Work was started on this level near the end of the year. Stations were cut on the north and south sides of the shaft, and a drift was run for a short distance to the east, along the main south wall. So little work has been done to date that it is impossible to form a definite opinion as to whether this level is below the line of shattering found at the 300-ft. level or not; but so far the ground does not seem nearly so broken, and the schists are more like those in the upper levels, that is to say they are softer and less silicious than those in the 300-ft. level. The main south wall is as strong and well defined as ever, and retains much the same strike and dip as it had at the upper levels.

Raises.—During the year 364 feet of this work has been done, but as it has been principally for purposes of ventilation it presents no special features of interest.

Stopes 100-ft. Level.—Six stopes have been worked on this level, and from them a total of 15,026½ tons of ore has been won.

Stopes 165-ft. Level.—From these stopes, and from the drift from the raise between the 300 and 165-ft. levels, 33,597 tons of ore have been won.

Intermediate Level (300-165).—This level was run from the raise between the 300 and 165-ft. levels. It is 40 feet below the stopes at the 165-ft. level, and shows a good width of ore throughout its length. As the ore on the sill floor of the stope immediately above this level has been very wide, a large tonnage of ore may be expected between the levels.

Ore Reserves.—The difficulty of giving an estimate of the ore reserves is even greater than it was last year. The ore-body makes and pinches so quickly that, under the present conditions, any estimate of tonnage in sight would be guess work. The only thing that can be said is that from experience in the past, and the general appearance of the stopes, it is safe to calculate on having enough ore left in the mine, in the known body, to continue regular shipments for another year, with the probability of there being a great deal more than this.

Cost of Work.—The cost of winning the ore, and transporting it to the Esquimalt and Nanaimo Railway Company have been \$2.21 per ton, which is divided as follows:—

Stopping and raising ore	\$1.325
	Per ton.
Proportion for development485
Transporting to Esquimalt and Nanaimo Rail- way Company.14
Surface, etc.22
Ore dressing04
	—
	\$2.21
	—

Under the heading of Surface, in the above costs, are included maintenance and repairs to buildings and plant, pumping from the Chemainus River, odd surface works, and general administration at the mine. The total costs chargeable against the ore are slightly higher than those of last year; this being due to the delays caused by the tramway. The stoppages due to this meant extra expense at the mine, as some of the expenses did not stop while the tram was idle. Also the cost of maintenance and repairs to buildings and plant was higher in proportion to the ore shipped, as the plant used was larger than that used last year, while it could not be worked to its full capacity until the capacity of the tramway was increased.

The amount of development work done during the year was: Drifting, 1869 feet. Cross-cutting, 1,251 feet, and raising, 364 feet. The costs have been considerably reduced from those of last year, being: Drifting reduced from \$9.15 to \$7.15 per foot. Cross-cutting reduced from \$6.77 per foot to \$5.19 per foot. Raising reduced from \$11.59 per foot to \$10.61 per foot.

Tonnage Delivered to the Smelter.—The total tonnage delivered to the smelter during the year was 48,623 $\frac{1}{2}$ tons, which was all won from the mine, and the average values of this, from assays received from the smelter during the earlier part of the year, and from assays taken at the mine from the daily mine run during the latter part, have been: Copper 4.61 per cent., silver 2.77 oz., and gold 0.14 oz. per ton, which would give the gross contents as being about, copper 4,483,000 lbs., silver 134,680 ozs. and gold 7,000 ozs.

"X. L." Mineral Claim.—A considerable amount of trenching was done on this claim, and the results have been most satisfactory, as they prove beyond a doubt that the lode runs through this ground. In several of the trenches a good iron capping was found on the direct line of the lode, and the schists are similar to those surrounding the Tyee ore-body. A cross-cut from a trench close to the southern boundary line of the Lenora encountered the main south wall of the lode, and some small stringers of barytic ore were found near it, so that the prospects for finding ore-bodies in this claim are good.

Prospects of Ore in Depth.—Now that preparations for developing the lower levels have been completed, it is hoped that during the coming year ore will be found in depth. Although it is possible that some time may elapse before discoveries are made, there is, I think, very little doubt but that ore in large quantities will be found as soon as the workings reach a point below the line of movement found at the 300-ft. level. The indications in the small amount of work done at the 400-ft. level are favourable, and although too little has been done there to prove it, the ground appears less broken than at the 300-ft. level. The ore-body in the upper levels has been proved to be of such a great size, that although it has been cut off temporarily by the broken ground at the 300-ft. level, it is certain to make again in depth. Even though no large body was found at the 300-ft. level, stringers of barytic ore were found, and the mineralization was heavy throughout. The graphitic schists, although in a shattered state, were found there, and they have been found again at the 400-ft. level. No ore has ever yet been found in the mine without there being graphitic schists in the vicinity, and they have undoubtedly had something to do with the deposition of the ore. Where these graphitic schists occur at the 400-ft. level, they do not show anything like the amount of shattering that they do at the 300-ft. level, and besides them there is a selvage full of nodules of quartz containing copper. It is possible that this selvage represents the top of an ore-body, and if it does, the ore-body should be encountered in the

main shaft, between the 400-ft. and 500-ft. levels. Had some intrusion of foreign rock, such as diabase, cut off the ore at the 300-ft. level, there might be grounds for thinking that the cut-off was permanent; but the only diabase met with at that level was a narrow intrusion lying parallel to the main south wall, and this, when cross-cut, was found to have graphitic schists to the north of it.

From the conditions so far found there is no reason to think that the ore has been permanently cut off; and indeed the very nature and form of the schists would lead one to expect to find the ore in masses, with zones between them showing stringers, as the channels through which the ore passed when in a molten or gaseous state; the large masses forming in the weak places in the schists.

In conclusion, I would say that, although as before remarked, the developments at the 300-ft. level have not been as successful as hoped for, I consider the future prospects of the mine very bright. The conditions are favourable for doing fast and cheap exploration work, and the great size of the ore-body in the upper levels gives time for a large amount of exploration work to be done while still keeping up regular shipments of ore, and also gives reasons for believing that the finding of other ore-bodies in depth is only a matter of time.

SMELTER MANAGER'S REPORT.

Mr. T. Kiddie, the smelter manager, reports as follows:

During the year the following additions and extensions to the plant have been made:—A general office, consisting of main office, manager's office, draughting room, vault and cellar was built. In order to provide additional roasting capacity and spread the roast piles over a larger area to facilitate their removal, eight additional roast beds were added during the year, and trestles extended with cuttings between, on the same general plan as those already installed. A brick-making plant, consisting of two one-horse power pug mills and drying shed, was installed for the making of raw ore fines into brick form. The buildings are 132 feet by 30 feet and 100 feet by 34 feet. The pug mills are the ordinary brickmaking mills, while the drying floor is a bottom heated floor, fired from both ends, with flues of red brick tiling between each fire box, with two separate stacks, one for each set of furnaces, the flues, being covered with clay and rolled, forming the drying floor. This has proved a practical and very economical mode of drying, the capacity of the plant being 8,000 bricks, equal to 28 tons of ore per day. A similar one-mill plant, 58 feet by 30 feet and 30 feet by 30 feet, for the making of flue dust into brick form, was erected west of the smelter building. The burnt ore tramway between the roast yard and the smelter was doubled in order to handle the increased tonnage of ore for the furnace. The coke track of the Esquimalt and Nanaimo Railway Company was extended 150 feet and ground graded 150 feet by 30 feet by 5 feet, and floored with 2-in. plank for the storage of coke against any possible accident or shortage; and on the east side of the burnt ore bins a temporary sampling mill was erected for the sampling of custom ores. The Esquimalt and Nanaimo Railway Company supplied and we installed a 6-in. Duplex steam pump, placed at high-water mark in the lagoon, and connected with our fresh water system. A dam of slag was run across to the "spit," which gives a large reservoir of salt water at all stages of the tide for fire or slag-shotting purposes. In addition to the above, we are now laying a 4-in. pipe line to connect with the city water mains. These, with our supply from Rock Creek, put us in a safe position against fire, or possible accident to the Rock Creek flume.

