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MINING RECORD

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E. JACOBS.....Manager and Editor

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NOTES AND COMMENTS.

Revised figures show British Columbia's mineral production in 1906 to have been nearly \$25,000,000.

The *Slocan Mining Review* intimates that the Whitewater mill may be at work again by the middle of May.

The concentrating mill at the Ruth mine, Sandon, is being prepared for operation during the ensuing summer.

An examination for assayers for licence to practise assaying in British Columbia will be held in Victoria on May 27 and following days.

"There is an increasing shortage of men at the mines," says the *Boundary Creek Times*. "The demand for more help is heard continually."

There has been a steady advance in the value of British Columbia's mineral production during the last five years. For 1902 the total was \$17,486,000; for 1906 it was nearly \$25,000,000.

All provincial annual free miners' certificates will expire on May 31. In order to retain rights in mineral claims not Crown-granted, certificates must be renewed on or before the date mentioned.

When in Nelson on April 23 the manager of the Ymir mine informed the *Daily News* that it is intended to resume work in mine as soon as certain plans, already ordered, shall have been prepared.

Those interested in mining and other developments on the larger islands of the Queen Charlotte group will be pleased at provision having been made for less infrequent mail communication in the future. Two services are being arranged for.

It is reported from Nelson that the La Plata mill, on Kokanee Creek, near Nelson, is treating about 500 tons of silver-lead ore daily and will be able to continue doing so until the season of low water again occurs. The mill machinery is driven by water power.

If all the coal bores now working are successful, Vancouver Island will soon be a beehive of coal mines, says the *Nanaimo Free Press*. Four bores are now in operation; the Dunsuir at Englishman's River, the Eastman at Nanoose, the Cedar district, and the bore at Courtenay.

According to the *Slocan Mining Review*, published at Sandon, "the long-headed ones say the present is not the time to sell zinc but to collect it. They believe that a few dollars extra spent in separating out the high-grade zinc during sorting will show a good profit before the year is out."

From the lately-published "Mineral Resources of the United States" it is learned that the exports of domestic quicksilver from San Francisco, California, to British Columbia during two successive years were as follows: In 1904, 205 flasks, valued at \$8,739; in 1905, 23 flasks, valued at \$870.

The work of sinking the main four-compartment shaft at the Le Roi mine, Roseland, below the 1,350-ft. level, commenced several months since, is progressing satisfactorily. A depth of 1,650 ft. was reached by the end of March, and the contractors were using all expedition in sinking to a deeper level.

On April 20 the *Grand Forks Gazette* mentioned that "the Granby smelter has been running seven furnaces during the past week or ten days and some phenomenal runs have been made." It also noted that during that week Boundary smelters by treating 33,516 tons of ore had beaten all their previous records.

The offices of the *Mining and Scientific Press* are now at 667 Howard Street, a few doors east of Third Street, and close to the financial district of San Francisco. We congratulate our esteemed contemporary in having at length become settled in permanent quarters after its year's temporary sojourn at Berkeley, rendered necessary by the destruction of its former abode at the time of the great disaster of April 18, 1906.

The *Canadian Mining Journal*, Toronto, Ontario, has published and distributed a 10x16 half-tone showing the officers and council of the Canadian Mining Institute for 1906-7, several of the members of which are prominently connected with the mining industry of British Columbia and others have also been in past years. The group is of general interest as being representative of the geologists, mineralogists and metallurgists of Canada.

With the favourable reports now coming from all parts of the Slocan as to the results of the winter's work in the mines and the cheerful prospects for the season, together with the announcement of the Government's decision to spend all available money on public works to assist the opening up and devel-

opment of the country, in the opinion of the *Nelson Canadian* there seems to be ample justification for the expectation formed of a genuine mining revival in Kootenay's silver district.

According to the *Ashcroft Journal*, the latest advices from the Tamarac mine in Highland Valley, where development operations are now being prosecuted, are that an ore body some 9 ft. in thickness has been uncovered. This ore will range from 12 per cent. copper upwards, it also carries small values in gold and silver.

An enlarged output of lead-silver ore at the Sullivan Group Company's mine is reported. One recent week's production was about 1,000 tons, which is stated to be an increase of 30 per cent. over the ordinary weekly output for some time past. The ore is all treated at the company's lead smelter at Marysville, a few miles from the mine.

The Dominion Copper Company is further increasing the equipment of its mines in Phoenix mine. At its smelting works at Boundary Falls the erection of the large blast furnace—the largest copper-smelting furnace in Canada—is well forward. The addition of this furnace increases the smelting capacity of these works to between 1,400 and 1,500 tons per day.

