

# The Mining Record

VOL. XI.

JUNE, 1904.

No. 6

## BRITISH COLUMBIA MINING RECORD

Devoted to the Mining Interests of the Pacific Northwest.

PUBLISHED BY

THE BRITISH COLUMBIA RECORD, LIMITED

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Victoria, B. C., Office, Province Building.  
Vancouver, P. W. Charleson, Hastings St.  
London Office: 24 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

Advertising Rates on Application.

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THE MANAGING EDITOR, B. C. RECORD, LTD.,  
P. O. Drawer 645, Victoria, B. C.

## THE MONTH.

In the course of its comments upon the unpleasant surprise that has been sprung upon the shareholders of the Le Roi Mining Company by recent disclosures relative to stated faulty sampling and assaying, the *Critic* (London) remarks: "The optimistic statements at the last meeting and the recent efforts to create an interest in the shares by pushing them up require some explaining. Probably an investigation of the register and the recent share transfers would throw some light on the people who have benefited by what appears to be another instance of manipulation of the reports from the mine in the interests of market mongering." Whilst we are not sufficiently acquainted with the other members of the directorate to warrant us in expressing a competent opinion as regards the probability or improbability of there being justification for this suggestion so far as they are concerned, we have no hesitation, from our personal knowledge of Mr. A. J. McMillan, managing director; Mr. Geo. S. Waterlow, another director, and Mr. S. F. Parrish, late general manager, in asserting very positively that we do not believe that either individually or collectively they would knowingly sanction or assist in any irregularity that would improperly benefit themselves at the expense of others. Mistakes may have been made, but deliberate and intentional collusion for the purpose of personal

gain is one of the last things we would conceive these gentlemen to be guilty of, and it is but doing them the barest justice at this juncture to frankly state so.

There seems now to be a reasonably good chance that gold dredging on the Fraser will develop into an important and profitable industry. At any rate the success that has attended the preliminary operations of the new dredge—built, by the way, largely after the New Zealand pattern—recently launched at Lillooet, is distinctly encouraging, and has resulted not only in the staking of the river as dredging leases for many miles but, according to report, a determination on the part of this and other dredging companies to immediately place other large dredges of the same type on the river between Lillooet and Lytton.

The reproductions of photographs appearing in the Minister of Mines Report merit notice. Most of them are of photographs taken by the Provincial Mineralogist, and when it is pointed out that of these the larger ones are from four to seven separate photographs joined together, the care taken in preparing them for the engraver will be evident. The excellent work of Mr. Robert H. Clarke, pressman in the Government Printing Office, in printing the illustrations is apparent to all who examine them. A number were printed in black with a sepia tint, the work being done at one printing. This was an experiment at first, but it gave such good results that it was continued until the limited supply of ink on hand was exhausted, and black ink only was used for the remainder of the illustrations. The reproduction, from the Report of the Minister of Mines for New Zealand, of plan, elevation, etc., showing appliances for saving fine gold from dredging, is also good, while the reduction, by the B. C. Photo-Engraving Co., of a large sketch map of a portion of South-East Kootenay deserves mention as well. It is with pleasure we take advantage of this opportunity to acknowledge the excellence of the work done at home.

The summary of work done in the Government Assay Office, as reported by the Provincial Assayer, exhibits the usefulness of that section of the Bureau of Mines of British Columbia. From the report it is gathered that the work included the making of 720 assays or quantitative determinations, of numerous qualitative determinations of minerals and rocks for identification and classification, the melting and assaying of 164 lots of gold, analysing of a number of samples of water and of oil, and, in connection with the platinum group of metals, the conducting of a series of experiments in separating gold, silver, platinum and osmiridium, results of which experi-

ments are published in the Report of the Minister of Mines for the information of the assayers of the Province. The care of the Provincial Mineral Museum and the duties of secretary to the Board of Examiners in assaying also devolve upon the Provincial Assayer, whose periodical review of the work of his department will be read with much interest, both in the Province and elsewhere, by many qualified to appreciate its value.

The Annual Report of the Minister of Mines for the year 1903 was issued last month. It contains a large amount of information relative to the mining industry of British Columbia, and constitutes a valuable record of mining and smelting operations, of progress made, and of the condition generally of the industry. The various statistical tables, the preparation of which involves much careful work, are most useful, supplying as they do exhaustive and reliable information, presented in such form as to make quite clear the respective proportions of the several minerals produced, and the fluctuations in production year by year. For purposes of comparison, too, figures are given in such manner as to make plainly evident in the production of which particular minerals this Province leads. The comments of the Provincial Mineralogist under the respective headings of "Progress of Mining" and "General Developments of the Year" forcibly direct attention to the leading features of the year's work and the results attained. These comments, made with a fuller knowledge of the actual facts of the situation than can be obtained by anyone not having similar access to the confidential reports and sworn statements of mine managers and others, possess an especial value, and since they carry considerable weight it is well that, besides narrating the results attained, as indicated by the statistics, they show that improved methods of mining and ore-treatment have already been or are being adopted, and that, as a consequence, mining and smelting operations may be expected to return more profit than under earlier and less favourable conditions. The special reports of the Provincial Mineralogist on the mining camps and districts he visited last year, particularly the one on the valley of the Flathead River, South-East Kootenay (reproduced in full in this month's MINING RECORD), will be read by many seeking an unbiased and competent opinion thereon. The official reports of Gold Commissioners and Mining Recorders appear to be, on the whole, more in keeping with the high standard looked for in the report of an important department; indeed several of them are very creditable, and their value has been much enhanced by the occasional introduction of notes by the Provincial Mineralogist supplying mining or smelting costs, information relative to reduction processes, or other relevant and useful information. The illustrations are unusually good for an official report. The sketch map of the coal and oil district of South-East Kootenay will be of service to many. Altogether, the Report is, in our opinion, the best the Department of Mines has issued.

and it should prove effective in advertising the mineral resources of the Province.

The New York *Engineering and Mining Journal*, in a recently-published review of the world's copper production, points out that the new sources of copper supply opened in the past two or three years are all in North America, and mentions that the mines of the Boundary district of British Columbia are among the important copper producers lately developed. Commenting on the circular of a well-known London firm, who give yearly a carefully-prepared statement of the copper production of the world, the same journal observes: "The large increases were in North America, where Canada is making nearly three times as much copper as was reported four years ago. The gain is entirely from British Columbia, chiefly in the Boundary district."

Some of the Provincial newspapers occasionally quote the "hot air" statements given out in Spokane, Washington, by certain persons interested in making it appear that the Imperial Coal & Coke Company is a very meritorious and important coal-mining enterprise. For instance, last week a Vancouver newspaper reproduced from the *Spokesman-Review*, notorious for its unreliability as regards its mining news, a characteristic statement attributed to Mr. O. G. Labaree, one of the promoters of the Imperial Company. Among the assertions included in this emanation are the following: "We have received assurances that the Canadian Pacific Railway Company will build a road 28 miles long, from Michel, B.C., to the properties of the Imperial Company this summer"; "Mr. John Brown, one of the original locators of the property, is on the ground and will put about 20 men to work developing and preparing to ship"; "Our output will be about 10,000 tons of coal a day." Seemingly, nonsense of this sort is not unacceptable to the general run of readers of the Spokane newspaper, but why British Columbia newspapers should reproduce as news such trash is inexplicable. Does anyone familiar with the business-like methods of the C.P.R. suppose that its management has so far taken leave of its senses as to contemplate shortly constructing 28 miles of railroad in a mountainous district to a property that will put 20 men to work to prepare to ship coal, of which there is more than enough at collieries their railways already taps to supply all present available markets? And as to an output of 10,000 tons a day, which means between 3,000,000 and 4,000,000 tons a year—why the total output of the Crow's Nest Pass Company during six years to the end of 1903 was less than 2,000,000 tons from all its many coal mines. We think it probable that Mr. John Brown's body, like that of his famous namesake, will "lie mouldering in the grave" long before the Imperial Company regularly maintains an output of 10,000 tons of coal a day. Meanwhile it would be better for the mining industry of British Columbia if such mis-statements, whether made designedly or ignorantly, were not

given publicity without question by the provincial press.

In this month's MINING RECORD will be found much information that has been taken from the Annual Report of the Minister of Mines for the year 1903. We have no doubt numbers of our readers will be glad to have this matter thus reprinted, for the MINING RECORD is read by many who will not see the official Report. Thanks to the courtesy of the Hon. the Minister of Mines, we have been enabled to use about half the blocks that served to illustrate his Report. The selected matter and the illustrations being both new to our readers we commend them to their careful attention, feeling assured that the result will be a more adequate conception of the enormous extent of the mineral resources of British Columbia and a fuller realization of the growing importance of its mining industry.

Although we gave prominence to the subject in the April issue of the MINING RECORD, its importance to this Province warrants our again directing attention to the value of the mineral production of British Columbia as compared with that of the whole of the Canadian territory situate to the eastward of the Rocky Mountains. The particular purpose of Tables 9 and 10, which have been published for several successive years in the Annual Report of the Minister of Mines, is to exhibit the favourable position this Province occupies in this connection. So that not even a suggestion of a lack of complete fairness to other parts of the Dominion may appear, we have, in the mineral statistics published elsewhere in this issue, shown, first the totals of the production of metallic minerals in British Columbia, the Yukon Territory, and all other Provinces combined, respectively, and then have added the coal and coke production. Those interested in the detailed figures may examine them closely for themselves; we shall only briefly point out here the leading facts of the position. The total production in 1903 of gold, silver, copper and lead in the Dominion was valued at \$27,026,190. Of this British Columbia's proportion was \$12,631,787, the Yukon contributed (all in gold) \$12,250,000, and all other parts of the Dominion \$2,144,403. This means that the production of the Pacific slope portion of the Dominion of these four minerals was greater, to the amount of \$22,737,384, than that of all the remaining portion of Canada combined. The disparity, though still very large, is not so marked, however, after the production of other metallic minerals—iron, nickel and zinc—has been added, the Pacific slope showing a total production of all metallic minerals of \$24,888,657 as against \$8,818,746 for the remainder of Canada. Going further and adding the value of the coal and coke production, the Canadian territory east of the Rockies shows to less disadvantage, since it makes a gain of nearly \$9,000,000, as compared with that of British Columbia in its coal production, although the Western Province is a little to the good in coke. Still, with coal and coke added the balance is considerably

in favour of the Pacific slope, the respective totals being \$29,220,954 for British Columbia and the Yukon, and \$22,108,120 for the remainder of Canada. To give the other provinces their due it will be admitted that after all the numerous non-metallic mineral products and the structural materials and clay products, these being included in the total mineral production of Canada, have been taken into account the balance is not in favour of the Pacific slope, which has a total value of all mineral products of \$29,745,954 as against \$33,480,556 for the whole of the other portions of the Dominion. Yet this may be justly claimed, that this Province is distinctly in the lead in value of production of metallic minerals, and that since its iron and zinc resources are now receiving attention it may look to these assisting it in the future to maintain its advantage. Further, with coal and coke production promising a substantial increase, the prospects are that these products, as well as all the metallic minerals, will contribute a substantial increase to production and so aid in making British Columbia the "Mineral Province" of the Dominion to even a greater degree than already obtains.

As the option for the sale of the Lenora mine expired on May 20th, without so far as we are aware action being taken thereon, it is to be presumed that the "deal" which was being promoted in London has fallen through. We cannot help expressing the hope that such really is the case, for there are many other mines in British Columbia which in our opinion might be acquired to better advantage by British investors than the Lenora. Unfortunately we have little actual proof of the truth of the reports which have been circulated concerning the representations made by the promoters of the scheme in the endeavour to effect a sale, and consequently are unable to comment as we should have wished. We are informed, for example, that it was actually claimed for the Lenora, among other things, that there is now in sight at the mine over a hundred thousand tons of ore of payable grade. If such a statement were made it would be interesting to learn how the estimate was arrived at. The adjoining Tyee mine claims, we understand, only some sixty thousand tons of ore in sight. This mine has been carefully and systematically developed for about the same length of time as the Lenora has been carefully and systematically "gutted." To us the inference is obvious. Again some stress seems to have been laid on the circumstance that the sale of the property was sanctioned by the court. But it should be remembered that all the court was called upon to determine was whether the unsecured creditors would be placed in a worse position should the mine be sold, and as that was impossible, and on that account a majority of the unsecured creditors had voted in favour of the option being granted, the judge gave his approval. At the same time no affidavit was produced in court certifying to the value of the property. If the property is sold to British purchasers who have not the good sense to exercise ordinary business precautions before investing, then, of course, they deserve to suf-

fer the consequences. All we care to consider is British Columbia's good name, which has been dragged in the mud too often as it is.

We have received some extracts from the preliminary report, made to the Hon. Clifford Sifton, of the Commission appointed to investigate the different electro-thermic processes for the smelting of iron ores and the making of steel, stated to be now in operation in Europe. Notes of what the members of the Commission saw at works in Sweden, Italy and France are included in the report, which, by the way, does not appear to us to have warranted the extremely sanguine anticipations of Eastern press correspondents and which we questioned last month. While the Commission saw processes in operation that indicated decided progress in the direction of the application of electricity to the manufacture of steel, its conclusions regarding the electric smelting of ore may be summed up in the words of the following excerpt from the report: "The process of electric smelting must yet be regarded as in the experimental stage, no plant existing at present where iron ore is commercially reduced to pig by the electric process." It is true the report, later, goes on to say: "We may expect that the application of electric energy to the extraction of metals from their ores will not be long delayed and that familiarity with handling large currents and experience gained in electric smelting will result in displacing some of the costly and complicated methods by comparatively simple and economic processes," but it is evident that as yet electro-thermic processes are not being applied on the large scale necessary to make them a commercial success.

It is unfortunate that the favourable reports of results obtained during the last few months at the Eva mine and stamp mill, Camborne, should be followed so quickly by an announcement that the Calumet & B. C. Gold Mines, Ltd., having exhausted its treasury, has not been able to exercise its option to purchase the Eva property, and that re-organization is necessary. The position is by no means a new one in connection with mining, the company having, like too many others, discounted its future by assuming financial obligations altogether beyond the capacity of an ordinary small mine to discharge and, as well, pay its working expenses. As a consequence mining in a very promising district gets a bad name, for the second time within a year. Whilst there can not fairly be charged in the case of the Eva similar mismanagement and reckless waste of money to that which last year wrecked the Northwestern Development Syndicate, operating in the same district, the effect upon those who put money into the Eva enterprise will be almost as discouraging. The lesson to be taken to heart is that with only a limited amount of development in a mine and inadequate equipment in a mill, eventual failure may, in most cases, be regarded as a matter of course, if the cash capital be small. The possession of a good mining property is not the only *sine qua non*—another essential is a

treasury reserve of cash or salable stock to meet unforeseen contingencies. Too often, though, chances are taken, with results as disastrous as those the Eva shareholders are now face to face with. It is to be hoped that some way out of the difficulty will be found, so that further development of the mine and the requisite addition to the mill plant may be provided for and work be pushed to the successful issue that appears to be possible.

The directors of the Providence Mining Company, of Greenwood, have decided to pay another dividend of ten cents per share. This will be the third dividend the Providence mine has earned, the first and second, each of ten cents, having been paid last year. The company enjoys several advantages; it owns a mine that has been fully paid for, its operations return all along a profit, and its issued stock is limited to comparatively few shares. From its inception the company has been managed on strictly business lines, so that after the output of the mine had provided sufficient money, in excess of current expenses and the cost of necessary plant and building improvements, to pay the balance due on the purchase of the property the surplus profits became available for distribution among the shareholders in the shape of dividends. The Providence mine is not a large one, but it has developed a payable lead of ore down to a depth of 325 feet on the incline and, in order to keep development well ahead of stoping, a contract has been let for sinking 100 feet deeper. Some interesting particulars of the mine and its ore returns were published in the MINING RECORD for April last. Though the company's operations have not been extensive they have been successful, and so have influenced the opening up of several other silver-gold claims in the neighborhood of Greenwood.

The Executive Committee of the Provincial Mining Association held a business meeting at Nelson last month. Among the matters dealt with were the question of the location of placer claims over mineral claims and the endorsement of an application to the Dominion Government for an extension of the benefit under the Lead Bounty Act to mines which are unable to get their lead ore treated in the Province. We print elsewhere a brief account of the proceedings at the meeting.

Advices we have received from Greenwood are to the effect that the installation of the converter plant at the B. C. Copper Company's smelter there will be completed shortly and that before the end of the current month blister copper will be produced at those works. At present the matte produced at this smelter is sent to Tacoma to be converted into copper, but we expect to next month be warranted in offering our congratulations to the B. C. Copper Company upon its successful accomplishment of this work at its own establishment.

The Provincial Mineralogist, himself an experienced metallurgist, characterizes the report of Mr.

Thos. Kiddie, manager of the Tye Copper Company's smelter, Ladysmith, as exceedingly interesting from a metallurgical standpoint, showing, as it does, the practical results obtained in smelting an ore carrying more than 35 per cent. of barium sulphate. This ore is described as unique in character and its treatment as presenting a problem not met with, so far as could be learned, elsewhere. With no previous experience, either of his own or of others, to guide him in treating this ore, Mr. Kiddie's work was for a time largely experimental. As showing the material improvement he has made in smelting this ore it may be mentioned that Mr. Kiddie succeeded in raising the treatment capacity of the furnace from a daily average of 177 tons during the period covered by the last annual report published by the company to one of 249 tons during six months to the close of April last. On another page we give Mr. Kiddie's absolute average figures of the results of his furnace work during the latter period.

The members of McGill Summer School of Mining completed their month's outdoor course for this year about May 24th, on which day they reached the end of their arranged programme. The final day was spent at Cascade visiting the power station there, the waters of Kettle River being utilised at that place for the purpose of generating electricity for the motive power for mines and smelters in the Boundary district. Most of the students have arranged to spend some time at practical work in one or other of the mines visited in the Province. Dr. Porter and his assistants have left on their return to McGill University, Montreal. Mutual advantage to British Columbia and the mining students must result from the visit of the school—the Province will benefit by having first-hand information relative to a number of its important mines and smelters disseminated wherever the visitors shall make mention of what they saw of mining in British Columbia, and the students were enabled to witness modern methods in mining, concentrating and smelting and particularly to learn something of the systems and economies that make it possible to turn to profitable account ores that in several instances are of lower grade than it is customary to mine and treat. Thanks are due to mine and smelter managers and all others who co-operated with Dr. Porter to secure the accomplishment of the purpose of the visit of the Summer School. It is pleasing to have assurance that the visitors fully appreciated the attention shown to them.

The Rossland Board of Trade recently unanimously endorsed and adopted a proposal made by two prominent local mine managers to the effect that the Dominion Government shall authorise the Geological Survey of Canada to make a detailed structural survey of the mineralized portion of the Rossland district. The memorial prepared for submission to the Government recites that from the time active production was commenced in the district in 1894 to January

1 of the current year there have been produced 1,616,259 tons of smelting ore of a gross value in gold, copper and silver of \$25,436,525, practically all derived from an area of 120 acres on the slope of Red Mountain. Whilst private enterprise has mapped out the rock formations, veins, dykes, faults, etc., within this comparatively small area, it cannot similarly cover the remainder of the mineralized region about Rossland, the task being beyond its capacity. It is claimed that there are many outcrops and exposures in prospect workings that would afford geologists much information for use in the preparation of the detailed report asked for, and that the economic results that would follow the making available to mining men the conclusions of expert geologists would be found to more than justify the expense involved in the much-needed examination and report.

A recent issue of the *B. C. Review* (London) contains this amusing editorial paragraph: "We stated in a recent issue that the B. C. Government is reported to be about to sell the extensive coal and petroleum lands in East Kootenay, which they have recently recovered from the Canadian Pacific Railway, to an American syndicate. Latest reports from the Province state that there is much local indignation over the matter, as these lands are known to be extremely valuable, some authorities appraising them at ten million sterling, while the American syndicate will obtain them for a nominal license fee of £4,000. Of course, every kind of epithet is hurled at the Government, who are accused of sacrificing the interests of the Province for private gain, but it is certainly better that these mineral lands should be developed by a financially strong company rather than be handed over piecemeal to penniless individuals who will hawk their grants all over the country. We trust that the Government will take some steps to ensure a substantial revenue to the Province from whoever obtains these valuable lands." There would be something a great deal harder than "epithets" hurled if the B. C. Government tried or even contemplated any such little game. But we can assure our contemporary that the B. C. Government has not as yet, at least so far as we are aware, removed its official headquarters from the Legislative Buildings, Victoria, to the lunatic asylum, New Westminster.