During the year a large amount of finishing work has been done to the plant. Steam pipes covered, boiler feed-water heater put in, additional cast-iron floor plates laid in the smelter shed, and steel plates on the charging platform; cast iron flume plates for slag shotting; engine and boiler room roof covered with corrugated iron; a machinery shed or storage warehouse, 20 feet by 30 feet erected; electric light system extended; drains dug and the grounds around the smelter and office generally cleared and graded; while the machinery, plant and buildings have at all times been kept in thorough order and repair.

SMELTING OPERATIONS.

Ore Receipts.—The receipts of ore from the Tyee mine for the year ending 30th April, were as follows:—

	Wet Weight Tons.	Moisture. Per Cent.	Dry Weight. Tons.
"Rough" ore..	33,320.770	1.284	32,892.933
"Fine" ore..	15,302.695	2.649	14,897.317
Total ore..	48,623.465		47,790.250
equals 31.17 per cent. of fine ore.			
		Tons.	
Customs ore "Rough"..		2,957.1755	
Customs ore, "Fine".....		3,278.1755	
		6,235.3510	
Custom rough flux ore..		891.1380	
		7,126.489	
Total ore receipts, dry weight		54,916.739	
Plus—Ore stocks on hand at 1st May, 1903..		4,421.360	
		59,338.099	
Less—Ore stocks on hand at 1st May, 1904..		3,245.837	

Total tons of ore smelted 56,092.262
a total of 68 per cent. rough ore and 32 per cent. fine ore; the Tyee ore assaying:—

Copper (wet) (Per cent. by electrolytic assay)	4.56
Silver..ozs.	2.87
Gold"	0.14
Ironper cent.	11.94
Zinc"	6.60
Silica.."	13.50
Alumina"	3.95
Barium Sulphate"	37.30
Lime"	2.20
Magnesia"	Trace
Sulphur as sulphidesper cent.	16.62

It will be noted in connection with the analysis for copper that the percentage of copper in the "ore" is figured upon the wet assay, while those of the "matte" and "yield" are figured upon the dry assay upon which the matte is sold; that is, the electrolytic assay, less 1.3 per cent., equals dry copper assay.

Roasting.—During the year we have roasted and trammed to the smelter 34,947 tons of ore the roasting operations being carried on without intermission and with satisfactory results. In order to treat the large accumulation of raw ore fines (some of which had previously been smelted, producing a low grade matte—which was slow, troublesome and expensive), experiments were instituted with a view to binding the fine sulphide ore into brick form, which could be roasted in heaps, instead of the orthodox practice of roasting in mechanical furnaces and afterwards briquetting the roasted fines. The final results of these experiments were highly satisfactory, both as to the oxidation of the copper, zinc, iron, sulphur, etc., and the hardness of the brick produced. After confirming these experiments on a larger scale, and the results being satisfactory, the brick-making and drying plant was erected at the north end of the roast yard, while horizontal oscillating screens were used under the ore bins to screen the mine fines to 3/8-in. size and less, reducing by 50 per cent. the quantity to be made into bricks, the oversize being sent to the roast heaps direct. The fine ore is trammed direct to the pit of the pug mill, covered with water, shovelled into the pug mill and made into brick form, as in slop brick-making, and then dried on the drying floor, which requires twenty-four hours. From there the bricks are wheeled direct to the roast beds, piled and burnt.

The brick produced after burning is hard, compact, and stands rough handling and usage; being sufficiently cindered it forms a porous homogeneous mass, and is a valuable addi-

tion to the furnace charge of ordinary burnt ore, increasing the furnace capacity at least 25 tons per day. The oxidation of the copper, zinc and iron is remarkably complete, average samples of large piles of burnt bricks giving 1.5 per cent. to 2.5 per cent. sulphur as sulphides, as against 7.00 per cent. in the ordinary burnt ore.

Burnt Ore.—The average analysis of the burnt ore trammed to the smelter during the year is as follows: Iron, 10.50 per cent.; silica, 17.90 per cent.; barium sulphate, 38.90 per cent.; zinc, 7.50 per cent.; magnesia, trace; sulphur as sulphide, 7.09 per cent., a decrease of .64 per cent. zinc, and an increase of 4.82 per cent. barium sulphate compared with the analysis a year ago.

Smelting.—During the year the furnace has been in blast 276 days of 24 hours each, and smelted as follows:—

	Tons.
Tyee burnt ore and bricks	34,947.9230
Tyee raw ore	14,490.0410
Custom ore	6,611.5530
Total ore	56,049.5170
Silica flux	1,132.3985
Iron....	447.5545
Flue dust	725.0285
Slag and barrings	3,109.4235
Low grade matte	2,751.8665
Total smelted (Tons of 2,000 lbs.)	64,215.7885

Coke used (Tons of 2,240 lbs.) 6,790.75

being an average of 203.077 tons of ore and 232.665 tons of mixture smelted per day, an increase of 52.69 tons of ore and of 55 tons of mixture smelted per day over that of 1903. The ratio of coke to ore was 1 ton of coke to 8.25 tons of ore, and 1 ton of coke to 9.45 tons of mixture smelted. The concentration was 10.28 tons of ore to 1 ton of matte.

Dividing the above operations into two periods of six months each, we have for the first period an average of 166 tons of ore smelted per day, and for the second an average of 243 tons per day, an increase of 77 tons smelted per day. The smelting operations during the year resulted in a steady increase in the amount of ore smelted per day, a result due to several factors, viz.—experience in handling this class of ore; to experiment; purchase of suitable fluxing ores; changes in the manipulation of the furnace, and the substitution of burnt bricks for raw ore fines in the furnace, making a shipping matte in one operation and using an average of 30 per cent. raw ore.

Slags.—An average sample of the slags for the year, sampled from the slag dump, assayed as follows:—

CopperPer cent. by calorimetric assay	.39
"Per cent. by electrolytic assay	.40
SilverOz.	.12
Gold"	.004
Iron oxidePer cent.	17.98
Silica"	28.25
Barium oxide.."	27.63
Calcium oxide"	7.00
Zinc oxide....."	6.95
Alumina"	10.88
Magnesium oxide"	Trace.
SulphurPer cent.	.88

The betterment in the slag assays being due in part to the addition of the flux ores, which were not available last year, and to doubling the settling capacity at the furnace.

Product.—During the year we shipped 5,454.113 tons of copper matte, containing: 4,416.987 lbs. fine copper, 143,303.01 ozs. of fine silver, 8,778.034 ozs. of fine gold. Total value, less refining charges only \$678,836.62. An average matte of copper (dry) 40.767 per cent., silver 26.277 ozs. per ton of 2,000 lbs., gold, 1.609 ozs. per ton of 2,000 lbs., and containing barium sulphide 7.47 per cent., zinc sulphide 12.66 per cent. equivalent to a yield of copper (dry) 3.96 per cent., silver 2.55 ozs., gold 0.156 ozs.

RECENT LEGAL DECISIONS AFFECTING THE MINING INDUSTRY.