Preparations are being made for the ensuing season's placer gold mining on both Wild Horse and Perry Creeks, in Fort Steele mining division. On the former the Invicta, Nip and Tuck and Brown-Larsen properties, among others, will be worked. The heavy snowfall of the 1906-7 winter promises an abundant supply of water for gravel-washing purposes.

The *Nanaimo Herald* has stated that "a single order has been accepted by the Wellington Colliery Co. to furnish 20,000 tons of sack coal for Nome parties." Our information is that while no undertaking has been given that this stated quantity will be supplied, efforts will be made to supply as much as shall be practicable under the condition that an active demand from numerous other quarters has also to be met.

Ore shipped in quantity from the Richard III mine at Mt. Sicker, Vancouver Island, is returning a few cents less than \$14 per ton net, after deduction of transportation and smelting charges. More than 1,000 tons were shipped during April. Should nothing occur to prevent the directors expect that the Richard III Mining Co. will soon be in a good enough position financially to justify the payment of a dividend to shareholders.

Hon. H. W. Cushing, minister of public works for the province of Alberta, while at Fernie recently in connection with the settlement of the differences between the coal mine operators and miners, tele-

graphed Premier Rutherford, also of that province, as follows: "Position here serious. Have promised miners that our government will pass an eight-hour bank act next session of the legislature. Do you approve?" The Premier replied: "Your telegram received. I approve of your assurance to the miners."

At the Krao mine, Ainsworth, the shaft has been deepened to 200 ft. and sinking is being continued, the intention being to go down to the 300-ft. level. A station is being cut at the 200-ft. level. Further development work is to be done on the 100-ft. level, and drifting and cross-cutting at both 200 and 300 ft. depth will be undertaken as soon as practicable. Some 20 men are employed at the mine, the work in which is being done under the supervision of W. E. Zwick, manager of the Rambler-Cariboo mine in Slovan district.

The Queen Victoria, in the Nelson mining division, made its first shipments in March, in which month it sent about 100 tons of copper-silver ore of fairly good grade to the smelter at Trail. It was expected that the output for April would be about 1,000 tons. Production will be gradually increased in later months. The ore is being broken down from a big bluff of mineralized rock and is roughly sorted before shipment. N. J. Cavanaugh, formerly at the Slovan Star mine, is in charge of operations, in which 22 men are employed.

Several mines in the Nelson mining division give promise of making a better showing in 1907 as regards ore production than they did in 1906. These are the Silver King and Eureka, both situated within a few miles of the town of Nelson; the Queen Victoria, a copper property near Beasley Siding, about seven miles west of Nelson; the La Plata, formerly known as the Molly Gibson, on Kokanee Creek, east of Nelson; and the well-known Ymir gold mine, in the Ymir section of the division, now under new management, and provided with ample funds for further development.

Will someone please send a Canadian geography book to the office of the High Commissioner for Canada in London, England. Among other notices from that office published in a recent number of the *London Mining Journal* is the following: "Ores rivaling in character those of Cobalt are said to have been discovered at Larder Lake, British Columbia." Possibly the mistake was made at Ottawa, whence the cable was dispatched to London. In any case it is in Ontario the sensational discoveries of rich mineral are being made; British Columbia's turn may come later.

The Silver King mine, near Nelson, is to be worked by the Hall Mining and Smelting Co., Ltd., on its own account, the partnership arrangement between the company and M. S. Davys having been

cancelled. An understanding has been arrived at with the owners of the adjoining Dandy mineral claim permitting the driving of a tunnel from the Dandy into the Silver King mine to connect with the workings of the latter at a depth that will drain the mine down to the seventh level without incurring the constant expense of pumping. All ore of payable grade accessible above that level will thereafter be mined and shipped to the smelter.

In making up the form in this issue containing Mr. Cairnes' report on "Explorations in a Portion of the Yukon," (*vide* pp. 152-157) it was found necessary to cut out a few lines. From page 156, immediately preceding the sub-head "Watson and Wheaton River Properties," the following was excised: "Some native copper is found on the east side of Windy Arm, but the work done is insufficient to determine whether it exists in paying quantities. The ore values given in this report were obtained from a number of samples taken and also from a great number of assay returns kindly shown the writer by mine managers, mine superintendents, prospectors and others, during the season."