Two months ago we commented on a statement published in a Rossland newspaper asserting that the deduction of the President of the Rossland Board of Trade from his own annual report of 1903 and from a leaflet published by the Associated Boards of Trade was "that in 1903 Rossland camp produced about 46 per cent. of the entire mineral wealth mined in British Columbia." We then expressed the opinion that when the official figures should be published it would be found that the Trail Creek Mining Division, which includes Rossland camp, did not contribute more than 25 per cent. in value and much less in tonnage of the total mineral wealth mined last year in the Province. The official figures are now avail-

able and we note that the total for the Province was \$17,495,954 of which Trail Creek Division's proportion was \$4,255,958—a little less than 25 per cent. Lately we received a marked copy of the report of the President of the Rossland Board of Trade, so we assume that it is desired we make some reference to it. We now find the statement of the President in connection with the above-mentioned matter, as printed in the report, to be as follows: "Out of a total metallic production of \$9,881,639, for the whole of Southern Kootenay and Southern Yale in 1903, Rossland produced \$4,251,463, or more than 43 per cent. of the total." (The italics used above are our own.) It is Rossland's misfortune to have much matter supplied for publication by an individual who is long on conceit and short on accuracy, so that mis-statements are frequent. As an instance of this we may mention that when a representative of the MINING RECORD visited Rossland last December to obtain information for a review of mining in 1903 he found that the tonnage statistics then being supplied to the Press showed the output of local mines to be about 50,000 tons more for the year to date than the actual production had been. The Rossland Board of Trade, therefore, need not be surprised to find journals that regard general accuracy as essential challenge glaringly-inaccurate published statements, such as those above noted. Reverting to the report—the statistical tables embodied in it supply some interesting and useful information, showing (1) approximate output of each producing mine during ten years, the total output for that period appearing as 1,617,259 tons having a gross value of \$25,436,525; (2) comparative yearly output, giving total tonnage and value for each year from 1894 to 1903, both inclusive; (3) details of output for 1903, including production, and gold, silver and copper contents of ore, respectively, of individual mines working; (4) statement, in lineal feet, of development work done in each mine during 1903, viz., 31,480 feet, and (5) number of men, which was 1,041, employed in the principal mines. Another table is the Associated Boards of Trade's estimated value of mineral produced in Southern Kootenay and Southern Yale in 1903. As the figures contained in the latter have been widely published it may be of interest to quote them, and as well the official figures, taken from the Minister of Mines' Report. These follow, those in parentheses being the official revised figures: Gold, \$4,219,718 (\$4,492,448); silver, \$1,839,953 (\$1,210,311); copper, \$3,332,175 (\$3,637,877); lead, \$489,793 (\$646,114); total, \$9,881,639 (\$9,986,750). It will be observed that whilst there are considerable differences between the values of individual metals, there is only about \$105,000 variation between the totals. The Rossland Board of Trade has done the mining industry a service by having printed and distributed a pamphlet containing much statistical information relating to the development and production of mines in the Rossland district. Having an output officially valued at more than four and a quarter millions of dollars, it is well that much publicity be given to that important fact.

The cablegram sent by Mr. J. H. Mackenzie, acting General Manager to the London office of the Le Roi Company, making the extraordinary statement that in consequence of faulty sampling and assaying recent shipments of Le Roi ore had been over-valued to the amount of \$335,000, has naturally caused much consternation not unmingled with indignation both in England and in this country. To us it appears incredible that such a serious and inexcusable blunder as that alleged should have been made and remained undetected for so long a period as claimed. Thus if the sampling and assaying at the mine were at fault, and this was known at the company's smelter, it is certainly strange that prompt action was, apparently, not taken to remedy the grave error. Another rather remarkable circumstance is that this is the second occasion on which it has been alleged that Le Roi shipments have been grossly over-valued. Mr. Frecheville, sent out by the London directors some two years ago to report on the mine, attributed, it will be remembered, a similar error to the then general manager, Mr. Bernard McDonald. Mr. Mackenzie, who, by-the-way, was appointed by Mr. Frecheville, and had charge of the mine for several months prior to Mr. Parrish's engagement, now claims to have discovered a like condition of affairs. This is a very damaging allegation in respect to both the financial position of the company and the competence of Mr. Parrish, its manager. Meanwhile the over-valuing, having as alleged, covered a period of several months, it is singular that so wide a discrepancy between the values in the ore as shown by sampling at the mine and those actually recovered at the smelter,—at any rate during the first half of the period referred to, was not detected by the London Board, which presumably receives fully detailed returns from both mine and smelter. Without Mr. Parrish's explanation of the position it is impossible to express an impartial opinion as to whether or not Mr. Mackenzie's statement is the correct one, but the latter gentleman before assuming the heavy responsibility of cabling the information he did to London must assuredly have thoroughly satisfied himself in his own mind that the facts were as set out in his message. It may not be out of place to make reference here to the excellent work done by Mr. Parrish since he undertook the management of the Le Roi. The condition in which he found the mine upon taking charge was not a satisfactory one, for, it is understood, all the higher grade ore in sight, had been removed from the mine by reason of financial exigencies which demanded that such a policy should then be followed. Mr. Parrish was called upon to practically rehabilitate the property, and despite the present disconcerting reports, there can be no doubt that the position and value of the Le Roi has been materially improved during the past twelve months.

Since the above was written our Rossland contemporary, the *Miner*, has published the following:

"During the early part of the present year the management of the Le Roi announced substantial profits. The public was thus led to believe that

\$108,000 had been earned in sixty days. It now transpires that nothing like this amount was earned; in fact recent developments show that during the first two months of the current year the earnings were next to nothing. The fault does not rest with the mine, nor is the smelter to be blamed. On an output of something like 20,000 tons a month the run of the mine was indiscriminately sent to Northport. Faulty sampling at the mine was the basis of the office estimate that created the reported profit, but the close check of Manager Wilson at the smelter proved it far from correct. The sampling at the mine is nothing short of a scandal, but the work at the smelter is above both reproach and suspicion. It is said that Mr. Wilson is on record in Rossland as well as in London, showing that his assays made on the receipt of the ore tally with the result of the smelter run."

But this explanation does not explain the points we have suggested, namely (1) how the discrepancy between the mine and smelter assay values, respectively, was not immediately discovered, (2) how it was that the Directors apparently failed to note the very marked difference between the estimates received from the Rossland office and the values actually recovered at the smelter, and (3) if this difference was noted why the shareholders were permitted to remain under the impression that comparatively large profits were being earned.

It is stated that Mr. Charles Sweeny, a well known Coeur D'Alene miner, has by an arrangement recently concluded, secured a controlling interest in the Sullivan mine, in East Kootenay. The property itself is, we believe, a valuable one, and under tolerably efficient management should be capable of becoming a profit-earning concern. Under Mr. Sweeny's direction—if the reputation he enjoys does not belie him—it is unlikely that the idiotic mismanagement of the past will be repeated. We should not be astonished if, at his instance, the Marysville smelter is reconstructed on something like approved modern lines. It is even possible that the calciner building of "unique and original design" may be demolished or utilized for (say) some homely agricultural purpose.

At the meeting in Nelson in May, the executive committee of the Provincial Mining Association passed a resolution endorsing the appeal made to the Dominion Government by the Associated Silver-Lead Mines, and agreed to by the Canadian smelters. "That the bounty on lead ore be paid for one year on any lead shipped out of Canada after the lead smelters had been supplied with all the ore they require." In this instance the Mining Association has merely followed the line adopted by the Kootenay Associated Boards of Trade by "backing" the request of a body of men who should know better than any outsiders what they require of the Government in order that the industry in which they are engaged should prosper. The mine-owners had previously convinced the home smelters that they would lose nothing by agreeing to the pro-

posal and as the smelters had raised no objection, it was nobody else's business to oppose a plan which at any rate meant the working of more mines and the employment of a greater number of men in the silver-lead districts of the two Kootenays during the next twelve months. The only opposition of which we have knowledge has come from a Mr. Fernau, who represented himself as ready and able, provided he received sufficient encouragement, to establish a lead smelter at Fernie or other suitable centre, and it is understood that the rate he suggested would be charged for treating both silver-lead and zinc-bearing ores was extremely low. However, Mr. Fernau must certainly have failed to convince Kootenay mine-owners of his bona fides, for none of them appear to have taken him or his proposals seriously.

RESULTS OF SMELTING AT LADYSMITH.

THE following absolute average figures of the results of work at the Tyeo Copper Company's smelter, Ladysmith, during six months to the close of April last, were supplied by the manager, Mr. Thos. Kiddie, for publication in the Annual Report of the Minister of Mines:

"During the last six months the furnace was in blast 123 days of 24 hours each, an average of 20 days per month, and smelted 30,703 tons of material, of which 28,290 tons were ore, making a daily average of 249.6 tons of material or 230 tons of ore per day, from which we shipped in the form of matte, 2,275,997 pounds of copper, 72,207.8 ounces of silver, and 4,592.18 ounces of gold. A general analysis of the burnt ore used during this period is as follows:

Iron . . . . .	11.45 per cent.
Silica . . . . .	19.36 "
Zinc . . . . .	6.97 "
Barium sulphate . . . . .	38.87 "
Sulphur (in sulphides) . . . . .	6.56 "

while the general analysis of the slags produced during this period, which also includes custom ores, was as follows:—

Copper . . . . .	.37 per cent.
Gold . . . . .	Trace.
Silver . . . . .	.12 oz. per ton.
Iron oxide . . . . .	17.68 per cent.
Zinc oxide . . . . .	6.44 "
Barium oxide . . . . .	26.16 "
Calcium oxide . . . . .	7.92 "
Silica . . . . .	33.34 "
Alumina . . . . .	10.75 "
Magnesia . . . . .	Trace.

"The improvement in the slag assays for copper over the previous year is due in part to the increased settling capacity of the receivers at the furnace; in part to a reduction in the specific gravity in the slags by the admixture of suitable fluxing ores, which were not procurable in the earlier stages of our operations; in part to the lesser amount of ZnO in the slags, as a result of the admixture of other ores referred to;

and in part to altered furnace practice, as a result of experiment with such ores. The specific gravity of the mattes was between 4.7 and 5.0, and of the slags between 3.6 and 3.8.

"Of the total ore smelted, 62.8 per cent. was burnt ore, 22 per cent. raw sulphide ore and 15.2 per cent. raw custom ore—or 62.8 per cent. burnt ore and 37.2 per cent. raw ore, from which a shipping matte of from 40 to 45 per cent. copper was produced in one smelting operation. Comparing the furnace work of the past six months, as shown above, with the last annual statement, it will be seen that the capacity of the furnace has been raised from 177 tons to 249.6 tons, an increase of 72.6 tons per day."

#### NOTES ON THE CONSTRUCTION OF MINE BULKHEADS.

(By William Thompson, Rossland, B.C.)\*

The writer was recently called upon to design and erect a number of mine bulkheads which required to be absolutely free from danger of collapse and fracture and possibilities of leakage. After consideration of the many classes of material available for this purpose, and various designs of construction, the following general design was decided upon and followed:

**MATERIALS**—Materials chosen for the erection of the bulkheads were hard burned, repressed brick, manufactured from clay found at Clayton, in the State of Washington, U. S. A., Portland cement imported directly through Vancouver agents from White Brothers, of London, England, and clean river sand found locally. Before being used samples of all materials were tested in the laboratories of Dr. J. T. Donald and McGill University, Montreal, Quebec.

**DESIGN OF BULKHEADS**—In each case the pressure exerted from the head of water to be retained was in one direction. Bulkheads were, therefore, erected in the form of an arch set against footings cut into the solid rock, footings also being cut into the roof and floor of the workings to remove loose or fractured material and make perfect seal against leakage at point of contact between brick work and walls of drift. The first arch was re-inforced by a second arch of similar design and the space between the intrados and extrados of the two arches filled with strong cement concrete. The extrados of the final arch was also sealed by strong cement concrete faced with two-inch cedar plank. The strongest and most perfectly shaped brick were chosen for the construction of the main arches and the mortar used consisted of two parts sand to one cement, freshly mixed as required.

**STRENGTH OF MATERIALS**—Brick—Transverse Test—Distance between centres of support in each case, six inches; specimens tested on flat. Breaking load at centre in pounds, arch brick, 6,500 pounds; breaking load at centre in pounds, face brick, 3,900 pounds.

**COMPRESSION TEST**—Load in pounds per square inch at initial failure, arch brick, 6,600 pounds; load in pounds per square inch at initial failure, face

brick, 2,117 pounds; maximum load in pounds per square inch, arch brick, 8,320 pounds; maximum load in pounds per square inch, face brick, 3,242 pounds.

**CEMENT**—Tensile strength in pounds per square inch: Neat cement 20 per cent. water, at end of 60 days, 699 pounds; one cement and one standard quartz sand, same period, 540 pounds; one cement and one sand used, same period, 498 pounds.

**PLAN OF BULKHEADS**—Diagram No. 1 shows vertical section, and Diagram No. 2 plan of bulkhead erected to withstand pressure due to 475 feet of water.

A three-inch wrought iron pipe was laid through each bulkhead to carry off water accumulating during construction, this pipe being sealed when water was allowed to accumulate against the face. Bulkheads were maintained free from pressure until material had become thoroughly set.

**RESULTS**—Results obtained proved eminently satisfactory, bulkheads proving watertight, and owing to large factor of safety are free from any danger of collapse or fracture.

#### THE CORRECT DIMENSIONS OF OPEN FLUMES.

(By Thornhill Cooper, Mine Manager, Westport, New Zealand.)

A matter recently came under my notice regarding the correct dimensions of open flumes so as to insure the greatest carrying capacity consistent with using the smallest quantity of material. From personal observation and inquiry I find that this subject receives but little attention, and therefore take the liberty of bringing it before your readers' notice.

I find by calculation that by modifying the dimensions of a flume it is possible to materially increase its capacity without any corresponding increase in the quantity of timber used in its construction. The correct relation of sides to bottom appears to be as 1 is to 2.

Taking, for instance, a commonly used flume of 2 feet by 2 feet, and say 12 feet long, we obtain an area of 4 square feet, and a capacity of 48 cubic feet, requiring for its construction 72 square feet of timber. Now, modify the dimensions in accordance with the proportion above laid down, making the sides to be 1 foot 6 inches and bottom 3 feet. We then obtain an area of 4 feet 6 inches, and with the 12 foot box a capacity of 54 feet, still using only the same quantity of timber—72 feet.

Other examples work out similarly, e.g.:

Sides.	Bottom.	Length.	Area. Sq. Ft.	Capacity. Cub. Ft.	Timber. Sq. Ft.
3 ft.	x 3 ft.	x 12 ft.	9	108	108
2 ft. 3 in.	x 4 ft. 6 in.	x 12 ft.	10'125	121'5	108
2 ft.	x 3 ft.	x 12 ft.	6	72	84
1 ft. 9 in.	x 3 ft. 6 in.	x 12 ft.	6'125	73'5	84
3 ft.	x 4 ft.	x 12 ft.	12	144	120
2 ft. 6 in.	x 5 ft.	x 12 ft.	12'5	150	120
4 ft.	x 4 ft.	x 12 ft.	16	192	144
3 ft.	x 6 ft.	x 12 ft.	18	216	144

In these examples I have—in order to simplify calculations—taken no account of the loss of timber entailed at the junction of sides and bottom, but this will not affect capacity results.

\*Paper presented at the March meeting of the Canadian Mining Institute.

## PROGRESS OF MINING IN BRITISH COLUMBIA IN 1903.

In the 1903 Annual Report of the Minister of Mines for British Columbia the Provincial Mineralogist, Mr. Wm. Fleet Robertson, makes comment on the Progress of Mining in the Province during the period under notice. In the course of his review he observes:

"The statistics of the mineral production of the year 1903, when compared with those of the previous year, do not show that increase of output which had been hoped for, and which there was reason to expect.

"The gross value of the mineral products of the Province for the year 1903 was \$17,495,954, an increase over the preceding year of \$9,404; not a very great sum, but still an increase, and including and overcoming the decrease occurring in both the placer gold and coal mining branches of the industry, for which in both cases there are special and, fortunately, only temporary causes.

"These statistics are only a record of the amount of mineral actually produced and marketed; as such they are true, but it is felt they are not quite a just measure of the progress actually made in the industry, as they take no cognizance of the improved methods of mining and treatment which have been or are being adopted, and which have so important a bearing on the chief end and object of mining, viz., the earning of a profit.

"It is generally conceded that mining in the Province is gradually assuming a better and more secure position as a business than it formerly held, and is on a more stable basis than it was a year ago.

"This has been secured by the general recognition of the necessity for, and the adoption by many companies of, methods more conducive to success, while others have passed through that initial and expensive experimental stage which seems inherent to mining in a new district.

"This viewing of mining from a more strictly business standpoint is gradually tending to the elimination of enterprises which are not based upon substantial merit, and which, therefore, can never succeed, but, by their very existence, cast a shadow of doubt upon legitimate enterprises.

"The labour conditions, too, formerly unsettled, appear now to be more stable, experience having apparently taught both employer and employee that strikes and lockouts are expensive luxuries not to be hastily indulged in, entailing not only a present but subsequent loss to both parties.

"The following is a brief review of the separate branches of the industry:

"With regard to coal mining, the collieries of the Province, taken collectively, did not produce as much coal in 1903 as in the previous year. The Crow's Nest collieries show a substantial increase in the production of both coal and coke, while the Coast collieries show a more than equivalent decrease. The output in both these districts was greatly diminished by strikes which occurred during the earlier part of the

year, causing a loss of time which could not be made up, while in the Coast district a change of ownership of one of the large properties led to alteration of plans and plant, which temporarily interfered with, although it will eventually increase, the output. There is also no doubt but that the Coast collieries are feeling the competition in California of the fuel oil found there, since in that market a large percentage of the Vancouver Island coal has of late years been sold.

"Placer gold mining has, on the whole, about held its own during the past year; there has been a decrease, but only a slight one. The northern districts have made an increased output, but the central districts show a diminished production. Of these latter districts, Cariboo requires a heavy snow and rainfall to insure success, while the valley of the Lower Fraser requires low water in the rivers to expose the bars. Unfortunately, during the past season these conditions were exactly reversed and the output of gold accordingly diminished.

"The tonnage of ore mined by the lode mines of the Province in 1903 was 1,286,176 tons, an increase over the preceding year of 287,177 tons, or about 29 per cent. In certain districts, more particularly those producing lead ores, there has been a decrease, but the Boundary, Rossland and Coast districts all show large increases in tonnage of ore mined. In the Boundary district the continually improving methods of mining and smelting have rendered further low grade properties workable. These new methods are gradually widening the margin of profit in the handling of the large but notoriously low-grade ore bodies of that locality.

"In the Rossland district the ore mined amounted to 360,786 tons, an increase over the preceding year of 31,252 tons, or about 9½ per cent. The metallic contents of the output have scarcely kept pace with the increased tonnage, as the average grade of the ore mined in the camp was lower than ever before. This gradually decreasing assay value of the ore is attributable to two causes, both of which are unquestionably true, although it is difficult to know exactly the relative importance to assign to either. One of these causes is the undoubted fact that cheaper methods of mining and of treatment charges which have followed year by year have rendered possible and advisable the handling of a lower-grade ore than formerly, admitting of the utilization of much material as ore which previously was waste. On the other hand, it is claimed that as the ore is followed to a depth, it is actually of a lower grade, or rather that there is a smaller percentage of high-grade ore in the ore body. On this point it might not be inappropriate to quote from the last annual report of the Manager of the Centre Star and War Eagle mines (two of the largest mines in the camp), who had ample opportunity to observe the facts. He says:

"Developments up to date show that the Centre Star mine' (he says the same of the War Eagle) 'has experienced the same general change in the character of its ore deposits which has occurred in all other productive mines in the Rossland district, and which is

the general rule throughout the mining districts of the world. This is the transition from the occurrence of high grade bonanza ore bodies, capable of profit under the expensive process of smelting, to masses of lower grade requiring a treatment by milling.

"This Centre Star report goes on to say that for the company's fiscal year ending September 30, 1903, the ore sales amounted to 88,387 tons, with average assay contents of gold, 0.50 oz.; silver, 0.40 oz.; copper, 0.99 per cent., in which ore the net profit in excess of all expenditures was \$228,358.90.

"The report of the War Eagle mine shows that for its fiscal year the ore sales have been 60,039 tons, the average assay contents of which were, gold, 0.418 oz.; silver, 1.02 oz.; copper, 1.45 per cent., having a smelter gross value of \$9.87 per ton. The excess of revenue over expenditure was \$68,512.21, of which \$38,171.74 was charged off to depreciation, leaving \$30,340.47 as net profit for the year.

"These figures indicate that the ore has certainly not as yet reached a limit in grade so low as to be unworkable by even the present methods, although the manager is possibly right in anticipating the transition to which he refers.

"The Coast mines are rapidly assuming an importance as a factor in the production of the Province which they never before occupied, there having been mined and treated some 103,524 tons of ore—nearly four times as much as formerly, an increase which is due almost entirely to mines in the Mt. Sicker district of Vancouver Island."

Among the statistical tables there is one showing the quantity of ore mined and shipped during 1903 in each district in the Province, the number of shipping mines, and the men employed. The totals of this table are as follows: Tons of ore shipped, 1,286,176; number of shipping mines, 125; number of mines that shipped more than 100 tons in 1903, 74; men employed in these mines, above ground 1,531, below ground 945, total, 2,476. By an unfortunate omission of the number of men employed in the mines in the Trail Creek Mining Division, viz., 635 below ground and 192 above, total 827, the last quoted figures are incorrect. It has been ascertained from the Department of Mines that the total should have been shown as 3,303.