THE important legal case of the Centre Star Mining Co., vs. the Rossland Miners Union and others, was brought to a close in July, a verdict being awarded the plaintiffs together with damages amounting to \$12,500. The questions the jury were called upon to decide were as follows:—

(1.) Did the principal defendants—or any and which of them—namely, the Rossland Miners' Union, No. 38, Western Federation of Miners, Rossland Branch; Rupert, Bulmer, William L. McDonald, Frank Woodside, W. G. Preston, the Carpenters' and Joiners' Union, No. 1, of Rossland, Peter R. McDonald, John McLaren, T. M. Beamish, and James Wilks, maliciously conspire together to molest and injure the plaintiffs and other mine owners of Rossland, in their business by unlawful means?

Answer—Yes; and all of them.

And did the said defendants, or any of them, by acts done pursuant to the said conspiracy, cause the plaintiffs pecuniary loss?

Answer—Yes.

(2.) Has the Western Federation of Miners, Rossland Branch, been carrying on its business in the name of, and has it usually been known as "The Rossland Miners' Union, No. 38, Western Federation of Miners," since the date of its incorporation?

Answer—Yes.

(3.) If you answer question 2 in the affirmative, did the defendants, the Western Federation of Miners, Rossland Branch, otherwise known as the Rossland Miners' Union, No. 38, Western Federation of Miners, unlawfully and maliciously procure employees of the plaintiffs to cease working for the plaintiffs on, from and after the 12th day of July, 1901, by calling out the said employees and compelling them to go on strike?

Answer—Yes.

(a.) And did the plaintiffs suffer pecuniary loss by reason thereof?

Answer—Yes.

(4.) Did the defendants, the Rossland Miners' Union, the Western Federation of Miners, Rossland Branch, and the Carpenters' Union, and their officers and members, or any of them maintain or assist in maintaining the strike by unlawful means, that is to say:

(a.) By molestation or intimidating men who were working for the plaintiffs or for other mine owners of Rossland, with a view to inducing them to cease from so working?

Answer—Yes.

(b.) By inducing men who had entered into contracts with the plaintiffs to break such contracts.

Answer—No.

(c.) By inducing or attempting to induce, men who were willing to enter into contracts of service with the plaintiffs or other mine owners of Rossland or to work for them, to refrain from so working?

Answer—Yes.

(d.) By furnishing strike money or pay or other relief or assistance.

Answer—Yes.

(e.) By unlawfully watching and besetting the premises of the plaintiffs and other mine owners of Rossland, and the roads and approaches leading to the said mines, and the railway stations in Rossland?

Answer—Yes.

(5.) Did the defendants, Rupert Bulmer, Wm. L. McDonald, Frank Woodside, W. C. Preston, P. R. MacDonald, John McLaren, T. M. Beamish, and James Wilks, or any and which of them, maintain, or assist in maintaining the strike by unlawful means, that is to say: By any and which of the means referred to in question No. 4?

Answer—Yes; all of them, by the means of a, c, to d, e.

(6.) Did the said principal defendants, and the members of the Rossland Miners' Union, or any and which of them

conspire with each other to do any and which of the things mentioned in said question No. 4?

Answer—Yes; all of them except question b.

(7.) Did the defendants, and the members of the Rossland Miners' Union or any and which of them, unlawfully and maliciously conspire together to molest and intimidate the plaintiffs in carrying on of their business, and were the plaintiffs so molested and injured?

Answer—Yes.

(8.) Did the plaintiffs sustain any substantial damages?

Answer—Yes.

(9.) The amount?

Answer—\$12,500.

THE CROW'S NEST DAMAGE SUITS.

THE text of the judgment delivered by Mr. Justice Martin in Leadbeater vs. the Crow's Nest Pass Coal Company is as follows:

During the consolidated trial of these five test actions evidence was given in support of two charges of negligence, viz.:

(1.) The use of the bonneted Clammy lamp, which it was contended was defective and not a "locked safety lamp," within the meaning of the Act; and

(2.) The accumulation of dust to a dangerous extent.

In regard to the first it is sufficient to say that it was clearly established that the type of lamp so used, while not perfect (which indeed, no safety lamp in reality is), yet is in very general use, and reasonably fulfils the statutory requirements. This was, in fact, practically conceded on the argument.

In support of the second charge the plaintiff advances the theory that the explosion was essentially one of coal dust; while in answer to that the defendant company maintains that it was a gas explosion substantially and essentially, though admitting that, as in every explosion in a mine of this nature, dust may have participated in it to an immaterial and unascertainable extent.

In support of these conflicting theories a great body of evidence was adduced in a trial lasting more than three consecutive weeks, and even if it were desirable for me to do so when discharging the functions of a jury on pure questions of fact (and I do not think it is) it would be almost an impossibility to attempt to review in detail all the evidence which I have listened to and weighed in a trial of such duration and complexity of fact, though not of issue. Dealing with such explosions as this, it is manifest that there is much that must remain a mystery, for no witness has been bold enough to claim to thoroughly understand the forces of nature or their varying operation when disturbed by man in such undertakings as those under consideration, or give other than a speculative account of the cause of ignition, or even fix upon the precise locality of the explosion's origin. But approximately I have no reasonable doubt that some unascertained point in McDonald's level must be taken to be the place of such origin.

The next fact to be determined is, was it a gas or dust explosion? In arriving at a conclusion on this vital point wherein science plays so great a part, the court is very largely in the hands of experts, and, in determining what weight shall be attached to their testimony, will be guided by their apparent competency and disinterestedness. Applying, then, the opinions of these witnesses to requisite facts which have been proved to my satisfaction, I am forced to the conclusion that on the evidence it must be held that this was essentially and substantially a gas explosion; and of such a nature and extent that, quite apart from any possible augmentation by dust it was alone sufficient to cause, and consequently must be held to have caused all the results which the plaintiff necessarily assumed the onus of attributing to a dust explosion. In this relation I think it proper to say that I accept as substantially correct the defendants' contention as regards two facts of paramount importance; viz.:

(a) the state of affairs at the overcast; and (b) in the main entry generally; and largely as a consequence thereof I am

satisfied that the explosion properly so called, did not pass through the main entry; though if the dust theory be accepted that is the place of all others throughout the length of which it must have passed in the condition of that mine. There is nothing in my opinion, in the conclusions of the Coal Dust Committee (second report, 1894, p. viii) which, having regard to the circumstances of this case, conflicts with this view; though it is apparent that there is still much to be learned on the interesting and important subject of dust in coal mines.

Such being the opinion I have arrived at, it is not necessary to consider any other matters, which become immaterial, nor to refer to the cases cited, because on the above facts so found no negligence can be attributed to the defendant company.

It follows that the test actions must be dismissed with costs.

COMPANY NOTES AND CABLES.

TAMARAC MISES, LTD. (Ymir).—The financial statement for the year ending March 31st, 1904, shows a balance in hand of \$535.53. The sum of \$1,690.44 was expended in development work during this year.

ARLINGTON MINE (Eric).—Shipments were resumed on 1st June, and returns were received during the month from the smelter for three carloads. The receipts amounted to \$3,116.77 and the expenses for the month of June were \$3,026.65.

YMIK MINE (Ymir).—The mine manager sends the following report for the month of May: Forty stamps ran 28 days 19 hours and crushed 2,950 tons (2,000 pounds) of ore, producing 789 ounces of bullion. The estimated realizable value (gross) of the product is \$8,450; 220 tons of concentrates shipped, gross estimated value \$6,250; cyanide plant treated 2,090 tons (2,000 pounds) of tailings, producing bullion having estimated gross value of \$1,100, sundry revenue \$900—\$16,700. Working expenses \$15,000. Profit, \$1,700. There has been expended during the month on development \$1,690.