At the British Columbia Copper Company's smelter, Greenwood, the third large blast furnace has been completed. Although having a nominal capacity of 600 tons per day it has been found that the new furnaces will each treat about 700 tons in 24 hours, so that the capacity of the works is fully 2,000 tons of ore per day. At the company's various mines good progress continues to be made. Several levels down to the 400-ft. are being extended in the Mother Lode mine. At the Emma electricity is being supplied for power purposes, the transmission of 40,000 volts from Bonnington Falls generating station to the Boundary giving ample power for both mines and smelters of the district.

The higher postage rates lately determined upon necessitate the payment of two cents postage on every copy of the *MINING RECORD* going to the United States. Will our numerous subscribers in that country please bear in mind when remitting their subscriptions that a post office or express money order only costs three cents, while a cheque on a bank in the United States costs us 25 cents exchange. If we are called upon to pay 50 cents in exchange and postage we lose one-quarter of our subscription income. In common fairness, our subscribers should see to it that we do not have to pay an exchange charge in addition to a much higher postage rate than has heretofore been charged.

According to the *Boundary Creek Times* the British Columbia Copper Company, which owns the Mother Lode mine in Deadwood camp and three mines in Summit camp, both in the Boundary district, requires more men. It can find employment for 75 more at Deadwood and 25 at Summit camp. The management claims that in order to hold its men

it has been compelled to agree to permit them to work two Sundays out of each month. No one will be compelled to work, but those desiring to do so may work every other Sunday. The men claim that in other camps they may work, so if they may not do so in Boundary mines they will go elsewhere. Of course, remarks the *Times*, there are many others who feel the necessity of the Sunday's rest and will not work anywhere on that day.

In its Mining Market comments the London *Mining Journal* said, on April 13, "it is announced that the Alaska United, Alaska Treadwell and Alaska Mexican have closed down in consequence of a strike of the miners, but the news has not affected the price of shares." The following week it stated that "Americans generally show lower prices on the week. Alaska Mexicans fell to 21 $\frac{1}{8}$, Treadwells to 6 $\frac{1}{4}$, and Uniteds to 15 $\frac{3}{8}$ on the strike of labour reported last week, but have since recovered a portion of the loss." The closing prices on April 12 were: Mexicans, 25-16@27-16; Treadwells, 6 $\frac{5}{8}$ @6 $\frac{7}{8}$; Uniteds, 111-16@113-16. A cable dated April 17 advised that there was "part crew at all mines." Local newspaper dispatches intimate that the miners have returned to work without their demands having been acceded to.

The long tunnel in the Highlander mine, Ainsworth, is being extended, Geo. H. Barnhart, several years ago manager of the Ymir mine, having a contract for driving another 1,000 ft. Mr. Barnhart is also operating the Libby, Spokane and Glengarry properties, all in Ainsworth camp. Mining work in this camp will be much expedited and costs reduced should the owners of the Taylor hydraulic air compressor, installed in a neighbouring creek in 1900 by the Kootenay Air Supply Company, Ltd., again supply the mines with power. The first drill ever operated by compressed air under the Taylor patents was started in one of the Ainsworth camp mines in April, 1900. The revival of interest in local mines which has taken place during the last year will probably lead to this compressed-air supply system being utilized to a greater extent than in former years when previously in operation.

The provincial mineralogist lately received from Lillooet, on the Fraser River, two ounces of black sand concentrate containing platinum, which he forwarded to Philadelphia, Pennsylvania, U. S. A., where it was sold for \$49.60. No information was received as to the source of the sand from which the concentrate was obtained, but it was probably the Fraser. Heretofore no platinum has been reported as having been found in any other tributary of the Fraser than the Quesnel, which joins the larger stream near Barkerville, Cariboo, about 200 miles north of Lillooet. It is not known to occur about Barkerville, neither in the Fraser nor its tributaries north of Quesnel; neither has it been reported as having been discovered in streams in the Lillooet district

emptying into the Fraser. Failing any other explanation, it would appear that if found in the Fraser near Lillooet the platinum was carried down that river from Quesnel.

With the completion of the railway to Nicola many changes for the better have taken place, and although there is no boom nor excitement on, everything looks as if there will be a prosperous year for Nicola Valley, says the *Nicola Herald*. The coal mines are doing good and substantial work, and in a short time there will be other industries started up as a result of the working of the mines. At Coal Gully all the coal that can at present be produced is disposed of as fast as taken out, and as soon as conditions shall be sufficiently advanced the working force will be increased and several hundred tons of coal mined daily. At the Diamond Vale property a number of men have been engaged in installing machinery, erecting houses and sinking shafts to the coal seams. This company has favourable prospects of becoming a producer of coal in a few months' time. With the work above-mentioned going on, that part of the valley is quite busy, and good results are extended to other parts.