The Provincial Mineralogist gives as well details relative to the several leading mineral productions of the Province. Briefly summarizing these the following information is obtained:

**COAL.**—There were mined in 1903, 1,450,663 tons of coal, of which total output 1,168,194 tons were sold as coal, and 282,469 tons converted into coke, producing 165,543 tons of the latter. This represents, as compared with the production of 1902, a decrease of about 16 per cent in the quantity of coal sold (and an increase of about 29.3 per cent in the amount of coke produced. Of the coal sold, 546,723 tons were exported to the United States and 2,725 tons to other countries. The Vancouver Island collieries exported (chiefly to California) 403,438 tons and the Crow's Nest Pass collieries (to Montana and Idaho, largely

for railway consumption) 146,010 tons of coal. It is noted that whilst in 1902 the Vancouver Island collieries sold in British Columbia only about 4,000 tons of coke and exported 12,000 tons, the whole of the 1903 production of 15,779 tons was consumed at local smelters, as well as 3,719 tons taken from the stock on hand at the beginning of the year. The Crow's Nest Pass collieries mined in 1903 589,888 tons of coal, of which 340,337 tons were sold as such, and 249,551 tons were sent to the coke ovens, producing 149,764 tons of coke, of which 27,758 tons were exported to the United States (to Northport (Washington) and Montana smelters) and the remainder used at the smelters of the Kootenay and Boundary districts of British Columbia. The gross output of coal at these last-mentioned collieries in 1903 showed an increase of nearly 50 per cent over that of 1902, while the increase in the production of coke was 38.8 per cent. Additional ovens have recently been built, increasing the output capacity by at least 25 per cent, so that a larger production of coke is looked for in 1904.

**GOLD.**—The placer gold production for 1903 was \$1,060,420, a decrease of about \$12,720, or 1 per cent, from the year 1902, but showing an increase over 1901 of \$90,320. The Atlin and Liard divisions of Cassiar are the only districts that in 1903 gave an increased production of placer gold. In the first-named division the increase was obtained chiefly from the working by improved methods, and on a larger scale, of an old high channel found in the benches of Pine and Spruce Creeks. The productive work in this district is still largely in the hands of individual miners or small partnerships of miners. The increase in the Liard division was due to the successful operations of the Thibert Creek Hydraulic Company. The Cariboo district as a whole, which includes the Cariboo (Barkerville) and Quesnel Mining Divisions, shows a drop in production of about \$65,000. In the Cariboo division the production was slightly diminished as compared with 1902, yet it showed a decided increase over that of other recent years. The output here was due almost entirely to small hydraulic concerns held by individuals or partnerships. The large companies, of which there are several, have not as yet arrived at a productive stage. In the Quesnel division individual miners did well, but the hydraulic mining companies had a poor season, owing to the shortage of water caused by the light snowfall during the winter of 1902-3. In the section drained by the Lower Fraser River, where at low water placer gold mining is carried on the bars and flats, heavy rains in summer and fall kept the streams full, so that there was little or no "low water," and consequently a decreased production of gold. Dredging for gold was continued, but although not with commercial success the dredging companies have confidence that they will yet be able to raise and save the gold they believe to be in the river beds. The production of gold from lode mines was \$4,812,616, a decrease of 1½ per cent as compared with that of 1902. There was a serious falling off in the gold production of the Rossland and

Nelson districts, with a corresponding increase in the Coast, Boundary, Trout Lake and Lardeau districts. In Nelson district the tonnage of ore mined was about the same as in 1902, but the assay value of the ore was materially lower. In Rossland the tonnage increased about 9½ per cent, but the gold production decreased about 10 per cent. In the Boundary the tonnage increased about 34 per cent, and the gold produced nearly 20 per cent, indicating that ores of a lower gold assay value have been treated, which reduction has, however, been more than met by cheaper methods of treatment and mining. The Coast district produced nearly three times as much gold as in the previous year, chiefly due to the output of Mt. Sicker properties. The Trout Lake and Lardeau districts each made an increase in lode gold output. Their total output of lode gold is not yet large, but they appear to be only at the commencement of their productiveness. In the Rossland, Boundary and Coast districts the gold is recovered, chiefly by smelting, from ores associated with copper, while in Nelson, Trout Lake and Lardeau districts it is obtained by stamp milling. The lode gold was derived, approximately as follows:

From direct smelting of copper-gold ores .. .. .	\$4,327,206
From combined amalgamation and concentration .. . . .	485,410
	\$4,812,616

**SILVER AND LEAD.**—The total output of silver for the year was 2,996,204 ounces, valued at \$1,521,472. Of this quantity rather more than 70 per cent—about 2,103,000 ounces—was found associated with lead. The lead production was 18,089,283 pounds, valued at 689,744, the lowest output for seven years. In the Fort Steele Mining Division less than 1,000 tons of lead ore were mined in 1903, as compared with 87,000 tons in 1900. In the Slocan division only about half the usual tonnage of ore was produced. Ainsworth division mined much more ore than formerly and produced 30 per cent more lead, the result of the concentration of a very low grade ore of the Highland mine. The Act, passed at the last session of the Dominion Parliament, to provide for the payment of a bounty on lead contained in lead-bearing ores mines and smelted in Canada stimulated development and equipment, but too late to result in a material increase in the production of 1903. Its effects will be seen in the 1904 production.

**COPPER.**—The copper ores being mined in British Columbia are very low grade in copper, but, fortunately, contain values in gold or silver, without which they could not, for the most part, be worked profitably. The total output for the year, and the highest yet made in British Columbia, was 34,359,921 pounds, valued at \$4,547,535, which was produced in the following districts:

Boundary District .. . . .	18,485,542 lbs.
Rossland District .. . . .	8,652,127 lbs.
Coast District .. . . .	6,861,171 lbs.

Nelson District .. . . .	346,218 lbs.
Various other Districts .. . . .	14,863 lbs.
	34,359,921 lbs.

In the Rossland camp the ores average about 1.2 per cent copper, and in the Boundary about 1.5 per cent, while on the Coast they average 3½ per cent copper.

**OTHER MINERALS.**—Very little iron ore was mined in 1903. Zinc has scarcely, as yet, become a factor in the mineral output of the Province, though at some of the Slocan mines, where it occurs as an impurity in galena ores, it is being separated and marketed as zinc ore. Oil-bearing shales have been discovered in the vicinity of Harper's camp, in the Cariboo District. From present indications there appears to be a large deposit of these shales, and, as far as can be determined at present, they do not appear to get their oil from any seepage from below. The occurrences of oil in the Fort Steele Mining Division, East Kootenay, were visited last summer by the Provincial Mineralogist, whose "Summary Report on the Valley of the Flathead River," is printed elsewhere in this issue of the MINING RECORD.

**GENERAL DEVELOPMENTS.**—Under the head of General Developments of the year the Provincial Mineralogist comments on the progressive features of the period under notice. He characterizes as the most noteworthy feature of the development work of the year the general recognition of the fact that the margin of profit, as a rule, lies in the large masses of low grade material, and the resulting attempts to overcome the difficulties in the way of mining and treating these low grade ores at a profit. He says: "In the Boundary District matters are most advanced in this respect. The smelting in that vicinity of very low grade ores must be considered as merely a concentration by a fusion method, which is considered the most applicable to such ores. This has been accomplished with most modern plants, the ore being taken from several mines and, by a judicious admixture of other ores as fluxes, the latter carrying values but not sufficient to be treated independently, concentration on a large scale has been possible, with a reduction in the costs of smelting greater than had at first been hoped for. With this cheaper cost of fire concentration, less discrimination had to be used in the mining of the great bodies of ore, much of which latter was of an assay value very near the line dividing profit from loss. As less discrimination had to be used in selecting the portions of the ore bodies to be mined, cheaper mining resulted, and it became possible to use steam shovels, together with power transportation in and about the mines, and a number of other economies.

In the Rossland camp, while much has been done towards lessening the costs of smelting, it has been recognized that certain of the constituents of the ore placed a limit upon the economies to be made in that direction, and hence steps have been taken to eliminate these constituents, so that not only might smelting be

done more cheaply, but also on ore in more concentrated form. Among the methods referred to are included a water concentration, or separation of certain portions of the ore, and a separation by oil of certain values more effectually to be recovered by this medium. So far the experiments made—for the plants are only so considered, although on a large scale—have given promise of satisfactory results."

Mention is made of experimental tests for the magnetic separation of zinc from lead ores, and the Provincial Mineralogist expresses his conviction of the wonderful possibilities of the process as applied to a number of British Columbia ores, the concentration of which by any water method is impossible. Reference is made to numerous other developments, but only three of these will here be noted. In the Similkameen District very extensive and satisfactory development on its property by the company owning has been made by the Nickle Plate group, the ore of which is chiefly iron sulphides carrying gold. A milling plant has been erected for the treatment of these ores and preparations are in progress for putting in a smelter later. At Mt. Sickler, Vancouver Island, the Tyee Mining Company, which started active operations about the beginning of 1903, during the year produced and sold mineral containing values to more than half a million dollars. The Crow's Nest Pass Coal Company added to its former extensive operations by opening a number of previously undeveloped seams of coal and did a commensurate amount of construction work, which new developments alone are sufficient to constitute a large coal mining centre.

The field work done by the Provincial Mineralogist during the year included visits to mining camps at Windermere, in North-East Kootenay; Perry Creek, Kimberley, and Bull River, and to the Crow's Nest Pass coal and Flathead oil districts, all in East Kootenay; and to Poplar Creek, Trout Lake, Ferguson and Camborne camps, in the Lardeau district of West Kootenay.

The report also contains a summary of the work of assay office, as reported by Mr. Herbert Carmichael, provincial assayer, a description of the Quatsino Sound mining district of Vancouver Island, also by Mr. Carmichael; much interesting information concerning the various mining divisions, supplied by gold commissioners, mining recorders and others, conspicuous among the official reports of the gold commissioners being those of Mr. John Bowron (Cariboo), Mr. John Kirkup (Rossland), and Mr. W. G. McMynn (Greenwood), all of which contain especially useful particulars of mining operations in the respective districts they deal with, and a new departure in the shape of an appendix giving the petrography of rock samples from British Columbia. The official statistical tables, prepared by the Department of Mines, contain much valuable data relative to the increasingly important mining industry of the Province, and diagrams and maps contribute to the general usefulness of the report. The map showing a portion of the coal lands of South-East Kootenay will be of much service to those interested in that section. The re-

production from the 1902 report of the minister of mines of New Zealand of illustrations showing a table for saving fine gold from dredging is also timely. The remaining illustrations, most of which, as a matter of course, relate to districts visited by the Provincial Mineralogist during the year, are excellent, well finished and printed and a decided credit to the government printing office.

#### A GOLD DREDGE AT ATLIN.

THE accompanying illustrations (two) of the British-America Dredging Company's gold dredge on Gold Run Creek, Atlin, will serve to convey some idea of the enterprise of this company in undertaking gold dredging operations in that district. In his official report for 1903 on the Atlin Mining Division the Gold Commissioner for the Cassiar District gives the following information relative to the British-America Dredging Company, Ltd., of which Mr. O. T. Switzer is general manager:

"This company has acquired a large number of hydraulic leases, comprising a considerable extent of alluvial ground, and is still acquiring more, so that already it controls a very large aggregate area, some portions of which are known to be rich. Among other properties acquired are the leases on Gold Run and Pine creeks known as the Ophir, Earth and Cosmopolitan Groups.

"The company brought in a Keystone drill, with which it operated for upwards of three months, prospecting its various properties, at an aggregate expenditure of about \$20,000, with unqualified success and satisfaction. A Bucyrus dredge and an electrical power plant capable of producing 500 h.p. were also brought in. The dredge was placed upon one of the Ophir Group of leases on Gold Run creek and the power plant a short distance below the Falls on Pine creek. In conjunction with the construction and installation of the dredge and power plant, this company excavated over one and a half miles of ditch, laid 1,800 feet of 30-inch steel pipe, built 400 feet of wooden flume, erected 6 miles of pole line equipped with 5 wires, using over 25 miles of copper wire, built a transformer house near the dredge site, together with dams, pressure box and the camp buildings, etc., necessary for the work and to accommodate its employees, at an aggregate expenditure of about \$300,000.

"Notwithstanding that the utmost diligence was manifested and a large force of men employed, the delays consequent upon the transportation of the heavy plant and timber, upwards of 700 tons of which had to be imported, in addition to such local timber and lumber as could be utilised, besides other causes, retarded the completion of the dredge and power plant until about the close of the season, and the management had to reluctantly content themselves with having everything ready for commencing operations with the opening of the season of 1904. The progress of this work was watched with unusual interest and its

non-completion in time for operation this season was disappointing to more than the management, for if its operation prove as successful as similar plants

of the ground, will surely prove remunerative to the owners.

"The company contemplates the construction of sev-



British America Dredging Company's Dredge—Gold Run, Atlin Mining Division.

have done elsewhere, it will mark an epoch in the history of mining in this district and in British Columbia, and with the values known to exist in some

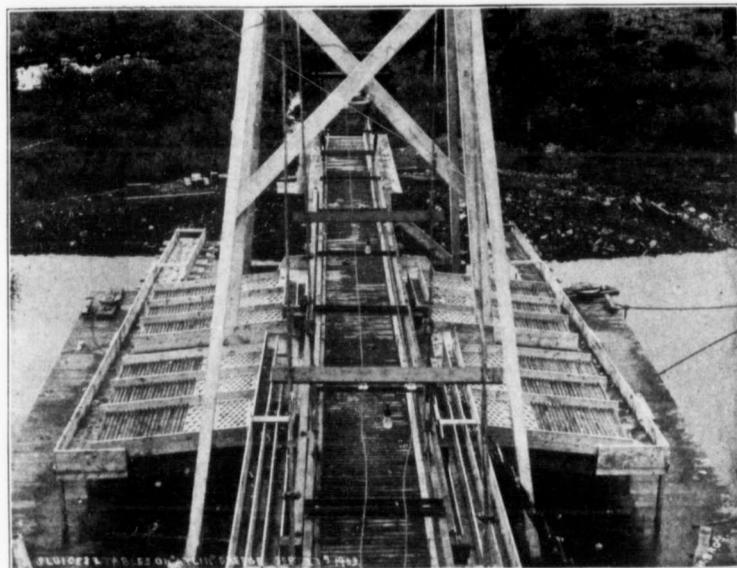
eral dredges upon its various properties in this district. As many as 100 men were employed by the company, the average during the season being 60."

### SUMMARY REPORT ON THE VALLEY OF THE FLATHEAD RIVER.\*

**GENERAL GEOGRAPHIC FEATURES.**—That area of land occupying the most south-east corner of the Province of British Columbia, and known on the official maps as Block 4,503, consists of a triangular piece of country, having as a base and boundary on the south the 49th parallel; on the north and east, the eastern boundary of the Province, i.e., the summit of the watershed of the Rocky Mountain Range; while on the west it is bounded by Lot No. 4,589, the eastern boundary of which is described as a line starting at o on the B. C. Southern Railway in Crow's Nest Pass, viz.: the Provincial boundary in this pass, and thence running due south to the International Boundary.

practical purposes, as that particular section is destitute of timber or good land, and as far as can be judged from its geological formation, is unlikely to be of mineral value.

The western boundary has not been run out on the ground, and as there are no maps of the district based on surveys, but only sketch maps made from the descriptions given by prospectors and others, it is impossible for one examining the district to more than very approximately estimate the position on the ground of this theoretic line. This western boundary line, after leaving the initial point as described, passes into Alberta, only striking the eastern boundary of the Province of British Columbia at a point some six miles to the south of the Crow's Nest Pass, so that this point thus becomes the real point of com-



Dredge at Atlin—Showing Details of Gold-Saving Tables.

The first of these boundaries, the International Boundary, is distinctly marked on the ground, the line having been run out this past summer by the joint Canadian and United States Commission, the right of way cleared through the timber for a width of 100 feet, with stone cairns at important and convenient points, while arrangements have been made for the bringing in this winter over the snow and the placing in position of bronze monuments where the line crosses summits or important streams.

The boundary between British Columbia and Alberta is a sharply defined mountain range on which the dividing line may be very approximately placed with little or no dispute, quite close enough for all

ment of the western boundary of the block in question.

The block in question may be practically described as that portion of the drainage area of the North Fork of the Flathead River lying in British Columbia, to which may be added certain parts of the headwaters of the East Fork of Lodgepole Creek, although exactly what portion of this latter cannot be determined without an actual survey. In shape the district is an inverted V, having a width along the base, i.e., east and west along the International Boundary, of approximately 35 miles, and a height, viz., north and south, of 35 miles.

The Flathead River flows from the northern corner of the district in a general S. E. by S. direction, almost along the centre line of the block, and crosses

\*The Provincial Mineralogist in Annual Report of Minister of Mines for 1903.

the International Boundary at about 114 degrees 28 minutes west longitude, into the State of Montana. The watershed to the east and north is the main range of the Rocky Mountains, while that to the west is a spur from the main range which branches off, in a nearly south direction, at the head of Flathead, and is known as the Galton range, forming the divide between the Flathead and Wigwam rivers. The upper and northern portion of the drainage area of the Flathead has very little width from east to west, the mountains approaching close to the river and the channels of the tributary streams rising rapidly from the river bed.

Above Pass Creek the river valley is from  $\frac{1}{2}$  mile to two miles in width, and is chiefly marsh or slough land, occasionally, towards the south, alternating with dry prairie. The elevation of the river bottom is here about 4,600 feet (barometric reading). The valley gradually narrows in as the canyon is approached (some 30 miles north of the boundary), and the limestone mountains almost hang over the channel of the river, forcing the trail to climb high up the side-hill. The elevation of the river just below the canyon is about 4,460 feet, and at the Boundary the elevation is 4,000 feet. (The United States geological survey bench mark is 3,986.) Between these points, a distance of about 30 miles, it is a gradual descent.

A few miles below the canyon the mountains to the east retire and the valley widens out, having evidently been an ancient lake bed which extended to the east and included the present channels of both Sage and Kish-e-neh-na creeks, the various gravel benches representing the different levels of the bottom of the ancient lake. The mountains to the east and north of the river are very rugged, with steep escarpments rising abruptly from low foot-hills. The average height of this range is from 7,000 to 9,000 feet above sea level, while the peaks rise to an elevation of about 12,000 feet. To the west of the river the mountains rise very much more gradually and are preceded by foothills, timbered to the summits with small black pine and spruce.

The Flathead River at the Boundary has a width of from 100 to 125 feet, and a depth in spring of from 6 to 8 feet, while in the late summer the average depth at such points will not exceed 2 feet, with an estimated stream velocity of from 4 to 5 miles per hour. The volume of water at the canyon in summer is estimated at about half that at the Boundary.

Kish-e-neh-na Creek rises at the Alberta summit, about 4 miles north of the Boundary, and flows a little north of east for 12 miles, thence southerly for 8 miles, where it enters the Flathead River from the N. E., about 4 miles south of the boundary.

Sage Creek flows nearly parallel to Kish-e-neh-na, but about 3 miles further north, entering the Flathead about 2 miles south of Boundary. The last 10 miles of its course is through the wide Flathead depression, free from the mountains.

About 14 miles up the Flathead River from the Boundary there is an important creek entering from

the east, evidently having its source at or near the summit of the Rockies.

Pass Creek comes in from the N. E. at the Big Prairie. The river here takes an almost right angle bend, flowing from the west, and above the bend there are two important creeks flowing in from the north, which, as far as known, are still un-named. The first of these has a length of 12 to 15 miles, and it is reported to have its source near that of the South Fork of Michel Creek, while it is said there is a low pass between the two creeks which might prove of value as a route of access for a railway.