CARIBOO CONSOLIDATED.—Cable from the resident manager, dated June 20th: "West drift is now in 100 feet. Bedrock (reached). Value increased to \$14 per cubic yard. Little, if any gravel (yet taken out). There is every indication that the gravel is very rich. Have obtained out of west drift 5 ozs. of gold. Present appearances most encouraging.' A later cablegram states: "West drift is now in 120 feet: gravel at the bottom of cap; bedrock values continue to improve; \$22 (about £4 10s.) per cubic yard; the east drift is now in 78 feet: present appearances most encouraging.'

LE ROI (Rossland).—Cable reports for the month of May and June are as follows: (May) from Mr. A. J. McMillan: "Shipped from the mine to Northport during the past month 6,226 tons of selected ore, to mix up with silicious ores already at Northport smelter, containing 2,612 ozs. of gold, 3,600 ozs. of silver, 172,300 lbs. copper. Estimated profit on this ore, after deducting cost of mining, smelting, realization, and depreciation, \$7,750; expenditure on development work during the month, \$4,500. The manager and mine superintendent have resigned, and a number of others have left service of company. Manager Northport smelter resigning, but remains for several weeks." (June.) From the manager: "Shipped from the mine to the Northport smelter during the past month 6,055 tons of specially selected ore, containing 3,117 ozs. of gold, 4,217 ozs. of silver, and 188,800 lbs. of copper. Estimated profit on this ore, after deducting cost of mining, smelting, realization and depreciation, \$20,000. Expenditure on development work during the month, \$4,500."

LE ROI No. 2.—Returns for May estimated tonnage shipped at 1,976 tons. The net receipts for the month were \$44,990, representing approximately 2,000 tons previously shipped. There has been a temporary enrichment due to rich ore met in stope 25 during development. The tonnage shipped during the month of June amounted to 1,600 tons. The net receipts were \$47,263, being 90 per cent. payment for 2,939 tons ship-

ped; \$2,020, being 10 per cent. payment deferred on 1,953 tons previously shipped; \$3,905 being payment for 125 tons concentrates shipped—in all \$53,188."

TYEE COPPER (Mt. Sicker).—The following report for the month of June has been issued: "Smelter ran 24 days during the month, and smelted—Tyee ore, 5,070 tons; Customs ore, 225 tons—5,295 tons; matte produced from same, 467 tons; gross value of contents (copper, silver and gold) after deducting costs of refining and purchase of customs ore, \$59,245. N.B.—Main shaft is now down 483 feet. There is a very favourable change in the rock, showing thin seams of copper ore. Appearances are in favour of striking ore body.'

COMPANY MEETINGS AND REPORTS.

TYEE COPPER CO.

ON July 7th the fifth ordinary general meeting of the Tyee Copper Company, Limited, was held in London, Eng., Mr. T. H. Wilson (the chairman of the company) presiding.

The Chairman said: "Before moving the adoption of the report and accounts I think I ought to make some few explanations, so that a clearer understanding as to the true results of the past year's working may be arrived at than the accounts, on their casual reading, may have given to the shareholders generally. Doubtless many were surprised to note that the profit for the year was so low as £25,390, the amount mentioned in the report, whereas the gross profit is £25,390, plus the amount placed to reserve as agreed, £22,125; the amount spent out of the revenues upon mine and smelter during the year, £9,500; amount of depreciation written off, £3,990; income tax, extra on the previous year, say £2,281; London expenses, £1,877—a total of £65,163. This, of course, is only taking into account the larger items. I now ask you to refer to the balance sheet. On the debtor side sundry creditors, £3,367 15s. 3d.: of this amount £493 15s. 3d. has already been paid, the balance is a debit made for income tax, which, although only one-third will have to be paid this year, yet it is felt by the board it is a liability to be spread over three years, and should be reserve. The next item to be dealt with is the profit made, 1903, £9,021 18s. 1d. This amount, though made, was spent upon buildings etc., at the mine and smelter. The board were in this position. Spent as mentioned 1903 say £9,000; 1904 say £9,500; total, £18,500. It was decided, therefore, to take this amount from the profit account, not having the money available for dividend purpose, and to dispose of it as follows: From the mine account, on the credit side, which in reality should be, in round figures, £19,167, they reduced by £8,000, making it £11,167. The smelter stood at £21,848, but that they reduced by £8,000, making it £13,848; and the aerial tramway stood at £8,502, which they reduced by £2,500, making it £6,002. This will explain why the amounts against these respective heads are much less than they appear in the report of 1903, notwithstanding the many additions made. The fact is your property is worth more than the figures give. The other items on the debtor side explain themselves.

Turning to the credit side, properties, concessions, &c., is increased by £343 4s. 7d., as per items named. I have already explained about the reduction at the mine, smelter, and aerial tramway. Stocks on hand are of the actual value as per stocking sheet. The reserve fund is as per arrangement settled upon last year; only the two-fifths of the sum has been found this year, and only half that amount will have to be provided in the three following years. Of the cash (£13,724), paying the proposed final dividend will take £9,000, leaving £4,724 to carry forward. Of the amount standing for sundry debtors, £3,896 has by this time been received. The reserve to be made for this year, £11,062, is well in hand; so that we have a hopeful future. Before moving the resolution I should like to refer to the report of Mr. Musgrave (our mine superintendent) as to the ore reserves. The conservative statement made by him has alarmed some of the shareholders, and inquiries have been made at the office

"Is the life of the mine limited to one year?" In reply to this I should wish you to read carefully Mr. Clermont Livingston's report on this subject. In the past he has proved himself to have such an excellent grasp of the facts. Mr. Musgrave refers only to the ore body on which he is at present working. I have no doubt that during the present year our developments will prove large bodies of ore in depth, likewise in our adjoining properties. New machinery for sinking a shaft on the X. L. claim has just been ordered. I have much pleasure in giving the results for the month of June, just to hand by cable, a copy of which will be posted as usual: Result—"Smelter ran twenty-four days during the month and smelted: Tyee ore, 5,070 tons; customs ore, 225 tons; total, 5,295 tons; matte produced from same, 467 tons; gross value of contents (copper, silver and gold), after deducting costs of refining and purchase of customs ore, \$59,245. N. B.—Main shaft is now down 483 ft. There is a very favourable change in the rock, showing thin seams of copper ore. Appearances are in favor of striking ore body." Mr. C. Livingston also informs us, by cable, in reference to Mr. Musgrave's annual report—which you will find on page 13, under No. 2 stope—as follows: "No. 2 stope—This has been worked on seven floors, which equals about 50 ft. in height, and what has been said of No. 1 stope applies to this; that is, there is still ore on the upper floors. There is in this stope a heavy seepage of water from the roof of the upper floor, which makes it appear probable that the ore makes again a little higher up. After raising 5 ft. a good body of ore was struck, and a further 15 ft. has been carried, with roof still in ore." He also adds: Mine and stopes look exceedingly well." Before closing my remarks there is one subject that I would like to say a few words upon—that is, the aerial tramway; that, although we had new ropes installed in December last, yet the hauling rope is not wearing so satisfactorily as we could wish; but arrangements are being made for a stronger rope, which may cause slight delay occasionally in the shipment of ore to smelter. There is a glass model of the mine in the room, showing developments, for your inspection. I have now much pleasure in moving the adoption of the report and accounts.

Mr. J. A. D. Hancke seconded the motion.

A long discussion ensued, one or two of the shareholders taking exception to the various sums written off for depreciation, and one proprietor moved as an amendment that the final dividend proposed by the board—5 per cent.—should be increased to 10 per cent. This was ruled out of order, and the accounts as presented were finally adopted, several shareholders cordially supporting the cautious policy of the directors. The Chairman in his reply defended the conservative attitude of himself and his co-directors, and said that although they might be blamed for this policy of caution, they hoped that the shareholders would later on see the wisdom of this course, and be able to congratulate themselves on the great success of the company. Cordial votes of thanks were passed to the board, the local directors and general manager, Mr. Clermont Livingston, and to the staff generally for their services during the year.