The Skylark Development Co., Ltd., of Phoenix, has made its final payment on account of the purchase of the Skylark mine, and the property has been duly conveyed to the company. On October 1, 1904, the Skylark and Denver mineral claims were taken under bond by a syndicate chiefly of practical mining men resident at Phoenix, distant two to three miles from the mine which about ten years ago shipped a quantity of high-grade ore but had not since been worked for some six years. Briefly stated, observed the *Phoenix Pioneer* in its last Holiday Annual, "the owners of the Skylark have, in about two years, developed the property to such advantage that the price of the bond, \$30,000, together with cost of operation, have been paid out of proceeds of ore mined and shipped from it." Values in Skylark ore are silver, gold, and a little lead, running as high as \$150 per ton in earload lots. The mine has been opened and developed by three levels down to 250-ft. depth.

The Government of British Columbia has decided not to give its assent to any prosecutions under the Lord's Day Observance Act, so the attorney-general stated in the Provincial Legislature just before it was prorogued on April 25. It is understood that the members of the executive council of the Province gave the matter their careful consideration and eventually came to the conclusion that conditions prevailing in British Columbia differ so much from those obtaining in eastern Canada that in their judgment it would be best to take advantage of the optional power the act gives provincial attorney generals to refuse assent to prosecutions under its other provisions. It will follow, therefore, that the interruption to carrying on the mining and smelting industries

of the Province as in the past will not take place, as prematurely suggested it would. Incidentally it may be mentioned that some of the larger mines have for several years been in the habit of suspending all mining work on Sundays.

Newspaper advices from Rossland sent out at the close of March were to the effect that the M. R. Galusha, manager of the Jumbo Gold Mining Co., Ltd., had raised a considerable sum of money and that as a result work would shortly be resumed on the Jumbo mine, situated near Rossland. The ore production of this mine according to published figures, has been as follows:

	Tons.
To end of 1903.....	4,395
In 1904	13,298
In 1905	11,188
In 1906	2,600
Total	31,481

Heretofore the development work necessary for a continuation of production has not been done. It is stated that it is intended to in future keep development well ahead of production so as to ensure uninterrupted operation of the mine.

The *Engineering and Mining Journal* of New York publishes the following concerning the Granby Consolidated Mining, Smelting and Power Co., which is operating in the Boundary district of British Columbia: "Hayden, Stone & Co. report that adverse weather conditions, together with a fuel shortage, proved a serious handicap to operations during the winter months, in consequence of which production suffered. Results for March, however, were probably the most satisfactory for those of any like period in the company's career. Net earnings were in excess of \$225,000, while the cost of production was approximately 7.64c per lb. copper. For the nine months ended March 31, the Granby has secured net earnings in excess of \$1,600,000. Under normal working conditions it is capable of supplying 25,000,000 lb. of copper per annum, at a cost of 8c. per pound. The company has a well-filled treasury, an excellent management, an extraordinary ore supply, and one of the best smelting plants in the country."

The hearing of the extra-lateral rights mining case of Star vs. White by the Full Court of British Columbia has been concluded and judgment has been reserved. This cause, in which defendant is being sued for a large sum of money as compensation for ore taken from the claim of plaintiff, has been before the courts for about six years. About two years ago the chief justice gave judgment in favour of the defendant, but last year plaintiff secured an order from the Full Court directing that certain additional work be done and W. E. Zwicky, manager of the Rambler-Cariboo mine, Slocan, was appointed by the court to supervise the doing of this work. Both sides called

experts to pronounce upon the result of this work—for the plaintiff, Frank J. Sizer of Helena, Montana, and S. S. Fowler of Nelson, British Columbia; for the defendant, Max Boehmer of Denver, Colorado, and W. J. Elmendorf of Spokane, Washington. The recent hearing occupied the attention of the Full Court about a fortnight. As the amount involved is \$500,000, the judgment of the Full Court is awaited with more than ordinary interest. The mines concerned are adjoining properties in the vicinity of Sandon, Slocan.