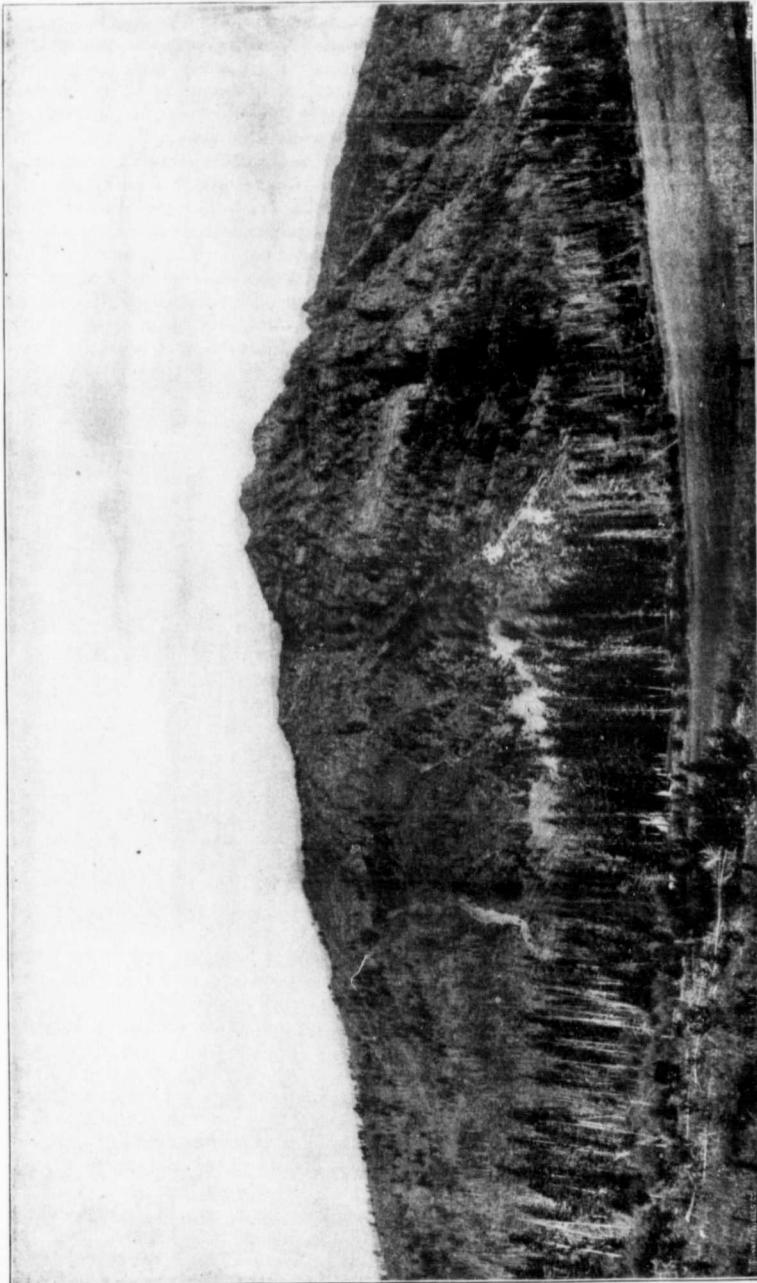
Of the creeks flowing in from the west, Calder Creek has its headwaters within a few miles of the Wigwam, about 6 miles north of the Boundary, and flows in a general easterly direction, entering the Flathead 3 miles north of the Boundary.

There is only one other creek of any importance flowing in from the west below the canyon, and this enters the Flathead about 10 miles north of the Boundary. This creek was not examined, as no trail could be found leading up it, and as it enters the river by a series of marshes and swamps, its course could not be easily followed with horses.

ROUTES OF ACCESS.—As already described, the valley of the Flathead, while opening out to the south, is surrounded on all other sides by mountain ranges. To the south of the International Boundary, in Montana, the valley gradually widens in a series of gravel benches rising above the river. Along these benches a fairly good wagon road has been constructed from the town of Belton, Montana, on the line of the Great Northern Railway, right up to the boundary. The distance is reported as being about 40 miles. Access to the district from British Columbia, or from Alberta, may only be had by trails passing over the mountain ranges mentioned. There are two well-known trails crossing through the valley of the Flathead, both connecting the valley of the Kootenay River, in British Columbia, with the plains of Alberta, the one passing through the northern part and the other through the southern part of the district. These are known as the North Kootenay Pass and the South Kootenay Pass trails and were used, since time unknown by the Indians of Kootenay as a pathway to and from the great plains, where they frequently went on buffalo hunting expeditions. On both of these trails the old and deeply worn ruts, plainly visible to-day, bear mute evidence of their former importance as highways.

The South Kootenay Pass trail followed the valley of the Kootenay for some five or six miles south of the Boundary, to the mouth of Tobacco River or Grave Creek, as it is known locally; thence, following this stream up, it crossed over a summit at an elevation of 5,280 feet (being here some 15 miles south of the Boundary) on to the headwaters of the Yakiniakak Creek, which latter it followed down to its junction with the Flathead, at a point some five miles south of the Boundary. The trail then followed the valley of the Flathead northward to the mouth of the Kish-e-neh-na Creek, up which it led, re-crossing the Boundary about four miles from the mouth of the latter

stream and following it up to its headwaters. From these headwaters the trail crossed, at an elevation of 7,100 feet above the sea and 3,100 feet above the valley of the Flathead, over the summit of the Rockies to the headwaters of the South Fork of Kootanie River (this spelling is applied to a river in Alberta), and following this stream eastward for 15 miles, the



Sage Creek, Flathead District, Showing Location of "Big Oil Spring."

of 7,100 feet above the sea and 3,100 feet above the valley of the Flathead, over the summit of the Rockies to the headwaters of the South Fork of Kootanie

open prairie of the foot-hills were reached near Watertown Lake, Alberta.

This trail, in passing thus some miles to the south

of the Boundary, circles south of the headwaters of the Wigwam (the southern tributary of the Lodgepole, having its headwaters some three or four miles south of the Boundary), and in so doing crosses only one summit between the Kootenay and Flathead.

The distances by this trail are approximately as follows: From Tobacco Plains to Grave Creek summit, 29 miles; from Grave Creek summit to Flathead River, 13 miles; from Flathead River to Kish-e-neh-na summit, 20 miles; from Kish-e-neh-na summit to plains near Watertown Lake, 15 miles.

The trail from Tobacco Plains to the Flathead is reported as being good, but was not travelled over by the writer.

From the Flathead up Kish-e-neh-na Creek the trail was found to be good to within about five miles of the summit, where it became wet and muddy, with a good bottom in all places. It was also here somewhat cumbered with fallen timber. This trail was used by both the first and second International Boundary surveys, and the district through which it passes has been described in the reports of these surveys.

The North Kootenay Pass trail left the valley of the Kootenay near the present town of Elko, crossed the Elk River on a pack bridge at the Elk River Canyon, thence, following up the Lodgepole to the summit between that river and the Flathead, crossed over the divide at an elevation of 7,100 feet. It then followed the latter river down to Pass Creek, a small stream coming in from the east, and followed this latter over a summit of 6,750 feet elevation to the headwaters of the south fork of Old Man River, which flows easterly into Alberta.

Snow remains deep on the North and South Kootenay passes from Alberta through the Rockies into British Columbia from November to July, but these trails have good hard bottoms, and as soon as the snow is gone are passable. The North Pass from the west along the Lodgepole is covered with snow at the summit for about the same length of time. The rise from the basin of the Lodgepole to the summit is very steep, and the trail bottom being clay renders it almost impassable in early summer until somewhat dried out, while from the summit to within five miles of Pass Creek, on the Flathead, the trail is along a springy side-hill with a clay bottom, and can never be made a practical road, being a succession of bog-holes.

It has since been learned that a C. P. Railway prospecting survey cut a trail from Morrissey over a low divide to the basin of Lodgepole Creek, thence following up the East Fork of the Lodgepole across a low divide into the Flathead Valley at a point a short distance above Pass Creek, thus avoiding the bog-holes on the old trail. This trail is reported to be feasible, but rather soft in places.

The two trails first described are the time-honoured roads leading into and crossing the district. They were located originally by the Indians, and so are presumably the most available, though it must be claimed that, as viewed from a high peak, there appeared to be a much lower pass leading from an east-

ern tributary of the Wigwam, about half way between the two known passes, and which appeared to admit of a railroad grade being obtained from the Kootenay Valley into that of the Flathead.

The writer, wishing to reach the Flathead from Tobacco Plains, on the southern boundary of the Province, by an "all-Canadian route," followed up Phillipps Creek, a small stream flowing into the Kootenay Valley from the east at a point about two or three miles north of the Boundary. The trail leaves the main wagon road at Roosville, a small general store and post office situated where Phillipps Creek flows out of the range of hills known as the Galton range, lying between the Kootenay and Wigwam rivers. The trail rises very steeply for about two miles, as the creek enters the Kootenay Valley with a fall of 300 feet in about half a mile; thence, however, the grade to the summit is more gradual. The elevation of the Kootenay Valley is about 2,300 feet, and that of the summit, at the head of Phillipps Creek, 6,150, while the distance is about nine miles. From this summit a small un-named tributary of the Wigwam was followed down to the main stream, a distance of ten miles, the Wigwam at this point having an elevation of 4,600 feet.

For this distance the trail was well cut out, having been recently used by a party of United States surveyors engaged in the demarcation of the Boundary Line. Both these creeks run nearly parallel to and about three miles to the north of the Boundary. From the Wigwam on there was no trail, but a blaze was followed which had been made last year by a prospector who had previously attempted to reach the Flathead by this course. It might be said that the prospector chose to return by another route.

Crossing the Wigwam about three miles north of the Boundary, a wide and heavily timbered valley was followed due east for about three miles, whence, following the blaze, the trail was taken by a series of zig-zags up a very steep and rocky range running east and west, to the summit (elevation 7,100 feet), where good horse feed was found on the shore of a small snow-fed lake having no visible outlet. The distance from the crossing of the Wigwam to the summit is about eight miles, and is a good day's travel for a pack-train.

The northern side of this range was here found to be precipitous, limestone and slate bluffs, impossible to descend, and the summit was accordingly followed for about two miles to the east, to a point where descent to the basin on the north side was possible by going down a rock slide.

This basin (elevation 6,600 feet) drains into an important creek which flows nearly due east and is about five miles north of the Boundary at this point. The stream empties into the Flathead about three miles north of the Boundary and is the first tributary of the river from the west flowing in north of such line. This stream was un-named and has been called Calder Creek.

From the summit, at the head of Calder Creek, to the Flathead is estimated at about 30 miles by trail.

but represents three days' hard travelling by pack-train. The total distance by this route from Tobacco Plains to the Flathead River is about 50 miles, and is five days' journey by pack-train with light packs. The route, as at present laid out, is possible but not practicable as a permanent trail, although it is believed a much easier summit between the Wigwam and Flathead could be obtained about five miles further north, but at the cost of that extra distance.

The writer is informed that since he was over the ground the United States Survey party mentioned has continued the trail from Wigwam to the Flathead, following closely the Boundary Line and crossing over two summits between these points.

Once the Flathead is reached good trails, or even wagon roads, could be built anywhere up the valley as far as the Canyon, and up the important creeks, at a comparatively small cost.

The present trails are Indian hunting trails, used only at low water; they lead in and out of the river, often following the river bars for miles. They would not be feasible in spring until high water is over, about the middle of July.

The trail to Sage Creek leaves the main Flathead River trail about two miles north of the Boundary, running thence easterly for about three or four miles over the benches and low hills of the Flathead depression to a crossing of Sage Creek, some six miles from its mouth. After crossing Sage Creek the trail follows up the course of the east creek for about four miles, where it re-crosses and continues up the west side. The distance by this trail from the Flathead to the oil on Sage Creek is about 11 miles. This trail has comparatively easy grades, is hard and in good order, but as the lower part of the Sage Creek Valley has been recently burned over, it is often obscure and hard to follow on the burned-over barrens.

A second trail has been recently blazed out, starting at a point on the main river trail some 10 or 11 miles from the Boundary and running due east to the "oil showing," a distance estimated at not exceeding five miles.

The Kish-e-neh-na Creek trail has already been described as a part of the old "South Kootenay Pass" trail.

**TIMBER.**—The valley of the Flathead, including Sage or Oil Creek, appears to have been all burned over about 30 years ago for a distance of possibly 10 to 12 miles from the Boundary, and timber is a second growth, consisting on the lower elevations of small spruce and fir, with some cottonwood and occasional tamarack (*larix occidentalis*), and on the benches of second growth black pine (*P. murrayana*). On the hills the timber consists of black pine, tamarack and spruce, and is small, not of a size to have any value for lumber. On Sage Creek there is no good timber, as the second growth extends up to a point where the mountains close in, and much of the lower part of the creek district is composed of "barrens," devoid of any vegetation save small brush. On Kish-e-neh-na Creek, for about four miles above the Boundary and for a width of about one-quarter of a

mile, the trees are occasionally of fair size, but there



View of Sage Creek, Flathead District, East Kootenay—(X indicates position of Oil Springs)

is not a great percentage of merchantable timber. In

the Flathead Valley the land is largely sloughs and islands, cut up by moving channels. On these low lands, from 14 miles above the Boundary northward for about 10 miles, there is a strip of timber having a width of from one-quarter to one mile, say an average of about one-half mile wide, on which there is some very good, large timber, chiefly spruce and tamarack, with some large cottonwood. This timber could be floated down streams in the spring but at considerable initial cost, as there are a number of extensive log-jams occurring in the river, besides many abrupt turns and bars. The trees on the upper reaches of the river are not suitable for lumber, but would serve for mine timbers should they be so required.

**SOIL.**—The ancient wide valley of the Flathead, including the present valley and that of its chief tributaries for some 12 to 20 miles above the Boundary, has been previously described as consisting of a series of gravel benches. On this gravel, to a depth of from 6 inches to 12 inches, lies a fine silt and on the lower elevations a dark loam, largely produced from sediment deposited at unusually high water and mixed with a certain amount of vegetable mould. This supports, on many small and larger open prairies, a fine growth of pea-vine, bunch-grass, etc., providing excellent feed for transient horses, etc., but the soil has **not a depth to admit of cultivation**, lying, as it does, on a bed of loose gravel.

The Flathead is a wild stream at high water, and is constantly changing its bed in the flat valley through which it runs, forming innumerable islands and back waters: in fact, so changeable is its course that no depth of soil seems to have collected on the sides of the valley.

Other than the valley mentioned the district to the west of the river is occupied by high rugged mountain ranges, for the most part bare or covered with stunted vegetation. The hills to the west of the river are more rounded off, and are often covered with small growth to the summits, but they rise so abruptly as to be useless for either grazing or agricultural purposes.

As already noted, the elevation of the river at the Boundary is 4,000 feet above sea level, so that, taking the character of the soil into account, none of the land in this section is deemed fit for agriculture, even at the southern end of the district.

There are three large creeks entering from the west, the valleys of these being about half a mile wide to where the hills rise steeply. These valleys contain considerable bog or marsh land, but lie at an elevation of nearly 4,400 feet.

**MINERAL RESOURCES.**—The district is so shut off from the remainder of the Province that very little prospecting has been done there for mineral other than coal or oil, particularly by British Columbia prospectors, although a number from Montana have visited the vicinity. As far as could be learned from prospectors and others, no mineral locations have been recorded in the district, nor has any mineral of economic value been found. It was reported that copper had been found on one of the tributaries

of the Flathead flowing in from the east, but nothing has been done to prove this alleged discovery, nor could the report be substantiated.

On the Flathead, near the mouth of the first creek above Pass Creek (still un-named) there is evidence that in the 60's or 70's considerable prospecting had been done for placer gold in the gravel of the creek bed, but as far as can be learned, without success.

There is a story, of Indian origin, in circulation among the prospectors, of a "lost creek" in which, in the early days, two men discovered valuable placers, and took out considerable gold. One of these men died at the diggings, and the other, going south to winter among the Indians, died also, and with him all knowledge of the whereabouts of the creek. The Indians claim this creek to have been an eastern tributary of the Flathead, and some of the old-time prospectors are still searching for the lost diggings. No black sand or trace of gold could be observed in the river or any of the creeks, which fact, coupled with the geological formation of the mountains to the eastward, renders the existence of placer gold very improbable. No mineral float, or indication of mineral, was observed at any place in the district.

**COAL.**—To the eastward of the main Flathead River the rock formations forming the mountain ranges appear to be, and have been so classed by the Geological Survey, of an older age than the Cretaceous, which is the coal-bearing formation in this part of British Columbia; consequently, no coal may be expected in this district nor could any trace of such be found. In the southern portion of the district, to the west of the Flathead, the geological formation is more recent than on the east side of the river. From the few rock exposures visible in this heavily wooded section it is impossible to learn much in a hurried trip.

The hills along the valley of Calder Creek are rounded off, the flanks being covered by wash which is chiefly dark shale and clay, through which a few outcroppings of light-coloured limestone and sandstone are visible. From the appearance of such formation as was seen, it is probable that it belongs to what has been classed by the Geological Survey as the "Fernie shales," and this section may possibly contain a small outlying basin of the Cretaceous or coal-bearing rocks, although no coal outcroppings are reported as found. This section has not been prospected, there are no trails in it and travelling is difficult.

On a small creek flowing from the north into Calder Creek, about 10 or 12 miles from its junction with the Flathead, there were exposed beds of a black carbonaceous shale which contains concretions of claystone. These concretions, when freshly broken, give off a strong odor of petroleum, but examination of the creek for some distance up revealed nothing further. This creek is about on the boundary between Lots 4,589 and 4,593; it is impossible, in the absence of a survey, to say in which it is situated.

The northern portion of the Flathead Valley has been examined in detail by parties of the Geological Survey and the outcroppings of the coal formations are shown in a "Map of the Crow's Nest Coal Fields"

published by the Survey within this past year. This map is based on actual triangulation and traverse surveys made by the Survey and show the coal measures of the Crow's Nest basin to be almost entirely to the west of the eastern boundary of Lot 4,589 and so, consequently, not within Lot 4,593. The coal basin is also shown as lying north of the east fork of Lodgepole Creek.

On the headwaters of the Flathead and of the Lodgepole there are numerous exposures of the eastern edge of the coal measures of the Crow's Nest basin, and these have been prospected by various parties, exposing very promising coal seams.

These coal measures certainly lie very close to the boundary between the two blocks mentioned, and as such boundary has not been run out on the ground, the map of the Geological Survey is undoubtedly the best authority we have, and this places the coal exposures in Lot 4,589.

**OIL.**—Oil seepages have been reported from this section of British Columbia and also from the adjoining Territory of Alberta, certainly as far back as 1889, if not earlier. The late Dr. Selwyn, then Director of the Geological Survey, visited the district in 1891 with Mr. William Fernie, and in his report to the Hon. Edgar Dewdney, then Minister of the Interior, he says:—

"I found a decided boom in petroleum claims and a company formed to put down a boring, the site selected being 18 miles south, and a little east, of Pincher Creek."

Speaking of the rock formation at the site of this venture, he says: "They were the ordinary varieties of sandstone and sandy shales of the Cretaceous."

Further on he tells of collecting a sample of crude oil from seepage through gravel, etc., in the bed of a stream about five miles to the east of the summit. He calls this Cameron Falls Creek, but it is possibly the south fork of the Kootanic branch of Watertown River, as at this point oil is found seeping to-day and boring is going on at present at a considerable depth. Over the summit, in British Columbia, he speaks of oil on Kish-e-neh-na Creek (he calls it Akamina brook in error):—

"On the edge of a beaver dam pool there were ledges of hard, dark-blue shale. Lifting layers of this at and below the water, a quantity of dark-green, circular patches of oil rose to the surface, and a precisely similar result followed by stirring up the mud in the bottom of the pool."

The finding of a trace of oil at this point has been reported to the Provincial Mineralogist by an old prospector who has been in the district for years. On the other hand, the Provincial Mineralogist camped on September 2nd and 9th on the spot described and was unable to detect or locate the seepage referred to. Dr. Dawson made a detailed examination of the geology of this creek in 1885, and must have also camped at this same spot, but he also failed to discover and record any oil seepage on this stream. The probabilities are that the seepage is very slight, or it may only show at certain stages of water.

In the same report Dr. Selwyn tells of his visit to Sage Creek and of the finding of two seepages of oil on that stream. These the Provincial Mineralogist found, and they are described hereafter.

As far as could be learned or found on the ground, these are the only seepages in the district known to-day. It will be seen, therefore, that the discovery of oil is a matter of some standing, and that the close prospecting of later years has not added materially to the early discoveries.

**GEOLOGY OF OIL-BEARING DISTRICT.**—Sage and Kish-e-neh-na creek are the only two streams upon which oil has been reported as actually found. These two creeks are parallel and closely adjoining, being only separated in their upper reaches by a spur of the main range. The seepages of oil reported occur on both creeks just where the mountains give way to the ancient wide valley of the Flathead, and it is quite certain that the geological formations are the same in both these creeks. This fact is immediately visible to the eye from the upper benches of the river valley, from whence the view obtained of the strata exposed on the ends of the mountain ranges show them to have been at one time continuous. The valleys of these two creeks have been cut out by erosion, there being no evidence in the lower portions of these valleys of any faults, folds or anything more than slight bending of the beds. About three miles above the oil on Sage Creek there is evidence of what appears to be a fault crossing the creek and affecting the strata; the mountains here are sheer and bare, enabling the formation to be seen, while on Kish-e-neh-na Creek the hills are not as steep and are covered with slide material, obscuring the view of the various strata except upon the peaks; but the same fault probably also extends across the valley.

As to the rocks comprising this regularly bedded formation, they consist of shales, slates, quartzites, compact magnesia, limestones, sandstones and at certain places **interbedded trap-flows**. All are close grained, compact, and not capable of absorbing oil. The rocks in the upper beds are very red in colour, chiefly shale and slates, while lower down beds of light-coloured magnesian limestones, containing much silicious matter, occur, bedded with banded sandstones and quartzites. None of these rocks are capable of absorbing oil, nor can they be suspected of being the source of any oil, as they are devoid of any appearance of carbonaceous matter. They have been referred by Dawson, by Selwyn and other geologists, to the Cambrian age, a formation older than the Carboniferous and very much older than the Cretaceous, in which latter the coal of British Columbia and also of Alberta is found. Oil had never been found in rocks of the Cambrian age, and the reported discovery of it rising through such was at first received with much doubt, until thoroughly substantiated by the Director of the Geological Survey, Dr. Selwyn, from personal observation. In the district itself there is no possible clue to the elucidation of even the possibility of such an occurrence, and it was only after the most careful and extended detailed survey of the whole range of

mountains that any explanation was possible. On this point it is best to quote direct from Dr. G. M. Dawson, in the report of the Geological Survey for 1898:

"The geological structure of the Rocky Mountain ranges proper, or that part of the western mountain region that lies between the eastern foot-hills and the great Columbia-Kootenay valley on the west, assumes a great practical importance in view of the opening up and working of the coal beds included within its area. On the map accompanying my preliminary report on that portion of the Rocky Mountains between latitudes 49° and 51° 30', forming part of Volume I. (1885) of the new series of annual reports of the Geological Survey, the areas of the Cretaceous coal-bearing rocks are represented with approximate accuracy, and in so far as the work carried out up to that date allowed. Several sectional diagrams were also given; but at the time the explorations to which

a gently inclined fault-plane for a distance of about seven miles, by pressure acting from the westward. This feature, as demonstrated in the vicinity of the Bow, is clearly shown in the sections accompanying the report cited.