NORTH STAR.

At an extraordinary meeting of the shareholders of the company held at the office of the company at Montreal on June 29th, it was resolved: "That the directors are hereby empowered to liquidate the company, also to sell the properties of the company at East Kootenay or elsewhere in such manner as may appear to them advisable and to distribute among the shareholders the proceeds of said sale, together with any other funds in their possession. The above resolution to be put into effect only after consultation and approval of the majority of the board, and a majority of the committee of shareholders composed of Messrs. John Beattie, R. Reford, H. S. Holt, Alexander Woods and R. C. Gillett."

It was also resolved: "That a distribution of the cash on hand be made to the shareholders of record on the 9th day of July, 1904, at the rate of seven cents per share."

In accordance with the above resolution the transfer books of the company will be closed at noon of Saturday, the 9th

day of July, 1904, and a distribution at the rate of seven cents per share will be made to shareholders of record of above date, payable on the 15th of July.

SOME NOTES FROM THE MINING CAMPS.

YUKON.

THE Detroit-Yukon Mining Company is operating extensively on Bear Creek, and recently there were received at the mine machinery weighing 200 tons in the aggregate, including two steam shovels and sluicing plant capable of handling 800 yards a day.

The Ogilvie Company's prospecting dredge on the Stewart river is giving very satisfactory results, making a profit of a big percentage over operating expenses. In consequence large dredges will next season be placed on the river.

A despatch from Dawson announces that No. 16 claim on Eldorado Creek, which at one time yielded a very large quantity of gold, but worked only in a desultory fashion during the past two seasons, is again about to be operated on an extensive scale, it being believed that by handling the gravel economically, sufficient gold yet remains to pay for recovery. As a means to this end it is proposed to drive a bed-rock tunnel the full length of the claim.

ATLIN.

First consignments of gold from Atlin are beginning to arrive at Coast ports. Recently the amalgamated McKee Creek Mining Co. made a first and the largest individual clean-up ever made in the district of over five hundred ounces. The undertaking was formerly known as the Atlin Mining Co.

Mr. W. J. Robinson, of the British America Dredging Co., operating on Pine Creek, Atlin, who recently returned from a visit to the district, states that Dixie Creek, situated beyond the boundaries of auriferous area at present being worked, is likely ere long to become importantly productive. The Creek has already been prospected and, it is said, heavy, coarse gold found there. The Company, Mr. Robinson stated, propose installing a dredge on Dixie Creek, there being ample water here for the development of power. The Company also announce their intention of operating two additional dredges on the Atlin leases, at an estimated cost of \$500,000; while the British Columbia Dredging Co. is installing a dredge on Spruce Creek.

COAST.

It is reported that arrangements are being made for the reopening of the Hayes Mines on Alberni Canal.

LILLOOET.

The big dredge is now in steady and successful operation, although the river being now in flood precludes the obtaining of the best possible results.

CARIBOO.

Prospects for a successful season in this district are reported to be most promising, there being an abundant supply of water for the working of the hydraulic mines in the vicinity of Barkerville. The Waverly, it is said, is likely to pay substantial dividends this year, while good reports come from China and other Creeks. The last report from the manager of the Cariboo Consolidated is most encouraging, bed-rock having been reached in the West drift of La Fontaine, where values have increased to \$20 per cubic yard, with every indication that the gravel is exceedingly rich.

A first clean-up at the consolidated Cariboo Hydraulic Co.'s Bullion mine resulted in the production of three gold bricks valued at \$60,000.

Rich gravel has been encountered on the Horsely Gold Mining Company's property.

KAMLOOPS.

It is reported that a Vancouver Island syndicate has purchased the Copper King mine at Cherry Creek, and propose developing the property on an extensive scale.

The new concentrator at the Iron Mask mine is now completed, and the machinery, it is thought, will be put in operation early in August.

SIMILKAMEEN.

The Daly Reduction Works at Hedley, in the Similkameen, are now in partial operation, but the installation of machinery is not yet completed. It is stated that the Olalla Company is arranging in the East for the securing of additional capital for development purposes.

LARDEAU.

A discovery of free milling gold quartz is reported to have been made near Ferguson, and a five-foot vein exposed.

Work has been resumed on the Triune mine, where preparations are now being made to install an aerial tramway and at other properties shipping operations are now in full swing. Recently the Great Western Company's new combination silver mill completed a first short run, producing a thousand ounces of bullion. At Poplar Creek a claim known as the Mother Lode has been bonded on working terms. Little development work has yet been done but the assay values of the surface ore are fair.

Another lead, eight feet in width yielding \$10 in gold, has been opened on the Swede group at Poplar Creek.

A rich strike of free milling quartz is reported to have been made in the upper tunnel of the Kingston mine, at Camborne, which was recently bonded to a Portland syndicate for \$200,000. In the same camp, a fine vein of quartz of considerable width has been also encountered on the Nelson group. Values are expected to average from five to eight dollars per ton.

SLOCAN.

The Rockland group of three claims has been secured by an American Syndicate, who propose proceeding at once with development work.

A comprehensive test of free milling gold ore from the Kilo is about to be made, arrangements having been made for the treatment of a parcel of a hundred tons at the Chapleau mill.

In the Slocan City division, the Pioneer Mining Co., has purchased the Black Prince fraction, bonded other claims in the vicinity and is negotiating for the Slocan Prince claim, of which an interest has been already secured.

The Edison, a high grade property, adjoining the Neepawa has been leased. There is an unauthenticated rumor which may be taken for what it is worth, that a German Syndicate propose establishing a smelting works at a point in the Slocan, this report having arisen from the circumstance that Dr. Sussman has been collecting information in the district.

The South Fork of Kaslo Creek is again attracting attention as a result of recently reported rich discoveries of ore discovered as "horn silver and black sulphurets." A number of claims are however showing well under development.

Mr. Thomas Jones, ore purchaser for the Lanyon Zinc Co., referring to the present production of zinc in the Slocan states that the Slocan Star is producing 20 tons a day, the Idaho five, the Wakefield five and the Payne 15. In the 18 months ending July 1st, there had been shipped to Kansas Zinc Works 3476 tons of zinc concentrates. Outside of this during the same period other shipments were made to Antwerp. Mr. Jones thinks the outlook for this industry in Kootenay is most encouraging.

According to Mr. Buchanan, inspector of lead bounties, lead production is being made at present at the rate of 30,000 tons per annum. Whether however this rate will be maintained depends on the continuation of production from the St. Eugene. To the end of June \$180,000 had been earned under the terms of the Lead Bounty Act.

Judgment was delivered this month in the case of the Last Chance vs. the American Boy. The plaintiffs, who won their suit, sued for \$8,500, the value of 84 tons of ore taken from their property by the defendant company.

The Slocan Star at Sandon is now employing seventy miners and shipping 500 tons of galena and 600 tons of concentrates to the Trail smelter. The company is installing machinery to the value of \$15,000 this year.

The cable for a 1,900 foot tramway at the Last Chance is now being installed at that mine.

NELSON AND YMIR.

There is now marked activity in the Nelson district, Forty-

nine Creeks in particular coming very rapidly into prominence as a promising free-milling quartz section. One company here, after expending a large sum in development work is now installing a fifty-ton plant, while a San Francisco syndicate has acquired a promising group of six claims, adjoining May and Jennie mine. There are three leads on these claims, the average value of the ore being, it is stated, \$17 to the ton.