The *Mining and Scientific Press* of San Francisco published, on April 20, an "Earthquake Anniversary Number." Its initial editorial note said: "It is a year since the earthquake-fire. We celebrate the anniversary by publishing this special number, in which an account is given of the reconstruction of San Francisco, together with other matter appropriate to the occasion." The number is instructive, the more so since it is outspoken in regard to faults and failings as well as appreciative of the pluck and enterprise which have achieved the large measure of success already reached in restoring the "City of the Argonauts." One editorial article, headed "San Francisco," is frank to a degree; another, entitled "Looking Back," tells of the troubled conditions under which this influential and widely-read journal has been conducted throughout the year since the disaster. Three special articles, respectively "The San Francisco of Today," "A Year of Reconstruction," and "Reinforced Concrete Construction," in addition to being of general interest give information of practical value to builders and others connected with construction work. The number is distinctly a credit, even to a journal which maintains the high standard characteristic of the *Mining and Scientific Press*.

Speaking in reference to the situation generally at Rossland, Mr. A. J. McMillan, managing director of the Le Roi Mining Co., Ltd., a few days before the recent strike at the Crow's Nest Pass and other western collieries, said to a representative of the *Rossland Miner*: "In common with all the other mines in the country, we have had lots of trouble this winter as a result of coal and coke shortage, and inability of the railways to handle traffic. Several times it looked as though we would have had to close the mine, owing to the fact that the smelters could not handle the ore, but our policy throughout has been to keep the mine going and the men steadily employed. Owing to the fact that we had arranged to start our smelter at Northport, we were able to store a quantity of ore there, and so keep things moving steadily at the mine all winter. Most of the mines in this camp are low grade, and as the copper contents of the ore are low—gold being the chief factor—the rise in price of copper does not help us in Rossland as it does the mines in some other districts. It is only by exercising rigid economy that Rossland mines can be made to pay dividends, which

they have commenced to do. It is to be hoped that for some time to come there will be no further troubles, and should that prove to be the case, I shall look for much more prosperous times at Rossland."

We would respectfully suggest to the editor of the Dominion of Canada *Labour Gazette* that he cease publishing such mining news (?) as the following from the Nanaimo correspondent of that publication: "There was considerable activity among the quartz mines, but not much work started as yet, it being too early in the season." This is not the first time a statement of this kind has appeared in the *Labour Gazette*. Of course it carries its own contradiction, for "considerable activity" is not usually the result where "not much work" is being done. As a matter of fact there are no producing lode mines, neither "quartz" nor any other metalliferous mines, in what is usually regarded as "Nanaimo and district," though there may be a few small "prospects" not considerably developed and which have not yet reached the ore-producing stage. There are several producing mines on Texada Island, which happens to be in what is officially known as Nanaimo mining division, as is also country up to 200 miles north of Nanaimo. The mines at Mt. Sicker, about 25 miles south of Nanaimo, are in Victoria mining division, and the Victoria correspondent of the *Gazette* makes reference to one of these, but strangely omits mention of the Tyce, the largest working mine on Vancouver Island and which has done more development work and produced more ore than all the others combined. If the *Labour Gazette* will require its correspondents to be definite in their mining news it will probably get some facts. Vague generalities, such as that here taken exception to, are worse than useless since they suggest the existence of an industry which is not a reality.

Mr. A. C. Flummerfelt of Victoria has offered prizes to the value of \$50 each for the most complete answers to a series of questions he has outlined in a communication published in the provincial press, no one person to reply to more than one question. The several subjects are, respectively, mining and smelting, timber, fisheries, agriculture, manufacturing, finance, and labour and capital. On the subject of mining and smelting the requirement is stated as follows: "Give a description by districts—of the various coal and mineral areas; an account of the work now proceeding; detailed production for 1906; value of same; average number of hands engaged; practical suggestions for the developing and increasing this most important industry." The greater part of the information thus asked for will be contained in the "Annual Report of the Minister of Mines" for 1906, now being printed. It may be that there will be found those sufficiently in accord with Mr. Flummerfelt's published ideas of what will be in the public interest to devote to it for the love of doing so the time necessary to meet this large requirement. Whether or not anyone well qualified to make the

practical suggestions asked for will do so, remains to be seen. We shall be glad to find that Mr. Flummerfelt's laudable desires meet with a ready response, but are not sanguine in regard to the last-mentioned part of this particular subject. Mr. Flummerfelt has already altered one condition we thought might prevent the mining and smelting subject being adequately dealt with, viz., that no paper should exceed more than 3,000 words. We now suggest that it will be well to soon announce the names of the gentlemen who are "to determine the winners and award the prizes."