"It had heretofore been supposed that a great normal fault, with downthrow to the eastward, defined the eastern base of the Rocky Mountains in this vicinity and separated the rocks of the mountain region from the wholly Cretaceous and Laramie rocks of the foot-hills; but the structural discovery above alluded to at once threw doubt on the earlier supposition, as well as upon several of the sketch sections drawn in conformity with it in other parts of the mountains.

"It further appears to be quite possible that overthrust of the kind referred to may serve to explain the otherwise somewhat anomalous occurrence of petroleum in the southern portion of the Rocky Mountains, between the Crow's Nest and South Kootenay pass-

No.	Where Obtained.	Specific Gravity.	Degrees Beaume.	Remarks.
1.	From tubing of bore-hole in Alberta, five miles east of summit.....	.879	30 °	{ Dark-coloured heavy oil; commences to distil over at 90 ° C.
2.	From surface seepage at same point.....	.879	30 °	
3.	From "Big Oil Spring," on Sage Creek, British Columbia.....	.828	40 °	{ *Dark-green oil; commences to distil off at 90 ° C., 90% of oil distilled off below 200 ° C., leaving 10% of thick, dark oil containing tar, which latter is estimated at 5%.
4.	From bed of Sage creek, near above (Leckie) spring).....	.818	42 °	{ Light-amber coloured oil; commenced to distil off at 90 ° C.; 97.5% of oil distilled off at below 185 ° C., leaving 2.5% dark, heavy oil containing some tar.
	California Oils.....	.889 to .907 average .910	28 ° to 10 ° 19 °	Commences to distil off at 150 ° C.
	Japan Oils.....	.82 .98	41 ° 12 °	

\*Appliances were not available for complete or further fractional distillation.

this report relates were made, the existence of extensive 'overthrust faults' as a factor in mountain structure had scarcely been recognized by geologists. At a later date, the importance of such faults was very strikingly demonstrated, particularly in connection with the geology of Scotland, and it was realized that by tangential pressure, acting on the earth's crust, older beds may be bodily thrust forward upon newer formations for distances measured in miles.

"The position of the Cretaceous coal-bearing rocks at and within the eastern edge of the mountains on the Bow and Elbow Rivers appeared to indicate the existence of an overthrust of this kind, but it was not until Mr. R. G. McConnell made his detailed examination of the Bow Pass, in 1886, that it was actually possible to state that the Paleozoic rocks had, in that vicinity, along the eastern point of the mountains, been thrust forward over the Cretaceous beds and up

es. The actual existence of small quantities of petroleum in several places in this portion of the mountains was verified, some years ago, by the personal observations of Dr. Selwyn. The petroleum was actually found in parts of the mountain region characterized at the surface by very ancient rocks, probably of Lower Cambrian age. If it may be assumed, however, that these rocks probably overlie, in some places, those of the Cretaceous series, by reason of overthrusts, it is easily conceivable that the petroleum in question may have originated in consequence of heat, at considerable depths in the earth's crust, acting upon the fixed hydrocarbons contained in the rocks of that series."

The so-called "Big Oil Spring" on Sage Creek occurs some 12 miles up from the mouth of the creek and about a mile above where the stream leaves the mountains and enters the flat depression of the Flat-

head Valley. The rocks of the district were certainly not oil-producing, and so gave no indications as to the probable locality of the seepage, and the oil was only located, after some time, by the odour. The spring was found in the brush, about a quarter of a mile from the trail, at the base of the mountain to the north of the valley and near a small lake and marsh, which lie at an elevation of some 200 feet above the stream and 4,400 feet above the sea. The ground to the north of this lake is marshy and full of springs of water which go to form the lake. About 100 yards from the base of the mountain, on a knoll higher than its immediate surroundings, there is issuing a good-sized spring of water, and besides this spring were found several pools covered with thick, dark-green oil. The oil, being lighter than the water, accumulated nearest the highest point, the water flowing off below. The oil had accumulated here in several pools which covered an area of some 50 feet diameter, but, as far as could be determined, actually rose only within a radius of 6 or 8 feet, the remaining pools being formed by overflows. As the oil spreads itself out over the face of the water, all these pools have the appearance of being entirely oil, but an attempt to skim it off soon revealed the fact that it could not be collected by this means, but only by laying a cloth on the top of the pool and allowing it to soak up the surface oil and water, the cloth then being wrung out into a tin, from which the water was syphoned off from the supernatant oil. Samples of the oil were thus obtained and brought down for analysis. In appearance it is lighter than the crude oil of Pennsylvania, probably containing less tarry matter and being richer in the more volatile constituents. The table on page 200 shows the results of an examination made of these oils by the Provincial Assayer.

It will be noted that both samples 3 and 4 are of exceptionally low specific gravity, and that sample 4 consists almost entirely of the lighter constituents of petroleum.

The oil rises through black marsh earth covered with charcoal, etc., resulting from the frequent ignition of the oil-soaked vegetable matter on the surface, and it is difficult to tell how much of its colour it owes to this source. This "spring" can only be described as an oil seepage; there is no flow and the quantity of oil therefrom is very small, probably not more than a couple of gallons a day.

The flow of oil here reported is exactly as it was observed in the last week in August, 1903. Conversations had subsequently with prospectors of undoubted reliability, would indicate that the amount of oil issuing varies with the season and with different seasons, probably being influenced by the flow of water in the springs, the water seeming to bring the oil up with it. As far as could be noted, there are no warm springs in the district, all being very cold and very clear, having no mineral taste or smell.

The oil rises with the water, as already said, on a knoll. It is not a question of seepage out of any surface material, but of a spring coming up from the formation underlying the surface deposit and carry-

ing oil. The immediate locality is surrounded on the surface by gravel wash, and if lateral flow existed it would be to the lowest level, which is the creek bed.

The place at which the oil is found is at the top of an anticlinal in the formation, that is to say, at the highest point in the bedding of the rocks, the axis of the anticlinal crossing the creek in a N. W. direction. From this point the beds dip up the creek to the N. E., and also down the creek, to the S. W. The beds can be traced dipping to the N. E. for about three miles, at first at a very flat angle, but gradually increasing until the dip reaches about  $35^{\circ}$ . At this point a fault occurs with, to the east, a different dip to the rocks, while further up the creek this is followed by other faults; hence it may be said that three miles above the "spring" is the limit in that direction of this possible field of accumulation.

To the S. W., that is, towards the valley of the Flathead, the beds dip at a very flat angle, probably not exceeding  $10^{\circ}$ , and apparently flattening out as they are lost to sight under the gravel and surface wash of the Flathead depression. In this depression no sign of solid formation can be seen, with the exception, possibly, of two or three places in the bed of the river (and these being covered with water could not be examined), where there seems to be a bed of yellowish clay shale lying flat, and which appears to be "in place" as a primary deposit.

On Kish-e-neh-na Creek, at a point where oil is reported, a similar anticlinal fold occurs, but with the axis running nearly N. E. and S. W., or with the course of the creek, the beds dipping off at an angle to the N. W. and S. E. into the adjacent mountains.

In neither of these anticlinals is there any evidence of a break, and it is quite possible that below the faults referred to overlying beds are unbroken and continuous to the S. W. over the whole area of the Flathead depression, for a distance of 10 or 12 miles north of the Boundary.

Directly across the valley of Sage Creek from the "Big Spring" in the direction of the axis of the anticlinal and about half a mile distant, a second seepage of oil occurs in the bed of the creek, just at the base of the mountain to the east of the valley. Here, on the east side of the creek bed, is seen in place, and lying nearly flat, a bed of hard, dark, flinty shale from which issues a spring of clear water, rising in a small basin, some two feet in diameter, formed in the gravel. With this water there is given off constantly a gas, perfectly colourless, having a strong smell of the more volatile constituents of petroleum, and this gas, when collected in a vessel, burns with a yellowish flame, or, when mixed with air, explodes. The water in this little pool is quite clear and the gas can be seen to issue from the shales, but no oil can be seen here issuing as such. On the surface of the pool, however, a whitish scum collects and a piece of paper touched to the surface of the pool absorbs the scum, which does not discolour the paper any more than would water. The paper so saturated is easily inflammable. The occurrence seems to be rather a condensation by the cold water at this point of the

lighter and more volatile constituents of petroleum, while the heavier portions may have been arrested below. For some little distance around, the shales show oil on their surface, and there is no doubt much more gas and oil exuding through them than this one little spring would indicate.

The amount of oil collecting on this and a couple of other similar pools is very small; it took a day of careful skimming and syphoning to collect a pint bottle full. In collecting the samples it was noted that, after it was in the bottle, there was a clear portion underneath the whitish-green and more viscous "scum;" this was at first thought to be water, but it was found that paper absorbed it quickly and that it was inflammable. The scum has, on standing in the bottle, become clear amber colour, with the colourless portion below. A careful analysis will have to be made of these two products to determine their character.

The two springs described are evidently at the ridge of the same anticlinal fold and are undoubtedly from the same area of accumulation, the one resulting probably from a fractional distillation only. If the oil should have been generated, as Dr. Dawson suggests, "in consequence of heat at considerable depth in the earth's crust, acting upon the fixed hydrocarbons contained in the rocks of that series" (Cretaceous coal-bearing rocks), then the oil so generated would rise until it met some impervious barrier of overlying rock formation, and if such rock should be in the form of an inverted basin (an anticlinal), it thus would collect and retain the oil.

Assuming the theory advanced as to the origin of the oil to be correct, and that it has been so generated in quantity, then there is a fair probability of there being underneath this "spring" a body of oil, because the overlying rocks are practically impervious, and the position in which they lie, an unbroken anticlinal fold, is such as would serve as a trap or reservoir in which it would be retained under pressure. The fact of the seepage being small does not argue against there being a large body of oil below, for if the seepage was large it would, in the ages past, have drained off the oil and there would be now no accumulation. As far as the disposition of the surface strata may serve as a guide, they would seem to indicate ideal conditions for such an accumulation, should the oil have been so generated.

If, by reason of an overthrust fault, the Cretaceous rocks do underlie at this point the surface formation of Cambrian age, then these Cretaceous rocks must be at a very great depth, quite beyond all practical reach, so deep as to be affected by the interior heat of the earth so as to generate the oil in question. Oil so generated would rise until arrested by the barrier mentioned, and the question as to how far below the present surface this barrier may be it is impossible to determine, but, judging from the rock exposures seen to the eastward, the depth must be very considerable. Whether the depth of such oil-retaining barrier is beyond economical reach only very extensive boring operations can determine, although a detailed geo-

logical survey and sectional plan of the whole formation from this point well into Alberta might serve as a guide.

As to whether oil in quantity exists under this inverted basin of rock, there is little data upon which to base an opinion. Oil has been found, however, over a considerable area of country, as it exudes at the two creeks mentioned and to the S. E., some 12 miles more or less, at Kintla Lake, in Montana, while on the same line of strike it has been found in small quantities. In Montana boring has been done to a considerable extent, it is reported to depths of over 1,200 feet, but without finding any quantity of oil.

About five miles over the Kish-e-neh-na summit into Alberta oil is found. There it occurs seeping through the gravel-wash of the bedrock of the creek, evidently coming out at some point higher up the valley. A few gallons a day have been collected there by washing the gravel in a sluice and collecting the oil from the surface of the water with cloths. Boring has been done here. One bore-hole was put down last year for over 1,200 feet, and it is reported that some oil was found at 1,120 feet down, but the quantity was small, and there is no flow nor has there been any production, although oil was seen standing in the "tubing" of the well and in the pit around the drill-hole.

A second drill-hole was being sunk this last summer by a Vancouver syndicate about half a mile further down same creek, and this hole was down over 1,300 feet without getting oil at that depth; this work is still in progress, while two or three additional bore-holes are being put in further down the valley, near the foot-hills.

These operations in Alberta are being carried on at a point very near the junction of the Cretaceous rocks and the older rocks which occur over the British Columbia summit, that is near the line of the supposed overthrust fault.

ECONOMIC VALUES OF OIL DISCOVERIES.—As to the economic importance of the oil in this district, it is very difficult at present from the data available to predict. The conditions may be summarized as follows: The geological formation, as exposed in the hills and on the surface, is lying comparatively regular and flat. There is no local evidence of serious disturbance, so that from local observation it might be taken for granted that this great mass of conformably bedded deposit was "in place" in its geological scale. This formation has been classed as of Cambrian age by two successive directors of the Geological Survey of Canada. Oil has never been found *produced* in a geological formation as old as the Cambrian, nor do the rocks here exposed admit of the probability of their being the source of oil. Under anything but very extraordinary conditions, these surface geological conditions would seem to render it impossible for oil to occur in this section, but the stubborn fact remains that it is found there. It is, as Dr. Dawson very appropriately calls it, a "somewhat anomalous occurrence of petroleum."

In accounting for this fact, the explanation given

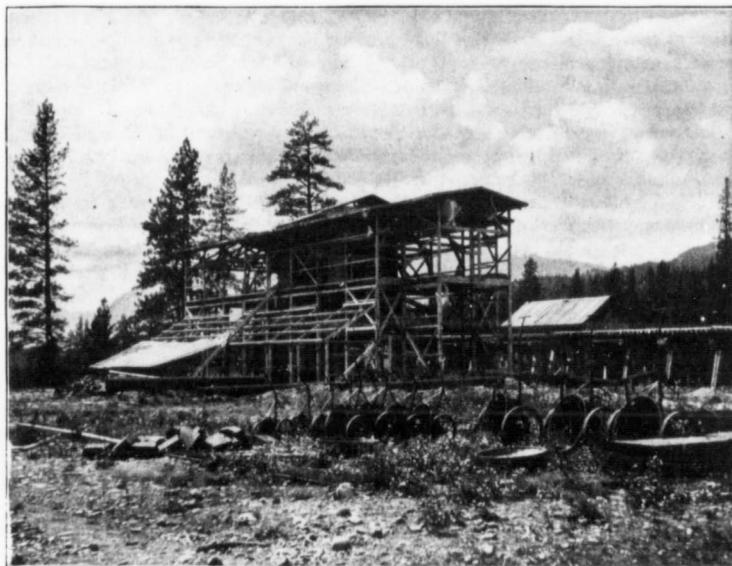
by Dr. Dawson and already quoted seems the only one, viz., that these older rocks have been, by a gigantic "overthrust fault," slipped eastward over the Cretaceous (coal-bearing) beds of the plains for a number of miles, and that the subterranean heat, acting on these coal-bearing rocks, generated oil which finds its way up through the older but now overlying rocks. If this explanation is the correct one, the "overthrust" must have been very great indeed to bring the Cretaceous beds underneath the present oil seepage, as the Cambrian beds extend eastward from 12 to 15 miles from this point, in fact over the summit into Alberta.

The oil might have travelled westward underground for some distance, but this is not probable, as a few miles to the eastward of the point of occurrence of the oil there are several faults which have the appear-

ceingly problematic; that if such body of oil does occur it can only be demonstrated by boring in all probability to a considerable depth and at a considerable cost.

#### THE SULLIVAN COMPANY'S SMELTER AT MARYSVILLE, EAST KOOTENAY.\*

The property of the Sullivan Group Mining Company, of Spokane, Washington, was visited by the Provincial Mineralogist last summer. In the recently issued Report of the Minister of Mines appear some information relative to the company's mineral claims on Sullivan Hill, Mark Creek, about two miles from the town of Kimberley, East Kootenay, and the following account of the company's unfinished lead smelter:



Marysville Smelter, Fort Steele Mining Division—Furnace Shed.

ance of being profound, and would, therefore, have allowed the gas and oil to rise to the surface through them, but of this there is no indication. This latter fact does not prove that oil has not been generated in this faulted region, as it may have travelled eastward along the main fault seam, and it may be that which is found seeping in Alberta.

As to whether there is oil in quantity to be obtained by boring, there is little evidence; the seepage at present is trifling, but the geological structure seems suitable for the retention of oil if produced in quantity. If it does so exist it must in all probability be at a very considerable depth, possibly over 3,000 feet.

In conclusion, I would report: the actual seeping of oil in three or more places; that the existence of a body of oil underground is quite possible, though ex-

MARYSVILLE.—The little town of Marysville is situated on Mark Creek, where it crosses the flat plateau or bench of the valley of the St. Mary's River, some five or six miles from the town of Kimberley, near which the North Star and Sullivan mines are located. A spur of the Cranbrook & Kimberley branch railway runs into the town, and recently a large saw-mill has been built, giving work to a number of men.

SMELTER.—Marysville is the site chosen by the Sullivan Mining Co. for the erection of a lead smelting plant for the treatment of ore from its mine, and probably in the expectation also of getting ores from the other mines in the locality. The

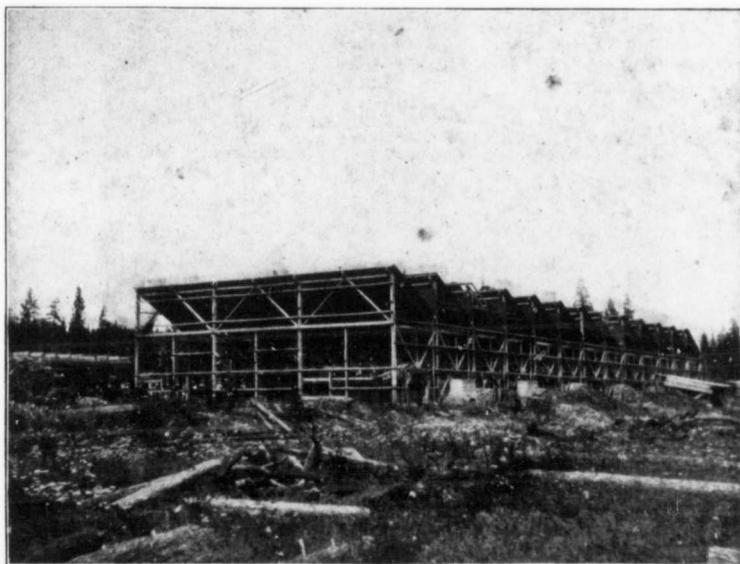
\*The Provincial Mineralogist, in Annual Report of Minister of Mines for 1903.

depressed condition of the lead market and other causes have prevented the completion of the plant, which stands today in a half-finished condition, exposed to the weather and rapidly deteriorating, a fact much to be regretted, as a slight expenditure would protect the plant and machinery in place until such time as the work is completed. The smelter bears evidence of having been constructed on designs of different people, and is, consequently, not entirely consistent. To be completed and rendered economical to work, it would require to be largely remodelled, but this could be done at no great expense, as much of the material and plant are very good, and suitable for the purpose intended.

**SMELTER SITE.**—The site chosen for the smelter is a large flat or bench, from which the ground

to the charging floor of the furnace shed by wire rope aerial tramway, the charge being dumped and mixed on this floor. The fuel and fluxes were to be dumped from railway cars standing on a trestle 8 to 10 feet high into bins on the ground level, and thence taken to the furnace shed by aerial tramline. The plant, as far as completed, was erected under the supervision of Mr. L. S. Austin.

**ASSAY OFFICE.**—The assay office is a one-story wooden building, clapboarded and with shingle roof, and is divided into a furnace room, in which there is a brick, muffle furnace for two 10-inch muffles, fired with coal from the next room, and the sampling room, off which there is a coal bin. From the furnace room a door opens into the "wet" or analytical room, and from each of these a door opens into a small but com-



Marysville Smelter, Fort Steele Mining Division—Calciner Sheds.

drops off on two sides to the river valley some 150 feet lower. The subsoil is gravel, giving an excellent opportunity for cheap but good foundations. The general scheme of the smelter, as apparently intended from the construction partly completed, is as follows: The ore was to come in on railway cars, over a trestle about 4 to 5 feet high, the level of the car floor being that of the receiving floor of the sampling plant. From the sampling plant the ore was to be delivered by buggies to a series of bins slightly elevated, and from these bins it was to be wheeled on the ground level to the calciners standing on the same level, into which it was to be shovelled presumably, as no provision for top charging was noted. The calciners were only equipped for drawing the ore into buggies, and it was afterwards to be sent

to the charging floor of the furnace shed by wire rope aerial tramway, the charge being dumped and mixed on this floor. The fuel and fluxes were to be dumped from railway cars standing on a trestle 8 to 10 feet high into bins on the ground level, and thence taken to the furnace shed by aerial tramline. The plant, as far as completed, was erected under the supervision of Mr. L. S. Austin.