Mr. Wm. Davys who successfully worked the Silver King mine under lease and lately the Hweitt at Silverton, has now leased the Poorman-Granite property on Morning Mountain, upon which work has already been commenced.

The Hall Mines smelter received last month 1885 tons of lead ore (dry weight). The lead realized aggregated 1072 tons.

The Bayonne group of ten claims, situated about 18 miles west of the foot of Kootenay lake was recently bonded for \$60,000 to Butte investors, who have made a first payment of \$7,000. The claims have good showings of ore carrying fair values in gold.

The Mollie Gibson, formerly owned by the Mollie Gibson Mining Co., was sold this month on a judgment held by the Eastern Townships Bank for \$23,400. The property which is a valuable one, ore to the net value of \$86,000 having been shipped consists of seven claims on Kokanee Creek near Nelson. The mine has also been fairly extensively developed and there are said to be still considerable ore-reserves. The purchasers are a syndicate of Sherbrooke, Port Arthur and Nelson men who propose to thoroughly develop the property.

The Tamarac Mines Ltd. have submitted a financial statement for the year, ending March 31st, 1904, showing a small balance in hand of \$535.53. During the year \$1690.44 was expended in mine development.

At Ymir seven mines are now making regular shipments, and reports from this district are most re-assuring. The last monthly returns from the Ymir place working expenses at \$15,000 and the revenue at \$16,700. A new company is now in process of incorporation to acquire and operate the Dundee mine.

A syndicate was formed last month under the mining partnership section of the Mineral Act to work three hydraulic leases at the mouth of Hall Creek near Ymir, and proposes to install immediately, a 6-inch centrifugal pump capable of moving from 900 to 1200 cubic yards of gravel in 24 hours.

A satisfactory strike is reported to have been made on the Foghorn in the drift east from the long cross-cut tunnel, five feet of ore having been exposed. This drift is some 900 feet below the surface. The Company has under consideration the erection of large mill.

ROSSLAND.

Mr. Ferdinand Dietzsch consulting engineer of the Giant Mining Co. is reported by the *Rossland Miner* to have said that the company which has been and is still supposed to be in deep water will now proceed to "discharge its obligations, develop the property vigorously and eventually equip it with reduction works to save the rare metals—cobalt and molybdenum—provided the report he is making is considered a satisfactory one." Mr. Dietzsch further stated that "arrangements had been made for the funds required, and a decision would be arrived at shortly after his return to England.

The Giant ore is complex, containing sulphides of cobalt, arsenic, iron and molybdenum, all carrying gold, which is more or less free, the gangue being silicious. By experiment it has been found the sulphides of arsenic, cobalt, nickel and iron may be separated by magnetic treatment, while the gangue and practically all of the molybdenum are non-magnetic. The ore may be therefore first treated by crushing and subsequent subjected to magnetic separation.

The magnetic product, carrying gold, molybdenum and silica would then be calcined and washed for the recovery of the molybdenum, and treated, practically by ordinary cyanid process, for the recovery of gold, the calcination and leaching having altered the character of the material to allow of ordinary cyaniding with the possible addition of amalgamation to save the coarse gold.

It is questionable whether sufficient cobalt and nickel exi-

in the ore to make their recovery of commercial importance. Eventually ore may be encountered carrying higher values in these rare metals, in which event the magnetic residue of the initial crushing will be reduced to an enriched nickel-cobalt speise in a reverberatory or cupola furnace, the resulting speise, which corresponds to smelter matte, being available for sale to cobalt refiners. For the recovery of the gold in the magnetic part of the pulps, calcination will be followed by cyaniding, a large recovery being possible, as indicated by the results of numerous experiments to date.

There is meanwhile no reason why the Giant should not with careful management be profitably worked.

A despatch from Rosslund states that Mr. F. W. Bradley, one of the members of the firm of consulting engineers to the Le Roi Company, has recommended the directors to proceed with the construction of a concentrator to treat 200 tons daily. The estimated cost of this mill is placed at one hundred thousand dollars.

BOUNDARY DISTRICT.

During the month the Providence Mining Company paid a fourth dividend of ten cents per share.

To the end of June last there had been done during the fiscal year, a total of sinking and raising, 5,098 feet at the Granby mines. The shipments of ore for this period aggregate 521,29 tons.

ments of ore for this period aggregated 521,292 tons.

At the sheriff's sale of the Winnipeg mine, on June 29th, no tender was made for the property.

EAST KOOTENAY.

Acting upon the advice of Mr. S. S. Fowler, a well-known consulting engineer of Nelson, the directors of the North Star Mining Company, at a recent meeting of shareholders recommended that further exploration work at this Kimberley mine should cease and provision made for the liquidation of the company. While there can be no doubt of the wisdom of this decision, it is nevertheless a matter for regret that the career of the North Star mine, which at one time paid very substantial profits, dividends aggregating \$312,000 having been distributed should now be closed, more especially as the affairs of the company have been judiciously and honestly administered. When some two years ago the main ore body was nearing exhaustion, an energetic effort was made to open up new ground, but though at times the indications appeared promising, and some small bodies of shipping ore were found, no new discoveries of importance rewarded the search. Recently Mr. Fowler's services were requisitioned and his report, made after a careful examination, sums up the situation as follows:

"The main old ore bodies have been worked out excepting a few remnants.

Several thousand feet of development work in all directions have found no new bodies.

Careful study of the rocks show that some of the unaltered country rock was probably the original source of the ore.

The ore bodies were found to have had altered country rock in relatively large volume on at least one side.

The rocks at depth (300 level) to the north, west and east are practically unaltered, and therefore I judge will not be found to contain ore bodies.

To the south of the old ore bodies, the rock has been altered on one or both sides of the main fissures, but mineral found there is insignificant in quantity and of low grade. If valuable ore ever existed in this region, it lay above and has been worn away.

For these reasons I cannot see any reasonable hope of further valuable discovery in connection with the fissures which have held ore heretofore.

As to the existence of other fissures, there may be no doubt, but their importance and position are both problematical. There appears no probability that they exist in the immediate vicinity of the mine, and to search for them without some tangible evidence of their existence would, I believe, be futile. So far as I can see, their discovery would be a matter of accident rather than of expectation, and I therefore advise against further development expenditure."

Meanwhile from the funds remaining in the treasury, an interim dividend of 8 cents per share will be paid, while a further distribution may be expected after the company's properties shall have been sold.

The recently re-organised Gold River Placer Mining Co., employing a force of fifty men has commenced work at Bull river, where a dam is to be constructed to direct the stream to facilitate the mining of the gravel in the channel. A flume sixteen feet wide and five feet in depth, of which a mile and a quarter is to be built, is meanwhile being constructed.

At the close of last month an important discovery was made at the St. Eugene mine at Moyie, a fine body of ore, fourteen feet in width, and carrying a higher percentage of silver than any yet mined here, having been encountered in the No. 1 tunnel, 1600 feet from its portal, and at a vertical depth from the surface of 1000 feet.

The quantity of realisable ore at this mine is enormous, and in any other country almost the average values would be considered satisfactory. The fact remains, however, that after shipping ore to the gross value of \$1,100,904 in 1900, and to the value of \$616,561 in 1901, it was found necessary subsequently to suspend operations until quite recently owing to unfavorable market, transport and treatment conditions. Thus in 1900 the freight and treatment charges per ton of concentrates averaged \$27.53, while in 1901 these were increased to \$28.62, at the same time the prices of silver and lead fell very considerably, and the American market was closed to British Columbia lead products. It is difficult to say whether the new discovery of ore will prove sufficiently rich to enable the company to continue production should the Federal Government refuse the request that has been made in respect to the amendment of the Lead Bounty Act, but the opening up of an extensive and valuable ore-body at so great a depth in this East Kootenay mine is nevertheless noteworthy in itself.

THE WINDERMERE DISTRICT.

The Bunyan mine, three miles from Windemere, has been bonded by Messrs. William Harrison, one of the owners, and William Chamberlain. They have already shipped one car-load of ore and are soon to have another car on the way. Last week, while widening the drift, they shot down the wall, exposing two feet of gray copper ore. From this they have taken 200 sacks of ore, which carries good values in gold, silver and copper. A trial shipment ran \$90 in all values.

THE CANADIAN MINERAL EXHIBIT AT ST. LOUIS.

MR. LOUIS LARIVE, Canadian Press Correspondent at St. Louis, sends us the following description of the Canadian mineral exhibit: Canada's great mineral wealth is admirably exemplified by an attractive exhibit in the Palace of Mines and Metallurgy at the World's Fair. The display is the largest ever made by Canada at any exposition. The exhibit occupies a space of 9,000 square feet near one of the main entrances, adjoining the United States Government section in the Mines building. The exhibit is not confined to show cases, but unique and striking mass displays are made. As Canada supplies more than one-half of the world's production of nickel and 95 per cent. of the world's production of asbestos, these two ores are given a prominent place in the exhibit. They are displayed in the form of large pyramids. The pyramid of nickel weighs 17 tons, while the one of asbestos weighs 14 tons. The other pyramids are shown, one of corundum, weighing 15 tons, and another of mica. These pyramids illustrate the processes the ores undergo in the transition from the crude state to the finished product. For example, in the nickel pyramid the ore as turned out of the mine forms the base; above is a section containing the product after the roasting process. Above this is a section containing the copper and nickel matte, and the apex is finished in the refined article. Surmounting the pyramid is a statue sculptured out of the refined nickel and typically Canadian in design.

A feature of the exhibit holds a place in the centre of the rear wall of the section and resembles a mantle in shape.

Three tall columns on either side are joined by a large arch, the top of which is 15 feet from the floor. The columns and arch are built up in sections composed of representative minerals from every province in the Dominion. In the centre of the arch is a rich exhibit of gold from the Yukon and British Columbia mines.

Coal holds a prominent place in the display. Specimens are shown from all fields, from Nova Scotia on the Atlantic to Vancouver Island on the Pacific. Most of the coal used by the Pacific Squadron of the United States Navy comes from the Vancouver Island mines. Gold-copper ores and silver-lead ores are shown in large quantities, as are also chrome iron and manganese iron ore. Seventy-five table cases contain minerals arranged according to their geographical location.

MACHINERY NOTES.

THE machinery ordered for the Reliance Mining & Milling Company's mill on Forty-nine is being delivered at the site, and the work of framing the building is now in progress.

The cyaniding plant installed at a very considerable cost at the Republic mine, Republic, Wash., some years ago, is to be offered for sale by order of the American courts on August 6th.

Five small machine drills were installed at the Spitzee mine, Rosslund, during the month.

The Granby Company are about to make an expenditure of between \$75,000 and \$100,000 in additional mine equipment, to facilitate extensive production of ore from the Nos. 3 and 4 tunnels.

It is stated that the erection of a zinc smelter to cost not less than \$100,000 at Fernie has been decided upon by a London syndicate, the Crow's Nest Coal Company having offered favorable terms to provide land for a site and slack coal for fuel purposes.

The Brown-Alaska Company's copper smelter at Prince of Wales Island, Alaska, is, it is said, to blow in about August 1st. Meanwhile the final installation of machinery is being made, and the smelter and mine are being connected by a Bleichert tramway, capable of carrying 50 tons an hour. The capacity of the smelter is 400 tons a day.

Arrangements are being made for the installation of electrical machinery at the Providence mine at Boundary district.

At Siwash Creek, near Yale, the recently incorporated International Gold Company is installing six Marrell stamps with quadruple discharge, there being at the mine, it is stated, 10,000 tons of rich ore ready for crushing.

Report has it that an electrolytic copper refinery to cost a quarter of a million dollars, is to be added immediately to the Tacoma smelter with a view to the completion of the works early next year. The new plant will be the only one in operation west of Buffalo, with the exception of the one at Great Falls, Mont., and, it is stated, will have a capacity of 9,000 tons of pure copper per year.

In addition there is some idea of establishing works either at Tacoma or San Francisco by men more or less identified with the smelter undertaking, for the manufacture of copper wire at one or other of these places.

Electrical power was utilized for the first time in July at the B. C. Copper Company's Greenwood smelter, the power being transmitted a distance of twenty-five miles from Cascade, it being there generated at the works of the Kettle River Power Company.

The Greenwood smelter will require something like 800 horsepower when the furnaces are in full operation, and there is no doubt that electrical power will prove vastly more economical than that formerly afforded by steam. The new copper converters are now in operation, and the matte, which heretofore has been sent to Tacoma and other outside points, will henceforth be locally converted into blister copper.

COAL EXPORTATIONS AND TRADE.

Coal deliveries at San Francisco during June from the Australasian colonies amounted to 6,778 tons. Australasian coal is now only in demand for domestic purposes.

The Western Fuel Company's coal exportations last month aggregated 11,022 tons.

Two seams of bituminous coal of excellent quality, the one eleven and the other six feet wide, have been discovered by a prospector employed by the Wellington Colliery Company, near McKay Lake, not far distant from Ladysmith. These seams are supposed to be continuations of the Wellington measures.

At Morrissey, after a "close-down" of eleven weeks, sixty coke ovens are now in use. It is expected that in a few weeks the entire battery of 240 ovens will be working, when an output of 500 tons a day will be made.

The construction of a branch railway connecting the Coal Creek mines with the Great Northern system is shortly to be commenced by the Crows' Nest Coal Co., to facilitate coal shipments.

The Imperial Coke and Coal Company has acquired control of the Alberta Coal and Coke Company's property of 6,400 acres on the line of the Crow's Nest line.

Mr. Justice Martin delivered a judgment in the important test actions brought against the Crow's Nest Coal Company, by relatives and others injured by the colliery explosion of two years ago. His decision, which was adverse to the plaintiffs, was based almost entirely on the evidence of the expert witnesses, who proved that the explosion was the result, not of dust, but of gas. Had the company lost the test actions it would have been mulcted in very heavy damages, claims for \$800,000 having been put in. Notice of appeal has meanwhile been given.

DRILLING FOR OIL AT STEVESTON.

A correspondent writes: "Cap rock having been struck in the well being drilled at Steveston, it was necessary to order additional machinery, also 1,600 feet of six-inch pipe to drill through the cap rock. The pipe and the machinery is now on the road and expected to reach Vancouver in a few days.

"The well at Steveston is down 925 feet, 702 feet being cased with a 10-inch heavy line pipe and 213 feet with an 8-inch; this pipe is filled with water to within ten feet of the surface, having a weight of over 300 pounds to the square inch. The pressure of gas is steadily increasing until it now has a pressure of 83 pounds to the square inch. Taking into consideration that the gas has to force its way through 915 feet of water the prospects are remarkably good to develop a sufficient quantity of gas to supply any smelter of factories that may be built at Steveston, also to supply the city of Vancouver with gas for heating and manufacturing purposes.

"The formation of the cap rock is such as to encourage the belief that oil will be found in paying quantities when the cap rock is drilled through."

THE MANUFACTURE OF LEAD PIPE AT TRAIL.