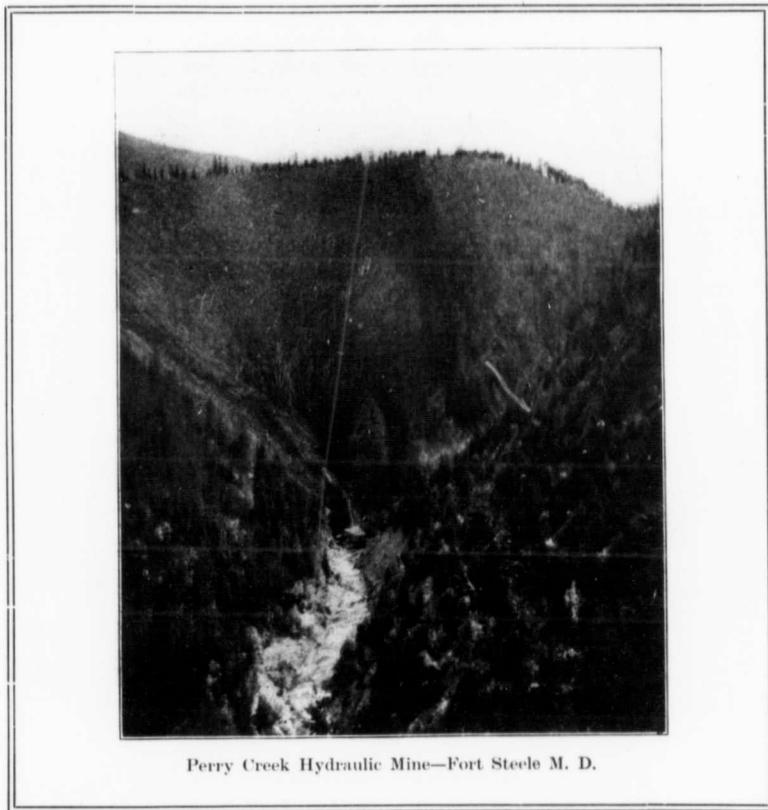
**SAMPLING PLANT.**—The sampling building is about 30 by 40 by 40 feet high, and is situated on the railway siding as it enters the smelter grounds. At present little of the sampling machinery is in place other than two elevators, each running the height of the building. The plant is arranged for a very complete system of automatic sampling, and it was reported that all machinery was on the ground for its equipment.

**MAIN FURNACE BUILDING.**—The main furnace building is 96 feet long by 32 feet wide, with a lean-to along one side in front of the furnaces.

The construction is entirely of sawn lumber and is so very light that supplemental trusses and posts were afterwards put in to support the charging floor. The charging floor is 25 feet above ground and the eaves about 14 feet above this. The roof has a very flat pitch, and is covered with tar and gravel roofing. In this are already built two lead blast-furnaces 7 feet by 14 feet outside dimension, and 138 by 40 inches inside of jackets at the bosh. The bottoms of the furnaces are of standard type, cast-iron plates, with suitable attachments, lined with "Carr" Scotch firebrick. Above this are the sectional

with full equipment of settling pots, slag pots, moulds, etc., all made by the Union Iron Works, of Spokane. Whatever criticism the general arrangement may be open to, the furnaces, as such, are good and suitable to fit into any readjustment. In a small shed are two Connersville pressure blowers, in readiness to be put in place, also all necessary blast-pipe, etc.

**CALCINERS AND SHED.**—The calciner building is of rather unique and original design (as shown in engraving), having a wooden frame covered with corrugated iron roof, and of such a form as to make a series of inclined steps, 13 in number and cov-



Perry Creek Hydraulic Mine—Fort Steele M. D.

jackets, of cast-iron, 21 inches wide, and each having a 4-inch tuyere hole. They are provided with the usual and suitable water attachments. The upper part of the furnace is brick-work resting on iron girders supported by iron columns and independent of the lower construction. The charging openings are the length of the furnace on one side; they are level with the charging floor, and provided with counter balanced doors of wrought iron. The stacks are vertical continuations of the furnaces and are of brick, iron bound, to above the roof, which is as far as they are built. No provision has been made for dust chambers. The furnaces are modern, well built and are provided

with 6 calciners. The calciners are of the ordinary single hearth hand-worked type, 46 ft. long and 16 ft. wide, having 9 rabbling doors on each side and a double-doored fire box. These furnaces are built of red brick, with a second quality fire brick inside; they have a brick hearth laid on earth filled in between the walls, and are bound with iron rail buck-stays and 1-inch tie-rods. The furnaces were built when there was frost in the ground and also in the filling under the hearths, which has caused such settling as would necessitate the arches and hearths being all rebuilt.

**POWER.**—Water sufficient to supply power for all requirements of the smelter is obtained from Mar-

Creek, from which it is conducted in a flume 4 feet by 4 feet 6 inches in size and 700 yards long. The flume conducts the water into the smelter bench, from which it is led to a power-house in the river bottom by iron pipes, giving a head of about 175 feet. The power-house is to be fitted with water wheels, from which power is to be transmitted to the smelter by 3 rope drives, but all of this work is as yet uncompleted.

**WATER SUPPLY.**—A water supply for use about the smelter is provided from Mark Creek, the water being conveyed from about half a mile up the creek by an 8-inch pipe-line.

working one property and the Perry Creek Hydraulic Mining Company another.

In the early days the gold was obtained principally below the Perry Creek Falls, and near the bottom of the canyon which cuts through a bluff of rock. The old channel of the stream apparently passed on one side of this, for on the right bank of the creek there is an old gravel channel on which, from the level of the creek below the Falls, a tunnel was many years ago driven between 1,000 and 2,000 feet. Later prospecting revealed two or three paystreaks in the bank overlying the tunnel. These do not appear to



East Kootenay Placer Mining Co's Steam Shovel, Perry Creek.

#### PLACER MINING ON PERRY CREEK, EAST KOOTENAY.

Reports of renewed activity in placer mining and the installation of two large plants on Perry Creek (in the Fort Steele Mining Division, East Kootenay), which in the early '60s attracted much attention and yielded a lot of placer gold, induced the Provincial Mineralogist to visit that locality last summer. From his account of his visit, which has only just been published, it is learned that the East Kootenay Placer Mining Company, of Fernie, is

be rich enough for drifting on, but, seemingly, it would be worth while to hydraulic the whole bank, for which purpose the Perry Creek Hydraulic Mining Company has been organized. This company has secured water rights on Perry Creek, taking water from the stream about four miles above the Falls, and has under construction a wooden flume, four feet wide by three feet high, of 1¼-inch lumber. The construction of the flume was in progress when the property was visited, with every probability of completion during 1903. The flume leads along the right or south hill-side, attaining a height above the creek of about

300 feet. At the lower end a siphon of rivetted iron pipe conveys the water over a narrow draw, 175 feet in depth, and delivers it to a short ditch leading to a pressure box, from which a pipe line runs down the face of the bank to the mouth of the old tunnel delivering water under a head of about 400 feet. The fall in the creek being insufficient to carry off hydraulic tailings they will have to be sluiced away in boxes for about half a mile below the Falls. This will necessitate the bottom of the hydraulic pit being some 50 or 60 feet above the creek at the mouth of the old tunnel, consequently while the upper part of the bank can be run off by straight sluicing methods, the lower 60 feet will have to be raised by an elevator.

The bank representing the face of the old channel has been cleared of timber. It is about 400 feet high and is composed of fine gravel, silt and some clay, and will wash cheaply and quickly. It was expected that hydraulic operations would commence this spring, and that, with judicious handling, the property has fair prospects of becoming a producing mine this season.

The East Kootenay Placer Mining Company has secured leases of about  $4\frac{1}{2}$  miles of ground above the Falls, and has put in a steam shovel for lifting the gravel into the sluice boxes. At the point selected for operations the creek bed has a grade of two to three per cent. At a depth varying from three to ten feet there occurs a false bedrock, consisting of a sandy clay on and above which gold in considerable quantities has been found. The true bedrock is believed to be at a depth of, approximately, 50 feet, having been struck about that depth in two shafts.

The intention when the plant was put in was to work the gravel on and above the false bedrock, and of this a patch 64 yards long, eight yards wide and two yards deep, equal to about 1,000 cubic yards, was taken and dumped into the rough sluice boxes. From this gold to the value of \$260 was reported to have been obtained, equivalent to 26 cents per cubic yard. If the results from the ground worked may be taken as an average of the values to be obtained from above the false bedrock there is on the leases a large tonnage of material, which, with certain necessary modifications in the plant to suit local conditions, may be handled at a good profit.

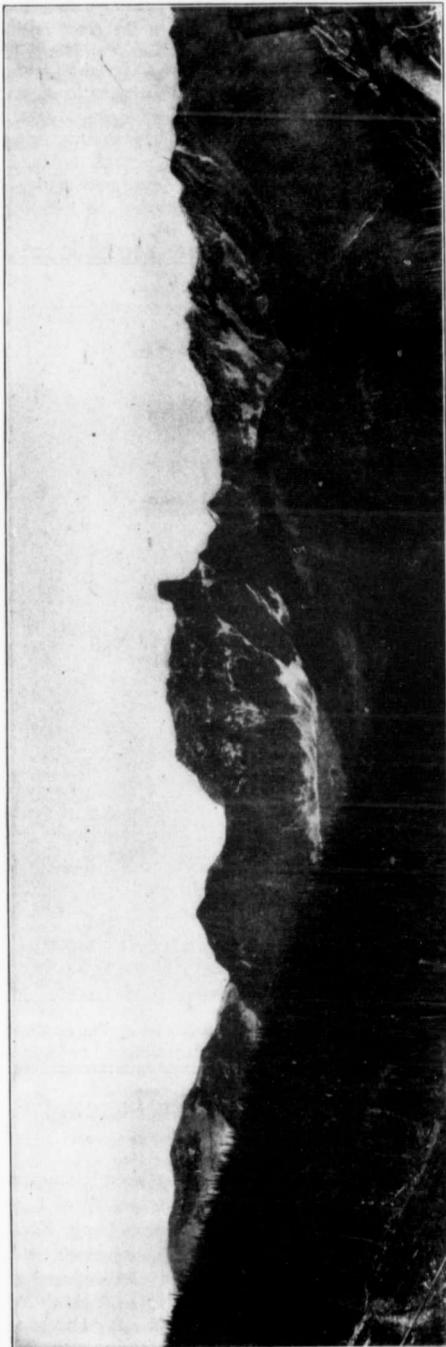
Water for sluices is taken out of the creek about half a mile higher up than where the shovel has been placed, and is brought down in a board sluice box 32 inches wide and 15 inches deep.

#### WETHERILL MAGNETIC SEPARATING PROCESS AND PTARMIGAN MINE ORE.

**I**N his summary of the general developments of the year in the Province the Provincial Mineralogist makes the following comments on magnetic concentration:

"Experimental tests have been made which lead to the belief that much of the zinc which now is regarded as merely a contamination of the lead ores of

the Slocan, may be separated by a magnetic process and rendered available as an ore of zinc.



View from Ptarmigan Mine, McDonald Creek—Windermere Mining Division, S. E. Kootenay.

"An experimental Wetherill Separator has been installed in the Province, with which many ores have

been tested, while other British Columbia ores have been sent East for experimentation. Magnetic concentration is as yet in its infancy, and from experiments which the writer had the pleasure of recently witnessing when in the East, he is convinced of the wonderful possibilities of the process as applied to a number of British Columbia ores, the concentration of which by any water method is impossible.

"That certain strongly magnetic minerals are separable by magnetic concentration is a fact so well known as scarcely to need comment, but that many minerals which are not acted upon by an ordinary magnet may be eliminated by higher magnetic powers is not so fully realised and is worthy the serious consideration of mine owners. To quote from Ingal's 'Production and Properties of Zinc' (p. 268):— 'It has been shown by Farady, Plucker, Wiedeman and others that magnetism is an inherent property of all substances, which are either attracted or repelled by the poles of a magnet, though in most substances the manifestation of this property is exceedingly feeble.'

"At the works of the Wetherill Separating Co., at Newark, N.J., the writer saw certain samples of zinc blende magnetically 'picked up' out of a mixture of gangue, galena, pyrite, etc., making a clean separation, while a similar separation of tetrahedrite (gray copper) was made from gangue and pyrite.

"Upon inquiry as to what minerals had been found separable by the process, it was said that no rule could be laid down, but that each special ore required to be determined by experiment, since, for example, of two samples of zinc blende, one could be easily attracted by the magnet of high power, while the other sample was so feebly attracted as to preclude any practical separation; similarly with tetrahedrite, although the sample of this mineral experimented upon, an ore from British Columbia, was strongly magnetic. This lack of uniformity is accounted for by the fact that in few ores does the mineral conform strictly to its theoretic composition, but contains usually associated minerals which materially affect the magnetic action. Certain minerals

"No reliable data could be obtained as to exactly what the assay on an average sample of this ore body" (on the Red Line claim) "would be, although the ore was admittedly too low grade to stand shipping without concentration. The ore consists of quartz and rock carrying a considerable proportion of iron pyrites, with varying proportions of tetrahedrite (gray copper), and the values seem to be chiefly associated with and contained in this latter mineral. Small shipments of sorted ore have been made which gave smelter returns as follows:—Copper, 4.1 per cent.; silver, 237 oz., and gold, 0.41 oz. per ton. The silver values of the ore seem to be nearly in proportion to the gray copper contained therein, and concentrates therefrom run as high as 1,000 oz. silver per ton, while the gold values are with the iron pyrites.

"A concentration by water of the gray copper from the iron pyrites and quartz was recognised as impossible; consequently, a lot of the ore was sent to New York for a trial of concentration by the Wetherill Separating Co., the results of which have been kindly furnished by the manager of the mine, Mr. Thos. Starbird, and are here given as being of more than local interest. It is perhaps unfortunate that the ore sent was sorted too high to make the test of much practical value to this property, as it in nowise represents the bulk of the ore. As a matter of fact, indeed, the ore sent was so highly sorted as not to require any concentration, but could be well shipped as it was. The following is an analysis of this ore, as reported by the Wetherill Company:—

ANALYSIS OF ORE TESTED.

Copper (per cent.) . . . . .	11.09
Zinc . . . . .	trace.
Iron (per cent).....	22.67
Sulphur (per cent).....	31.38
Antimony (per cent).....	10.78
Bismuth (per cent).....	0.15
Silica (per cent).....	16.32
Gold (oz. per ton) . . . . .	0.73
Silver (oz. per ton) . . . . .	416.47

TEST OF SILVER ORE BY WETHERILL SEPARATING COMPANY.

Size.	ORIGINAL.				POLES 3 & 4, 15 AMPERES.				POLES 5 & 6, 25 AMPERES.				NON-MAGNETIC TAILS.			
	Weight Grms.	Copper %	Silver Oz.	Gold Oz.	Weight Grms.	Copp'r %	Silver Oz.	Gold Oz.	Wght Grms.	Cop-per %	Silv'r Oz.	Gold Oz.	Weight Grms.	Copper %	Silver Oz.	Gold Oz.
10 to 20	39,615	6.94	283.25	0.45	9,675	22.59	838.75	0.67	1,710	9.70	358.70	0.55	28,230	1.85	67.20	0.56
20 to 40	20,170	7.05	273.80	0.55	4,700	23.72	910.40	0.50	1,300	15.59	580.25	0.75	14,170	1.15	42.18	0.49
40 to 80	10,880	6.54	248.97	0.52	2,240	27.28	1,030.80	0.50	240	16.18	592.40	0.87	8,400	0.9	32.75	0.50
80 to 200	7,430	6.33	241.35	0.50	1,070	27.53	1,049.30	0.45	290	15.85	982.50	0.53	6,070	1.55	63.85	0.48
Dust E.	7,000	7.03	277.50	0.53												

which naturally are practically non-magnetic may be rendered so by a partial or complete roasting."

The tetrahedrite, the treatment of which the Provincial Mineralogist had the opportunity of witnessing, as mentioned above, was from the Ptarmigan mine. In his account of a visit made to that mine last summer that official says:

The property now called the Ptarmigan mines was formerly known as the Red Line, or McDonald mines. It is owned by a syndicate of eastern American investors, and includes the following Crown-granted mineral claims: Red Line No. 1, Red Line No. 2, Iron Cap, Iron Crown Fraction, and Contention Fraction. The mine is situate in a basin

at the head of McDonald Creek, a branch of Horse Thief Creek, at an elevation of 8,500 feet above sea level, and at a distance of about 27 miles from the town of Wilmer, on the Columbia River, in North-East Kootenay. The accompanying illustration gives a typical view of the neighbouring country.

#### PEERLESS CLAIM, QUATSINO SOUND.

One of the best of the many blocks illustrating the special reports in the Annual Report of the Minister of Mines for 1903 is that entitled "Open Cut, Peerless Mineral Claim, Quatsino Sound." Printed in a sepia-black tint on plate paper, it makes a far more attractive picture than it is practicable to reproduce here. It represents one of a number of photographic views taken by Mr. Herbert Carmichael, Provincial As-

flows round the north-western base of the mountain from Victoria to Alice Lake. After crossing Link Creek from the June group, and at the eastern end of a slight ridge, open quarry work has exposed an ore body 30 feet wide of nearly solid zinc blende mixed with a little quartz vein matter. The quarry shows a face of from nine to ten feet high. Some prospect holes have been sunk on the ridge 200 feet to the west of the quarry, the mineral at this point being principally arsenical iron in a quartz, with some blende."

#### MINERAL PRODUCTION STATISTICS.

The following statistics relating to the mineral production of British Columbia are taken from the Report of the Minister of Mines for 1903:



Open Cut, Peerless Mineral Claim, Quatsino Sound.

sayer, when he visited the Quatsino Sound country last year, and was used to illustrate his report on that section. Although the Peerless had not then been opened up sufficiently to warrant its being classed among the more important mining properties of the district, it appeared to be one of considerable promise. It is in the neighbourhood of Teta River, a small stream flowing into the South-East Arm of the Sound on its western shore, five miles south-east from Yreka. Mr. Carmichael made the following reference to it in his report: "The Peerless mineral claim is situated to the east of the June group, on Murray Creek, on the western end of the range separating Alice Lake from Victoria Lake. Link Creek

Total production for all years up to and including 1903—

Gold, placer .....	\$65,688,103	
Gold, lode .....	26,862,348	
		\$92,550,451
Silver .. .....		19,997,354
Lead .. .....		11,137,265
Copper .. .....		16,803,754
Coal and Coke .. .....		63,321,869
Building stone, bricks, etc.....		3,325,000
Other metals .. .....		88,799
		\$207,224,492

Amount and Value of Mineral Products for 1901, 1902 and 1903.

	Customary Measure.	1901		1902		1903	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value
Gold, placer	Ounces	48,505	\$ 970,100	53,657	\$ 1,073,140	53,021	\$ 1,060,420
Gold, lode	Ounces	210,384	4,348,603	236,491	4,888,269	232,831	4,812,616
Silver	Ounces	5,151,333	2,884,745	3,917,917	1,941,328	2,996,204	1,521,472
Copper	Pounds	27,603,746	4,446,963	29,636,057	3,446,673	34,359,921	4,547,535
Lead	Pounds	51,582,906	2,002,733	22,536,381	824,832	18,089,283	689,744
Coal	Tons, 2,240 lbs.	1,460,331	4,380,993	1,397,394	4,192,182	1,168,194	3,504,582
Coke	"	127,081	635,405	128,015	640,075	165,543	827,715
Other materials	"		417,238		480,051		531,870
			\$20,086,780		\$17,486,550		\$17,495,954

Production of Mineral by Districts and Divisions.

NAME.	DIVISIONS.			DISTRICTS.		
	1901.	1902.	1903.	1901.	1902.	1903.
Cariboo District				\$ 538,700	\$ 540,395	\$ 475,200
Cariboo Mining Division	\$ 279,600	\$ 340,395	\$ 314,400			
Quesnel	240,000	160,000	132,000			
Omineca	19,100	40,000	28,800			
Cassiar District				322,949	426,636	480,368
Kootenay, East, District				2,746,839	1,477,466	1,951,128
Kootenay West, District				8,159,662	7,806,399	6,603,981
Ainsworth Division	331,011	272,967	219,818			
Nelson	1,244,568	818,494	653,457			
Slocan	1,865,752	1,608,827	1,126,986			
Trail Creek	4,621,299	4,938,395	4,380,458			
Other parts	97,032	167,716	295,262			
Lillooet District				48,383	31,429	31,283
Yale District				3,317,686	2,843,537	3,714,422
Osoyoos, Grand Forks and Greenwood Div.	3,250,986	2,782,263	3,654,234			
Similkameen Division	4,680	2,700	2,000			
Yale	62,020	58,574	58,188			
Coast Districts (Nanaimo, Alberni, West Coast V. I., Victoria)				4,052,561	4,360,688	4,239,572
				\$20,086,780	\$17,486,550	\$17,495,954

Production of Lode Mines for 1901, 1902 and 1903.