The important announcement is made that the Canadian Smelting Works at Trail are about to commence the manufacture of lead pipe and sheet lead in connection with that industry. Until the present time all the lead pipe used in Canada has come from abroad, notwithstanding that the silver-lead mines of British Columbia produce an excess of the raw material required to meet the total consumption of manufactured lead in Canada. It is further stated that arrangements are being made for the establishment of lead corroding works at Montreal. This step is decidedly in the right direction, and is an excellent indication of the improvement that is gradually being brought about in industrial conditions in the country.

Another rather curious anomaly, meanwhile, is the fact that all the refined silver produced in British Columbia is sent out of the country, only last week 70,000 ozs. having been shipped.

to China. On the other hand Canadian silver coin is made from Mexican silver minted in England. For many years an agitation has been maintained for the establishment of a Canadian mint, but for certain more or less obvious reasons, the banking interests have opposed the proposal. It is now, however, understood that the Canadian Government have the matter under advisement and arrangements will doubtless be ere long concluded for the establishment of a mint at Ottawa.

MINING MEN AND MATTERS.

Mr. S. H. C. Miner arrived in the Boundary last month on his annual visit to the properties of the Granby Consolidated Mining, Smelting & Power Company, of which he is president.

Mr. Geo. E. Cole, an occasional contributor to the *Mining Record*, for the past two years employed at the Granby mines, has returned East. After a few months at survey work in the field he will go to McGill University, Montreal, to there complete his course in mining engineering.

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Mr. A. H. Holdich, an assayer well known in the Lardeau and other parts of West Kootenay, is reported to have had a legacy left him that will provide him with a competence.

Mr. J. C. Haas has returned to the Boundary from a visit to Tonopah, Nevada, whence he went to examine mining properties for clients.

The resignation of Mr. E. J. Wilson, smelting manager at Northport, takes effect on August 1st.

Mr. H. T. Pemberton has been appointed general manager of the recently reorganized Montreal & Boston Company, in Boundary district. Mr. J. Cuthbert Welch has received the appointment of smelter superintendent and Mr. G. H. Collins that of mine superintendent.

Mr. Thos. R. Stockett, Jr., who first entered the service of the Crow's Nest Pass Coal Company in 1901 as superintendent of the Morrissey Mines, and recently acted as the company's general manager, has resigned that post in order to accept the position of general manager of the Western Fuel Company's collieries at Nanaimo. The duties of general manager at the Crow's Nest collieries are meanwhile being filled by Mr. Drinnam, general superintendent, while Mr. G. L. Pearson, recently of the Republic Iron & Steel Co., Pennsylvania, has been appointed sales agent and superintendent of the coke works.

Mr. Alfred McMillan has joined the staff of the Northport smelter, he being given charge of the automatic sampler.

The services of Mr. Chester W. Purington, of the firm of Doveton & Purington, mining engineers, of Denver, Col. have been temporarily engaged by the United States Geological Survey to report on placer mining methods and costs in the Alaskan territory. Accompanied by an assistant, Mr. Sidney Paige, of Washington, Mr. Purington is making a general inspection of the placer operations in Alaska during the present season. He recently arrived in Atlin, accompanied by Mr. Sidney Paige of the Geological Survey and has inspected the hydraulic operations in progress on Pine, Boulder, Spruce and McKee Creeks, and the dredging operations on Gold Run. Mr. Purington states that the area covered by pre-glacial auriferous gravels is undoubtedly large and will prove a factor of much greater permanency from a placer mining standpoint than the post-glacial or very recent gravels occupying the beds of the present streams. The Atlin district thus appears to afford a field for placer operations on a large scale, which will depend for their success largely on a preliminary mapping and prospecting of the ancient river channels.

Mr. Thos. Kiddie, manager of the Tyee Copper Company's smelter, last month paid a visit to Nicola and afterwards to the smelters of the Kootenay and Boundary.

Mr. George B. McAulay, for many years actively associated with the company owning the Cariboo gold mine, at Camp McKinney, of late years as managing director, died recently in Scotland, whilst visiting his old home in that country.

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NOTICE.

RESPECTING COAL AND PETROLEUM LANDS IN SOUTH-EAST KOOTENAY.

NOTICE is hereby given that licenses to prospect for coal and petroleum upon and under lands situated within Blocks 4,593, South-East Kootenay, will be issued forthwith to all persons who have made proper application, in pursuance of the provisions of the "Coal Mines Act" and amendments.

The fee for each license will be \$100, and all applicants who have not deposited accepted bank cheques to cover that amount are hereby required to do so without further notice.

Licenses will be issued in the following form, viz.:

"MINING LICENCE ISSUED UNDER THE COAL MINES ACT AND AMENDMENTS.

"In consideration of one hundred dollars now paid under the said Acts, and subject to the provisions thereof, I, W. S. Gore, Deputy Commissioner, acting for the Chief Commissioner of Lands and Works, license

to enter, prospect, search and work for coal and petroleum (but no other metal or mineral) upon, in and under all that piece or parcel of mineral land situate in and forming part of Block 4,593, East Kootenay District, and described as follows:— and not exceeding in the whole six hundred and forty statute acres.

Owing to the number of applicant for licenses to prospect for coal and petroleum, and the peculiar circumstances surrounding the application for and issuance of these licences, and the well-known fact that the issuance has been unavoidably suspended for so many months, the Government of British Columbia finds it impossible to determine the equitable rights of the numerous applicants. Therefore, for the purpose of enabling all persons to go before the proper tribunal for the determination of their respective rights and priorities, this licence is issued and accepted subject to such prior rights of other persons as may exist by law, and the date of this licence is not to be taken or held as in any sense determining such priority, and further it shall not be taken or held to waive enquiry by the Courts into the proper performance of all conditions precedent as between adverse claimants; and further, on the understanding that the Government shall not be held responsible for, or in connection with, any conflict which may arise with other claimants of the same ground, and that under no circumstances will licence fees be refunded.

And the holder hereby waives any claim or demand against the Government, and expressly agrees not to take any steps or proceedings, or present any petition, to enforce any alleged claim or demand against the Government of the Province of British Columbia arising out of the issuance of this licence or of any other matter of thing appertaining thereto.

"The land being under reserve from pre-emption and sale this license does not include any right other than the right to prospect for coal and petroleum.

"The duration of this license is for one year from the , 190 .

"Deputy Commissioner of Lands and Works.

"Lands and Works Department.

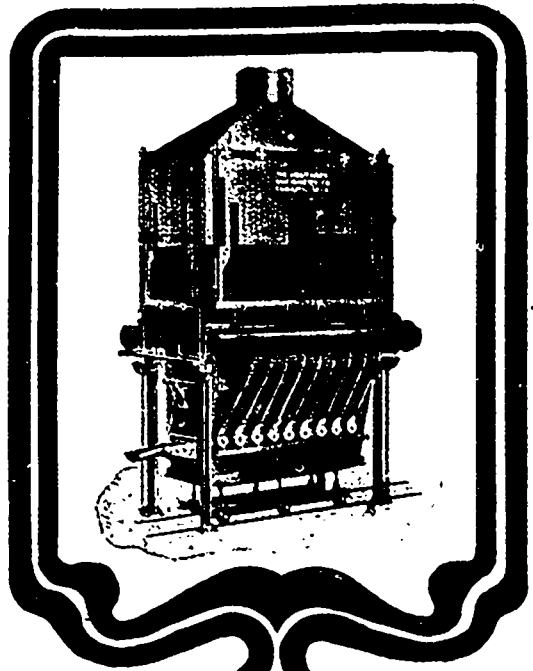
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R. F. GREEN,

Chief Commissioner of Lands and Works.

Lands and Works Department.

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