Year.	Gold.		Silver.		Lead.		Copper.		Total Values.
	Oz.	Value.	Oz.	Value.	Pounds.	Value.	Pounds.	Value.	
1901	210,384	\$ 4,348,603	5,151,333	\$2,884,745	51,582,906	\$2,002,733	27,603,746	\$ 4,446,963	\$13,683,044
1902	236,491	4,888,269	3,917,917	1,941,328	22,536,381	824,832	29,636,057	3,446,673	11,101,102
1903	232,831	4,812,616	2,996,204	1,521,472	18,089,283	689,744	34,359,921	4,547,535	11,571,367
	679,706	\$14,049,488	12,065,454	\$6,347,545	92,208,570	\$3,517,309	91,599,724	\$12,441,171	\$36,355,513

NOTE—The total value of the production of the lode mines of the Province for all years to the end of 1903 was \$74,800,721.

## Comparative Mineral Production for 1903 of British Columbia and other Provinces of the Dominion.

	British Columbia.	Yukon Territory.	All Other Provinces Combined.	Total.
Gold.....	\$5,873,036	\$12,250,000	\$ 711,454	\$18,834,490
Silver.....	1,521,472	.....	179,307	1,700,779
Copper.....	4,547,535	.....	1,180,726	5,728,261
Lead.....	689,744	.....	72,916	762,660
	12,631,787	12,250,000	2,144,403	27,026,190
Iron.....	6,870	.....	1,623,539	1,630,409
Nickel.....	.....	.....	5,002,204	5,002,204
Zinc.....	.....	.....	48,600	48,600
Total				
Metallic.....	12,638,657	12,250,000	3,818,746	33,707,403
Coal.....	3,504,582	.....	12,453,364	15,957,946
Coke.....	827,715	.....	836,010	1,663,725
	\$16,970,954	\$12,250,000	\$22,108,120	\$51,329,074

## THE RELATIVE COSTS OF POWER.

THE most satisfactory way in which to make comparison of the relative cost of various kinds of power is by the cost per horse-power per month. Steam, electricity and water power are the three kinds most generally in use in the mining regions of the West. In some districts there is also power derived from gas, gasoline, distillate and other types of engines. No comparison of the relative cost of water, steam and electric power can be given without a complete knowledge of conditions obtaining at the place where the power is to be employed.—*Electrical Review.*

## SOME NOTES FROM THE MINING CAMPS.

## ALBERNI (VANCOUVER ISLAND.)

OUR special correspondent writes: A great activity in mining is expected in this district. Besides the Southern Cross mine on Uchuelesit Harbour, which already has made several shipments, two more properties will be in a position to ship ore within a very short time. The latter are the Happy John mine on Alberni canal and the Cascade mine on Uchuelesit harbour. It is understood that both these properties are looking exceedingly well with a great quantity of ore in sight, practically ready for shipment as soon as the roads to the deep water are completed.

The Monitor mine is expected to reopen again in a short time, and this will add another to the shipping mines.

Assessment work is done on many claims in the district.

As far up the coast as Clayoquot and Sidney inlet it is reported that mining this year will be prosecuted with great energy and several properties will be operated.

## MT. SICKER (V.I.)

During the month application was made to a Supreme Court judge to sanction the proposed transfer of the Lenora mine, in liquidation, to an English company. Permission was granted, the judge holding that while at present there was absolutely no prospect of the unsecured creditors getting anything, under the terms of the proposed sale there was a chance that they might realize at least a proportion of the amounts owing them. Without actual proof it is perhaps unwise to condemn the methods that appear to have been employed by the promoters of this scheme to unload the Lenora mine on English capitalists, but there is at any rate some ground for belief that the representations now being made in London concerning the value of the property are misleading to a degree. It is not in the interests of legitimate mining in British Columbia that a badly gutted mine should be palmed off on investors as a property having over a hundred thousand tons of ore "in sight."

It is possible that even the slag produced at the Tye

Copper Company's smelter at Ladysmith may prove to have a marketable value, the city authorities of Vancouver having decided to test the suitability of this material in making "cinder" paths for cyclists, while too, it is thought the slag may be advantageously used in new cement sidewalks, several miles of which are to be laid in Vancouver this year.

## MINERAL OIL AT STEVESTON.

Boring for oil at Steveston is now in steady progress. The plant is designed to drill to a depth of 1,800 feet if necessary, but it is expected the shale will be reached at a thousand feet or less.

## TEXADA ISLAND.

We understand that the Tacoma Steel Company, which some time since acquired a bond on the Marble Bay mine, Texada Island, is meeting with considerable success, the profits on ore shipments being sufficient to meet the purchase payments as they fall due. The workings are now down to the 500-foot level and stoping is being done between the 400-foot and 500-foot level, where the richest ore has been encountered.

## THE ALESK PLACERS.

The miners in the new Alek diggings have commenced cleaning up. From a claim on Bullion Creek ten cents to the pan being obtained on bedrock, a depth of 14 feet; while the owners of discovery claim are making \$14 a day.

## ATLIN.

The new power plant of the British American Dredging Company at Pine Falls has been thoroughly tested, and is now working satisfactorily. This plant supplies power to the dredge built last season on Gold Run, six miles up Pine Creek. The pond in which the dredge is situated is now taking water from Deek's ditch, which has been thoroughly repaired, and the dredge will be running full time early next week. The richness of the dump taken out this winter by Clarke and Martin, indicates that the dredge will have a very prosperous season. A new pole line from the power plant to Upper Spruce Creek is under construction, and will carry power for the second dredge contracted for with the Western Engineering & Construction Co., of San Francisco.

Work has now fairly started on all the creeks, piping having already commenced on McKee. The Spruce Power Company, on Spruce Creek, has also completed the installation of a large plant and piping should start before the end of the month.

## ASHCROFT.

A very promising group of copper claims, in the Highland valley, near Ashcroft, has been acquired on bonding terms. The surface indications on this property are said to be exceptionally promising, the deposit being of great size. Steps have been taken to commence the development of the property at once.

## LARDEAU.

Towards the close of May operations were started at the Great Western Company's new combination mill. The machinery worked very smoothly and well. A large force of men is shortly to be employed at the Silver Cup mine, and it is expected the mill will be kept in steady operation hence forward. In the Poplar Creek district some two hundred prospectors are now engaged in assessment work, and several promising new discoveries of ore are reported. One lead on Meadow Creek is said to be 200 feet and well mineralized throughout.

The Criterion or No. 2 lead on the Rossland, one of the properties of the Oyster group, owned by the Great Northern Mines, Limited, was encountered last week in the main tunnel in which operations have been conducted during the past two months. The lead, which was struck at a distance of 500 feet from the mouth of the tunnel, is about three feet in width, and is said to contain good values.

## CARIBOO.

In Cariboo district pay gravel has been struck at Willow

River, values, it is reported, running forty ounces to the sett of timbers. It is also announced that rich ground has been reached in No. 2 drive, west, at Slough Creek. On the Eleven of England group, on Lightning Creek, a good prospect has also been encountered at the end of the drift recently run.

## SLOCAN.

At the end of March the Kootenay lead mines had earned \$121,000 under the Lead Bounty Act.

Recent developments at the Queen Bess mine in the Slocan, formerly owned by an English company, but now being worked under lease, have afforded most encouraging results, a rich vein of carbonates and galena having been encountered at a distance of 150 feet in No. 5 tunnel. The assay returns show the galena ore to run 109 oz. silver and 75 per cent. lead and the carbonates 54 to 58 oz. silver, and 19 to 24.5 per cent. lead.

A dividend of \$6,000 was declared by the Sunset mine in May, the property having thus paid \$66,000 in profits to date. The ore produced from this property contains very good values, assaying 140 oz. silver and 80 per cent. lead per ton. Seven carloads of rich ore are now ready for shipment.

The Ivanhoe, one of the important silver-lead mines in the Slocan, is now again being operated on an extensive scale, and a large tonnage of both silver, lead and zinc concentrates is being produced. The zinc contained in the ore occurs in a very pure state, being almost free from spathic iron, which facilitates concentration very considerably. The mine recently made another contract to ship 500 tons of zinc to Lanyon Works, Kansas.

The Donnelly Group near Sandon has been leased for two years. The mine is in an advantageous position as regards facilities for transport, having access to two railway systems. A strike of fourteen inches of galena ore is reported to have been made on the Majestic and Unexpected properties on Payne mountain.

## NELSON.

At the Hall Mines smelter the second furnace was blown in last month, in order to treat a large tonnage of concentrates from the Highland mine at Ainsworth.

The Five Metals Mining Company operating at the head of Haughton and Gray Creeks in the Nelson Mining Division, proposes to commence shipping ore immediately, and a road is now being cut to the property with this object in view.

## ERIE.

Considerable activity is being displayed in the Erie section, and preparations are now in progress for the commencement of work at a number of properties. Thus the Relief stamp mill and concentrator have started crushing, and work, it is expected, will be resumed on the Waffer, Good Hope and Copper Farm very shortly. Shipments from the Arlington are to recommence directly the condition of the roads permit.

## TRAIL.

The last shipment of silver from the Trail refinery aggregated some 54,000 ounces and was made to Shanghai, China. A shipment of 550 ounces of fine gold was also made at the same time for the same port. Pig lead shipments have been made regularly to Montreal and other Canadian and United States cities, mostly for home consumption.

## ROSSLAND.

A circular has been directed to shareholders of the Spitzee mine, stating that ore stoped from the vein recently crosscut yielded \$17.50 per ton. Another vein was encountered west of the shaft, the ore assaying \$5 in gold and 9 per cent. copper. The drift in the 200-foot level encountered the vein ten feet to the north of the shaft, and developments have proved its strength and continuance. Large bodies of low grade concentrate ore have also been opened up. The managing director states that the mine is now in a position to ship several hundred tons of ore a month and maintain development on the second level. The company is now experimenting with the Elmore process.

The recent abolition of the duty on oil used in connection with the Elmore process of concentration has resulted in effecting a saving of no less than 12 cents per gallon, the price formerly charged with the duty added having been 41 cents, against the present price of 29 cents per gallon. An effort is also now being made to induce the railway company to reduce the freight charges, and it is thought that ere long the price on oil delivered at Rossland and other Kootenay points may be reduced to the relatively low figure of about 20 cents per gallon. Meanwhile the White Bear Company at Rossland is already breaking ground for the foundations of a 100-ton plant, which is to be installed forthwith. The operation of this mill at the White Bear will be awaited with particular interest, as likely to afford a more satisfactory demonstration of the commercial possibilities of the process than has been possible with the small Le Roi No. 2 plant. The latter mill is, however, to be started, it is stated, early this month with a view to continuous operation when its capabilities will be more clearly shown. It is announced also that the ores of the Iron Mask mine in the same camp will shortly be tested to ascertain their amenability to this process, and doubtless other mines will follow suit.

It is expected that the Rossland Power Company's new concentrator at Trail will be completed very shortly. This plant is being erected chiefly for the purpose of saving the values in the low grade iron ores from the Centre Star and War Eagle mines, but in addition some custom work will be undertaken. The mill will have an initial capacity of 200 tons per 24 hours, but the arrangement is such that by duplicating certain machines the capacity of the works can be nearly doubled without enlarging the present buildings.

The essential feature of the process about to be used is a thorough water concentration, with gradual reduction to prevent the formation of rich slimes, a preliminary course of crushing and concentration permitting of the removal of a considerable percentage of the sulphide contents as a product for smelting. The tailings will then be ground and separated into sands and slimes, each of which will be given a special treatment for the recovery of the remaining values. The location of the works and the arrangement of the plant are such as to afford an almost automatic handling of the material from the time it enters from the railway cars as crude oil until it is discharged into the railway cars as concentrates, the tailings going to the waste dump. The plant is of the "level site" type, as distinguished from the usual side hill type. It is believed that this is the first mill of this type to be built in British Columbia. The water supply, which is necessarily a large one, is from Stoney, Rock and Murphy creeks, whence it is conveyed by flume point on the north side of the first named stream, and thence to the mill by a steel pipe line. The waste water and tailings will be discharged to the large sandy flat opposite the mill. The motive power will be electricity from the system of the West Kootenay Power & Light Company, Limited. The equipment of motors will be a little less than 500 horse power. The estimated cost of the plant is \$150,000.

There is now some talk of a concentrator being erected at the Le Roi, and it is certain some method will have to be adopted for treating the silicious ores mined from below the 800-foot level, the smelting of which is necessarily a somewhat extravagant proceeding.

Heretofore the Northport smelter has been compelled to purchase iron ores for fluxing purposes. It is now announced that dependence on outside sources may in future be avoided during the recent close down of the works, experiments having been successfully conducted in mixing ores from the different stopes in the Le Roi mine.

## BOUNDARY DISTRICT.

It is expected that connection will be made shortly in the long No. 4 tunnel of the Granby mines, work on which has been proceeding for some months. The portal of this tunnel will then be about 1,500 feet from the No. 2 shaft of the Old Ironsides mine, the grade being about 5 per cent.

Work is being resumed on many claims that have been idle during the winter. A number of bonds and leases are also being sought on various high grade properties, incited, as the seekers thereof have been by the results obtained from the Providence, the Elkhorn, the Gold Bug, the E. P. U., the Goldfinch and the Helen.

The Volcanic Mining & Development Company of Marquette, Mich., has secured an extension of two months from May 1st to July 1st, on the bond on the Volcanic mine group.

A syndicate has acquired a bond from the Bank of Montreal on a group of twelve high grade properties formerly owned by the Boundary Creek Mining and Milling Co., Ltd., near Greenwood.

The Providence Mining Company in the Boundary district last month declared a third dividend of ten cents per share.

The B. C. Copper Company has acquired a bond on the Roderick Dhu claim in Long Lake camp, and is developing the property.

Work is about to commence on the construction of a branch of the Great Northern Railway from Grand Forks to Phoenix.

#### CAMP MCKINNEY.

It is announced that the Kamloops, Minnehaha and Sailor Mining Companies, Camp McKinney, have been consolidated. The properties have been closed down for some two or three years.

#### CAMP HEDLEY.

The Federal Government lately acceded to the request of the Daly Reduction Company for permission to purchase a smelter site on the Indian reserve, near Hedley in the Similkameen district. The company had threatened to build the proposed smelter in the United States should the Government have refused this application.

#### MOYIE, E. KOOTENAY.

Another silver-lead property to resume work, production having been suspended since July, 1901, nearly three years ago, is the St. Eugene, at Moyie, E. Kootenay, where a force of 275 men is now employed. Shipments were begun from this mine last month, when eight carloads of ore were sent to the Trail smelter. Should the St. Eugene, as is anticipated, remain in steady operation, it is reasonably certain that this year's silver-lead production will at least equal the record achievement of 1901. For the present the company has only contracts to output 4,000 tons, but should the concession sought by exporters of low grade ore in respect to the extension to them of the Government bounty on lead, the output will be increased to 18,000 tons.

#### NOTES FROM THE DRY ORE BELT OF THE SLOCAN.

By W. D. MCGREGOR.

**A**N exceedingly dry spring has let the working prospectors in the lower section of this camp earlier than usual, and the general success of leaseholders is having a marked effect on the development work planned for the coming season. On Ten Mile Creek the Enterprise continues its satisfactory output. The leasers of the Nee-pawa have just received returns of \$116 per ton for their initial car of ore. Griffith is taking good ore out of the Westmount. Twelve Mile Creek shows two or three cars of high grade ore in the new work on the Happy Medium, and there has been a sensational strike made on the Coronado group, near the head of the creek. Along this line from near the head of Twelve Mile to Springer Creek there is a string of most promising properties that warrant anyone's careful investigation. These include the Myrtle, which shows a vein 30 feet wide carrying streaks of 200 oz. ore (smelter returns) at 80 feet depth. The owners are running a 450-foot crosscut tunnel to handle the surface water, which has always been bad and are now in 370 feet below this on Robinson Creek. Work on the Club has de-

veloped a shute of quite \$200.00 ore, including over 1 oz. of gold. Adjoining this is the I. X. L., on which a crosscut is being driven to tap the vein at some depth below the surface ore shutes, and below this and Springer the Cripple Stick group seems to have fallen into unfortunate hands, though the sorted ore gave smelter returns of \$90 with over 2 oz. gold. Just west of this the Port Hope has been developed under lease and the leasers are now bucking down and sorting ore that should return them about 200 ozs. silver and 107 oz. or better in gold. All these are working and all are showing a considerable amount of second class ore that would make first class profits if handled to advantage.

On Springer Creek proper: The Ottawa should have a paper to itself. This mine has shipped 215 tons of 200 to 500 oz. ore. So far this season's systematic development has shown the main ore shute, say 50 feet on the upper level, 135 feet on No. 3 and 365 at least on No. 4, as the grade of ore has improved; at the same time it can easily be understood that the position is an interesting one for the owners. At present a waggon road from the trunk road on Springer Creek is under construction, also necessary buildings for the enlarged force at the mine. The Black Prince is still in the best of shape at the hands of the leasers, who have still a couple of carloads to get out when the roads permit.

Lemon Creek promises great things if certain titles can be cleared. The leaseholders on the Chapleau profess themselves satisfied with the outlook and have run some 100 tons through the old mill. The Alberta has a choice shipment waiting the disappearance of the snow. Generally things promise well.

#### PROVINCIAL MINING ASSOCIATION.

**A** MEETING of the Executive Committee of the Provincial Mining Association was held at Nelson on May 18 and 19. Besides disposing of a lot of correspondence and routine business the following important matters were dealt with, as stated:—Re bounty on surplus lead ores shipped to foreign smelters:

Resolved: "That the Executive of the Provincial Mining Association heartily endorses the appeal made to the Dominion Government by the Associated Silver-Lead Mines, which has been agreed to by the Canadian smelters, and endorsed by the Provincial Boards of Trade, viz., that the bounty on lead ore be paid for one year on any lead ore shipped out of Canada after the lead smelters have been supplied with all the ore they require, and the Executive respectfully urges the Government to grant the concession, believing that it will greatly stimulate lead mining, which has been in a most depressed condition for the last three years, and tend to place it on a more permanent and prosperous footing. At the end of the period for which the concession is asked, it is confidently expected that the local smelters will have increased their capacity sufficiently to enable them to treat all lead ores mined in British Columbia, and that a copy hereof be sent to Mr. W. A. Galliher, hon. member for the district, and the Hon. W. S. Fielding, Minister of Finance, Ottawa."

Re location of placer claims over lode claims:

Resolved: "Whereas the judgment recently rendered by the Hon. Mr. Justice Martin in the case of Tanghe vs. Morgan, decides that whenever a free miner makes the statutory affidavit (Form G) required by the Placer Mining Act, and pays or tenders the requisite fee to the Gold Commissioner, such free miner becomes entitled to a record of his location, notwithstanding the fact that the ground is already occupied as a lode location, and the Gold Commissioner, after personally inspecting the ground, is of the opinion that the application for a placer location is not bona fide, and

"Whereas, the said judgment also affirms that in an action brought by the placer locator against the earlier lode locator, the placer locator is entitled to the judgment of the court, notwithstanding the fact that the evidence establishes that the so called placer location, was not a placer claim at all, because there was no placer ground in it, and

"Whereas, in the case of an adverse action between rival claimants of a lode claim, where both parties have filed the statutory affidavit, stating that they had, respectively, each discovered mineral in place, it has also been open to the court to find that one, or both, of the locations is invalid by reason of the fact that no mineral had been in truth discovered; and it is difficult to say why the law should be administered differently in case of placer claims, and

"Whereas, if the said judgment be correct, endless confusion will arise by the locating of imaginary or fictitious placer claims over valid existing mineral claims, and the said judgment demonstrates that the provisions of the Act relating to the matters in question, are ambiguous and doubtful.

"Therefore be it resolved that the uncertainty and confusion which apparently exist in the Placer Mining Act ought to be promptly removed by an order of the Lieutenant-Governor in Council, pursuant to the powers conferred by section 150 of the Act."

The president reported that the branches of the association at Bullion and Quesnelle Lake had both passed resolutions deprecating the covering of lode claims with placer claims.

Re surface rights of mineral claims:

Resolved: "That the Executive of the Provincial Mining Association is strongly of the opinion that the free miner should be entitled to surface rights of his mineral claims. That under the existing law much litigation has already arisen, and is bound to arise in the future, that a committee consisting of Messrs. Galt, Smith-Curtis and the president be appointed to investigate the matter, and bring in a report on the amendments necessary to the various Acts affecting this most important question at the next meeting."

It was decided to make further representations to the Provincial Government regarding delays in the issue of Crown grants.

A resolution was passed expressive of sincere regret at the death of Hon. Senator Reid, a member of the Executive, and it was decided to communicate to his widow the earnest sympathy of the members with her in her bereavement.

Messrs. Robert R. Hedley and A. H. Kelly, both of Nelson, were appointed members of the Executive.

Ymir is in the peculiar position of being about the only mining camp of any importance in British Columbia which has not organized a local branch of the Provincial Mining Association. This is an association which is undoubtedly doing good work in the interest of the mining industries of the Province. It is composed of men of all classes, representative alike of mine owners and men, of mine owning associations and labour organizations; and one of its most useful functions which has already been put to the test, is the suggestion of useful and remedial legislation for the protection and furthering of mining. The local branches have the power of bringing to the notice of the central organization questions of local import on which an official ruling is important, and the central organization: is in a position to urge on legislation calculated to relieve undue pressure on certain lines or protected established right. The Poplar Creek branch, for instance, has taken up with the head association the local case where placer rights and lode locations conflict with one another, and the result will probably be new legislation next session, which will clear away the present ambiguity of the law.—*Ymir Herald*.

#### COMPANY MEETINGS AND REPORTS.

##### IMPERIAL COAL AND COKE.

THE annual meeting of shareholders of the Imperial Coal and Coke Company was held recently in Montreal. Mr. W. Herbert Evans occupied the chair. The following directors were elected: Messrs. O. G. Laberee, Spokane, Andrew Laidlaw, Spokane; W. Herbert Evans, of Evans Brothers,

coal merchants, Montreal, Canada; J. W. Pyke, of James Pyke & Company, iron and steel merchants, Montreal; Randolph MacDonald, vice-president of the Sovereign Bank, of Toronto, Canada; C. W. Spencer, general superintendent of transportation, Canadian Pacific railway; Frank Thompson, of Frank Thompson & Company, financial agents, Montreal. At a subsequent meeting of the board, Mr. W. Herbert Evans was elected president, Mr. J. W. Pyke, vice-president, and Mr. Humes Hall, secretary. The company has 96 square miles of coal lands in South-East Kootenay and a capitalisation of \$4,500,000.

##### MT. SICKER AND BRENTON.

A meeting of the Mount Sicker and Brenton Mining Company was held in Victoria during May. Only routine business was transacted. The accounts for the year ending April 30th, 1904, were passed. The following officers were elected: President, Dr. T. J. Jones; secretary, Mr. R. T. Elliott; directors, Messrs. J. L. Beckwith, R. L. Drury, W. A. Dier, T. J. Jones, H. Dier, T. D. Conway and R. R. Dier; auditor, Mr. C. S. Baxter.

##### LUCKY BOY.

The annual meeting of the Lucky Boy Mining Company took place in Rossland on Monday last, several shareholders from Northport being in attendance. The election of officers resulted as follows: Mr. S. L. Myers, Northport, president; Mr. J. M. Lauridson, Port Angeles, Wash., vice-president; Mr. H. W. Sterrett, Northport, treasurer; Mr. W. L. McDonald, Rossland, secretary; Mr. S. L. Myers, manager. Directors, Messrs. S. L. Myers, G. M. Lauridson, H. W. Sterrett, M. E. Meyers and W. L. McDonald. The Lucky Boy Company will resume work shortly on the Waffer mine, adjoining the Relief in the Erie district.

#### COMPANY NOTES AND CABLES.

Le Roi, No. 2, (Rossland)—The manager reports by cable receipt of \$21,200, proceeds of 1,665 tons shipped between February 12th and March 8th, from which remain to be deducted mining and development charges, the estimated tonnage shipped for March being 2,300 tons from the Josie mine and 900 tons from the No. 1 mine. Writing on March 16th, he reports that he is drifting eastward on the 600-foot level in 10 feet of rich, heavily mineralised ore. A cablegram has now been received as follows: "In addition to ore referred to in my letter dated March 16th, have struck downward continuance stope 20. Cannot send dimensions at present, but ore in both places is excellent." Stope 20 is the most westerly point yet opened up in the Annie ore shoot.

April Returns—Manager reports: "Estimated tonnage shipped for month of April, 1,920 tons. Net receipts from smelter during month amounted \$32,520. Proceeds of 1,699 tons Josie ore and 1,103 tons No. 1 ore previously shipped. Where remain to be deducted mining and development charges."

Le Roi (Rossland)—The following cables have been received from Mr. J. H. Mackenzie, the acting general manager, and Mr. A. J. McMillan, the managing director of the company:—"Shipped from the mine to the Northport smelter during the past month 3,720 tons of ore from all stopes which show the average value of the mine is \$8.17 per ton. 430 tons shipped from the 1,350 feet level showed \$7.45 per ton. No profit at all has been made for several months. The amount realised from the treatment of the furnace bottoms is \$85,000. Owing to faulty sampling and assaying, excessive valuation, \$335,000 has been made in the assets. Four furnaces running. We are now shipping 200 tons of picked ore per day.—J. H. Mackenzie." "I have been here only three days, have not had time to thoroughly investigate. After further investigation and seeing S. F. Parrish, who is expected to arrive here towards the end of this week, I shall be able to better advise.—A. J. McMillan."

The Ymir Gold Mines (Ymir)—The mine manager reports the return for the month of March, 1904, by cable, as

follows:—45 stamps ran 30 days and crushed 3,300 tons (2,000 lb.) of ore, producing 870 oz. bullion. The estimated realisable value (gross) of the product is \$9,000. 270 tons of concentrates, shipped, gross estimated value, \$7,780. Cyanide plant treated 2,280 tons (2,000 lb.) of tailings, producing bullion having estimated gross value of \$1,800. Sundry revenue, \$700. Total, \$19,280. Working expenses, \$18,400. Profit, \$880. There has been expended during month on development, \$800.

Ymir (Ymir)—The mine manager reports the return for the month of April, 1904, by cable, as follows:—40 stamps ran 30 days and crushed 3,050 tons (2,000 lb.) of ore, producing 731 oz. bullion. The estimated realisable value (gross) of the product is \$7,650; 250 tons of concentrates, shipped, gross estimated value, \$6,825; cyanide plant treated 2,280 tons (2,000 lbs.) of tailings, producing bullion having estimated gross value of \$1,950; sundry revenue, \$825—total, \$17,250; working expenses, \$15,800—profit, \$1,450. There has been expended during month on development, \$1,275.

Fern (Hall Siding)—Crushing operations have been resumed at the Fern mill, at Hall Siding, Ymir, a considerable amount of ore having accumulated at the mine.

Tyee Copper (Mt. Sicker)—The smelter returns for April were: Smelter ran 30 days, treating 6,715 tons of Tyee ore, which gave a return after deduction of freight and refining charges of \$80,373.

Boundary Helen (Greenwood)—A meeting of the shareholders of the Boundary Helen Gold Mining Company will be held at Greenwood on June 8 to authorize the sale of the Helen mineral claim to a syndicate which has lately been developing the property.

Paradise Mine (Wilmer)—The manager kindly sends us the following returns: From April 1st, 1901, to December 31st, 1903, there were shipped from the mine 1,610.49 tons of ore to Trail. The gross value of the metals exclusive of smelter deductions of this ore was \$76,910.61. From April 1st, 1904, to date, 54 tons have been shipped.

#### MACHINERY NOTES.

THE company owning the Jumbo mine, at Rossland, purchased last month an eight-drill compressor plant formerly in use at the Mascot mine.

Machinery for a 75-ton silver-lead concentrator has been ordered for the Alice Broughton mine near Creston.

The plant of the Nickel Plate mine, Hedley, is divided into three compartments, the amalgamating, the cyaniding and concentrating rooms, each operated independently of the other. The power used is water, taken from Twenty-Mile Creek. The overflow from this power is utilised to engender electricity, and the electricity, besides being used for lighting the mill, is held as a reserve power that may be used to run the mill in case of necessity. The tram from the mine to the mill was at first four miles long, but, because of the difficulty encountered in working it has been cut into two sections, which greatly facilitates the handling of the ore from mine to mill.

The Daly Reduction Company has practically completed the equipment of its immense plant and ore is already being brought from the Nickel Plate mine to the stamp mill at Hedley. The company has already spent, it is said, \$1,000,000 in equipment and mine development.

The sum of \$15,000 has been spent in remodelling the Sloan Star concentrator, which is now in running order. The mill is provided with four Frue vanners and four Wilfley tables. Four compartment jigs have also been provided to separate the zinc from the lead. The mine has large zinc reserves and considerable future profit is anticipated from this asset. Besides the ore in the mine there is 6,000 tons of zinc ore on the dumps. This will be run through the mill and the zinc separated from the lead and marketed separately. There is a great deal of silver-lead ore too. The force at the mine has been increased from 40 to 80 men.

At the Willecox mine at Ymir, a new aerial tramway is in the winter months. These contracts are now expiring,

being erected to carry the ore from the upper tunnel to the ore bins near the waggon road. Development is meanwhile being steadily carried on the big vein from which values of from \$10 to \$15 a ton are obtained.

The Crow's Nest Pass Coal Co., of Fernie, have decided upon installing a thoroughly up-to-date system of fire protection at their collieries at Morrissey, Fernie and Michel. A contract for the supplying of 6,000 feet of 2½ inch Red Cross and Gutta Percha brands of cotton rubber lined fire hose was awarded to the Gutta Percha and Rubber Manufacturing Co., of Toronto, through their British Columbia representative, Mr. A. G. McKenny.

Arrangements, it is said, have been practically concluded for the establishment of three additional large steel dredges on the Fraser river near Lilloet. A Chicago syndicate is also preparing to place a dredge on the river, and there is likely to be a regular "dredging excitement" this summer. It is stated that a company now operating succeeded in winning 160 oz. of gold in 24 hours run, but that of course was an exceptional achievement.

The Fraser River Gold Dredging Co.'s new dredge at Lytton has been completed, while the old dredge is in operation, producing, it is reported, \$400 a day.

It is proposed to increase the capacity of the Oyster-Criterion mill at Camborne by adding twenty stamps.

It is stated that the machinery for the zinc enriching plant to be erected at Rosebery has already been ordered, and that the erection of the buildings will be commenced early in July.

It is reported that machinery for a 25-ton experimental concentrating plant has been purchased in Spokane for the Velvet-Portland mines on Sophie mountain, near Rossland. Water concentration will be used on gold and copper ores. The company expects to install a small smelting plant this fall to reduce ores not amenable to water concentration.

In the Lardeau another stamp mill is to be shortly erected, the Elwood Tinworkers Company, which recently acquired several mine groups in this district, having decided to commence crushing on Silver Dollar ore this summer.

#### COAL EXPORTATION AND TRADE.

VANCOUVER Island coal trade conditions this year are decidedly bright and there is every promise of an exceptionally large output, this being due to an increased Alaskan demand and the expansion generally of Northern trade and travel.

Preparations are now being made for the survey and exploitation of the Imperial Coal & Coke Company's coal areas at Fording River, East Kootenay.

A very serious fire broke out on Sunday, May 29th, at No. 1 pithead of the Western Fuel Company's colliery, Nanaimo, causing a very heavy loss, estimated at not less than \$75,000. The engine room, in which were housed the costly hoisting engines, the recently installed washer and conveyors, and several buildings, including the blacksmith shop and lamp room were destroyed. The fire, it is thought, originated either behind the bunker or among the timbers of the pit-head, and was started probably by a spark from the yard locomotive. The ventilating fan was fortunately uninjured, and is again working, and a force of men is being employed clearing out the shaft. Meanwhile coal will be hoisted from Protection shaft. Instructions have been received from the San Francisco office to commence the reconstruction of the destroyed works.

Operations were to have been resumed at the Morrissey collieries on May 30th. The output of coal and coke will be hauled by the Great Northern as formerly, and the demand will be materially increased when the Columbia Falls "cut off," now nearing completion, is in operation. This new portion of line saves 93 miles to Eastern points, and also does away with the 2,000-foot climb over the Hoskell Pass. Recently the G.N.R. has been overstocked with fuel from contracts entered into previously with American companies. This condition was aggravated by the falling off of trade

the traffic is rapidly increasing, and the demand for Morrissey coal, which is admittedly superior to the American product, is expected to be steadily maintained henceforward.

#### RECENT PUBLICATIONS.

**A**SSAYING, by C. H. Aaron, author of "Testing and Working Silver Ores," "Leaching Gold and Silver Ores." Fifth edition. The Mining & Scientific Press, San Francisco, 1904.

We are glad to welcome the fifth edition of this excellent little text book, which in its present form displays careful revision and valuable additions. The work is divided into three parts, the first dealing with gold and silver ores; the second with gold and silver bullion and the third with lead, copper, tin, mercury and other metals. Under each heading the subject is most comprehensively treated, the directions given being also couched in remarkably clear and simple language.

Dictionary of Altitudes in the Dominion of Canada with a relief map of Canada, by James White, F.R.G.S. Geographer, King's Printer, Ottawa. The "Dictionary" is a supplementary to Mr. White's "Altitudes in Canada," and should have formed part of that work, but, its inclusion therewith would have considerably delayed the publication of Part 1, for which there was a considerable demand. Altitudes in Canada is particularly useful to civil engineers, while the present work has a more general utility. The arrangement is alphabetical by provinces and territories.

It affords us a great deal of pleasure to congratulate our British Columbian poet, Mr. Philipps-Wolley, on the circumstance that his Canadian publishers have found it necessary to issue another edition of the "Songs of an English Esau." Three editions of a volume of verse within one year is surely rather unusual, but very strong evidence that the work of the author of "The Kootenay Prospector" is held in high esteem in the land of his adoption.

#### MINING AND METALLURGICAL PATENTS.

**M**R. ROWLAND BRITAIN, patent attorney, of Vancouver, sends us the following report for May:

U. S. patent No. 759,670, reduction of copper ores, E. F. Clarke, New York, N.Y., May 10th, 1904.

Claim 1. A process for working the mixed ores of copper, consisting in first leaching the ore raw to extract the soluble contents, then concentrating the insoluble portion of the copper contents, and rendering this portion soluble by oxidizing it and then leaching the same, substantially as described.

2. The process of obtaining copper from its mixed ores, which consists in first leaching the pulverized ore with a solution of water, sulfuric acid and sulfate of iron to obtain the soluble contents, then separating the insoluble contents from the remaining mass, then oxidizing the said insoluble contents and finally leaching the same to obtain the values therein.

#### RECENT ISSUES AND NEW REGISTRATIONS.

**T**HE following companies have been registered during the month:

Consolidated Mining & Smelting Co., Ltd., capital, \$2,500,000; specially limited under section 56 of the Companies' Act, 1897.

Royal Smelting & Refining Co., Ltd.; capital, \$1,100,000; specially limited under section 56 of the Companies Act, 1897.

South-East Kootenay Coal & Coke Co., Ltd.; capital, \$100,000.

Atlin Dredging Co., Ltd.; capital, \$25,000.

Berry Creek Mining Co., Ltd.; capital, \$150,000.

Minnie Mining Co., Ltd.; capital, \$125,000.

Hawkeye Gold Dredging Co., Ltd.; capital, \$500,000.

#### MINING MEN AND MATTERS.

**M**R. ROBERT HAMILTON, of the Wm. Hamilton Manufacturing Co., who is largely interested in dredging on the Fraser River, informs us that there is now every reason to believe that the problem of successful enterprise in this direction has at length been solved, and that the Fraser may now be made to yield a large amount of gold by dredging methods. At Lillooet the gravel has been dredged to a depth of 46 feet, values being most evenly distributed to this depth, and the ground where the dredge is now working is said to average a dollar a yard. Recently 70 miles of the river from Lillooet has been staked and leases applied for.

Mr. Thomas G. Blackstock, vice-president of the War Eagle-Centre Star Companies, is again visiting the West.

Among the eminent coal experts who will testify in the C. N. P. C. Co. damage suits now being heard are: Messrs. N. Galloway, of Cardiff, Wales; J. T. Beard, of Scranton, Pa.; and James Ashworth and D. C. Ashworth, of Derby, Eng.

Mr. Chas. J. Andrew, for the past two years one of the furnace foremen at the B. C. Copper Company's smelter, Greenwood, will shortly proceed to Hadley, where he will be similarly employed at the Alaska Smelting & Refining Company's smelter under his old manager, Mr. Paul Johnson.

Dr. Alfred W. G. Wilson, assistant in the geological department at McGill University, who accompanied the members of the McGill Summer School of Mining on their recent visit to some of the interior mining districts of the Province, came on to the Coast and spent a day with the Provincial Mineralogist.

Mr. W. J. Sutton, F.G.S., has returned to Victoria from a trip to England.

Mr. Isaac B. Atkinson, M.E., of Victoria, visited the Cascade Copper Company's mine at Uchucklesit Harbour, Alberni Canal, last month.

Mr. C. W. Hurter, assayer at the Ladysmith smelter, was a visitor to Victoria last week to attend the annual meeting of the B. C. Assayers' Institute.

At the examination for certificates of competency and licence to practise assaying in British Columbia held in Nelson in the early part of last month the following were successful in passing: Messrs. B. N. Sharp, A. F. McCormick, J. MacFarlane, Frank Nicholls, Jas. Buchanan and C. T. Mitchell.

Mr. S. F. Parrish is stated to have resigned the general managership of the Le Roi Mining Company, Rossland.

Mr. J. L. Stanford, of the Northwest Coal & Coke Company, Nelson, has returned to that city from a visit to England and France in the interests of that company, which has arranged for British capital to develop its coal lands in Alberta.

Mr. F. Elwell, superintendent of the West Kootenay Power & Light Company's works at Bonnington Falls, has gone to Montreal on a business trip.

Mr. J. J. Campbell, manager of the Hall Mining & Smelting Company, Ltd., Nelson, went East about the middle of last month.

Mr. G. Attwood, consulting engineer for the Silver Cup Mines, Ltd., and the Great Western Mines, Ltd., both operating in the neighbourhood of Ferguson, Lardeau district, has returned from a visit to England.

Mr. E. W. Monk, of Nelson, agent for the Hamilton Powder Company in the Kootenay and Boundary districts, recently spent two or three weeks on the Coast visiting Vancouver, Victoria, Nanaimo and other points.

Mr. J. H. Brownlee has returned from San Francisco, to which city he went on business.

Mr. A. J. Beaudette, Dominion Government Mining Engineer in the Yukon Territory, arrived from the East last month and returned to his Northern post.

Mr. R. W. Brock, of the Canadian Geological Survey, who spent the field-work season of last year in the Upper

Lardeau, will probably resume his geological work in that district shortly.

Mr. H. B. Munroe, of Greenwood, having been appointed one of the Canadian Commissioners to the St. Louis Exposition, left the Boundary last month to assume his duties at St. Louis. Mr. Munroe has been many years in British Columbia and, prior to settling at Greenwood about eight years ago, did a lot of pioneering in different parts of the province, so is well qualified to speak of life in the British Northwest as it really is.

Mr. G. G. S. Lindsey, of Toronto, third vice-president and secretary of the Crow's Nest Pass Coal Company, Ltd., has lately been engaged at Nelson in connection with the defence in a number of actions for damages, suit having been brought by relatives of men who lost their lives in an explosion at one of the company's coal mines.

Mr. Paul S. Coudrey has retired from the managership of the Le Roi No. 2 mine, at Rosslund, and has been succeeded by Mr. Ernest Levy, who had been assistant manager for a few months. It is understood that Mr. Coudrey goes to Australia to take charge of important mining interests held there by English capitalists who are also interested in the Le Roi No. 2.

Capt. Mallett Richardson, secretary to the Minister of Mines, died at his residence, Victoria, on May 10, after a very brief illness.

Mr. D. R. Thomas has succeeded Mr. Frank J. Stevens as superintendent at the Le Roi No. 2 mine, Rosslund, the latter having accepted a similar appointment with the Guanajuata Consolidated Mining & Milling Co., Mexico.

Mr. Jas. A. Baker, the British Columbia member of the Executive Board of the Western Federation of Miners, left Socan for Denver, Colorado, early last month on business connected with that organization.

Mr. Jay P. Graves, general manager of the Granby Consolidated Mining, Smelting & Power Company, recently returned to Spokane from St. Paul, Minn.

Mr. J. A. Magee, managing director of the Spyglass Mining and Development Company, has returned from St. Paul and other Eastern points, where he has been in the interests of the company. It is understood that he has disposed of the bulk of the underwritten stock of the company.

Mr. R. G. Stanley Anthony has returned to Rosslund to assume a post in the cyanide department of the Rosslund Power Company's concentrator.

Mr. Alfred C. Garde, of the Payne mine near Sandon, resident manager of the Payne Consolidated Mining Company, went to Montreal, Quebec, last month to attend an adjourned general meeting of shareholders in the company.

#### TRADE NOTES, CATALOGUES AND CIRCULARS.

THE St. Louis *Republic* makes a lengthy reference to the electrical sign of the A. Leschen & Sons Rope Co., which attracts a great deal of attention. This company has just completed the erection of probably the largest and handsomest wire-rope factory in America on thirty-one acres of ground, which they purchased something over a year ago in the northwestern part of St. Louis. Their plant is equipped with the most modern machinery, and the ropes which they are manufacturing they are selling and shipping at the present time to all parts of the world. The rope is used in the elevators of the largest buildings in every city in the States and wherever anyone travels. It is also found in use in mines, in quarries, on derricks, in the logging camps throughout the country and on aerial wire-rope tramways, which the A. Leschen & Sons Rope Company are building in very large numbers.

The Canadian business of the Allis-Chalmers Company, which recently acquired the Bullock Electric Manufacturing Company, of Cincinnati, will hereafter be conducted by a new organization bearing the name Allis-Chalmers-Bullock, Ltd. The works and principal offices of this important new Canadian company are in Montreal.

Mr. H. V. Croll, who has been in charge of the Salt Lake City, Utah, office of the Allis-Chalmers Company, for sev-



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