On one page of a recent issue of the *Mining Reporter* of Denver, Colorado, U. S. A., there is an editorial protest against "the extravagances and absurdities of many of the mining items appearing from time to time in the mining camp press." Strange to say, that is just the complaint we have to make against the *Mining Reporter*, which seemingly "cribs" news about British Columbia and, not having any intelligent knowledge of local conditions and geography, misrepresents things. For instance, on another page of the same number as that above alluded to the following item of news (?) is given: "Operations on the coast are considerably interfered with at present on account of a coal shortage, occasioned by labour troubles at the Crow's Nest coal fields." The source of the coal and coke supply for coast industries is Vancouver Island, where there are several collieries within a few miles of the sea. Freight charges for the long railway haul from the Crow's Nest collieries being prohibitory, no fuel for the coast is obtained therefrom, unless under very exceptional conditions. Under the sub-head "Slocan District," this veracious journal says: "The shipments from the camp for the week ending April 13 were 4,204 tons, making a total for the year of 33,364 tons." According to the *Nelson Daily News*, which publishes a weekly statement of ore shipments, there were in that week only 64 tons of Slocan ore shipped, while the greater part of the total tonnage given as that of the year to date was from mines not in the Slocan district, though in Kootenay. Again, on still another page, the *Mining Reporter* says: "The Alaska Southern Railway Company has been incorporated to build and operate a railroad for Skagway, Alaska, to Port Simpson, British Columbia." About 400 miles of deep sea water along channels protected from the open ocean by the Alexander Archipelago, connect these two places. The shore line is extremely rough, broken by fiords and other inlets backed by mountains. The suggestion that a railway will be built to connect these places is, to use some of the *Mining Reporter's* own words, "so palpably ridiculous and unreasonable as to make superfluous on our part any comment thereon." We venture the hint, however, that some people might with advantage renew their acquaintance with two verses in the "Good Book" concerning the mote in thy brother's eye and the beam in thine own.

MCGILL SUMMER MINING SCHOOL.

THE MEMBERS of McGill Summer Mining School will pay a brief visit to the cities of Vancouver and Victoria before returning East after having spent the time allotted for study at mines and smelting works in the West. The following information concerning their movements has been obtained from an authoritative source by the *MINING RECORD*:

The members of McGill Summer Mining School, with Dr. J. Bonsall Porter, professor of mining at the university, in charge, are now in the interior. The itinerary of the party part of which has been carried out, is as follows:

Ontario—Cobalt, (silver-nickel-cobalt mines), two days.

Alberta—Lethbridge, one day; Frank, two days; Coleman, one day, (coal mines).

British Columbia—Moyie (lead-silver mine and concentrating mill), one day; Nelson (lead-silver smelter), one day; Poorman mine and mill (gold), and Bonnington Falls (hydro-electrical power generator), one day; Rosslund (gold-copper mines), nine days; Trail (copper and lead smelter, lead and silver refinery), one day; Boundary (copper mines and smelters), three days.

The party is travelling in a special car which, under contract, is to be "back by June 1st," consequently there will be little time available for visiting the coast cities. According to present programme, stated in a letter received by Mr. W. F. Robertson, provincial mineralogist, from Dr. Porter, the party will leave the upper country on May 22nd, reach Vancouver and Victoria on the 24th, and leave the latter city on the return trip on the night of the 25th, unless, as is possible, arrangements shall be made to stop over until 27th.

GOOD FEELING AT ROSSLAND BETWEEN MINE MANAGERS AND MINERS.

Miners' Union Appreciate Advance in Men's Wages.

AN ADVANCE IN WAGES of 25 cents per day has been granted to shovellers, carmen, ore sorters, and surfacemen employed at Rosslund mines, as from May 1. This brings the wages of men so engaged up to \$3 per day, instead of \$2.75, the latter being the rate heretofore paid in Rosslund camp. Men similarly employed in Boundary district mines have long been paid at the rate of \$3 per day. The companies that have agreed to this advance are the Consolidated Mining and Smelting Company of Canada, owning the Centre Star-War Eagle group of mines; the Le Roi Mining Company, owning the Le Roi and Black Bear and operating under bond the Spitzee mine; the Le Roi No. 2, Ltd., owning the Lasic and No. 1 mines; and the White Bear Mining Company, owning the White Bear mine. The letter of April 16 from the mine managers to the executive of the Rosslund Miners' Union acceding to the request

for the advance above-mentioned, also intimated that no other increases would be made. It stated that: "In view of the fact that the ores of Rosslund camp are low grade, containing low copper values, and, therefore, affected only to a small extent by the increased price of that metal, making it difficult to carry on operations at a profit, it would be distinctly understood that in thus meeting the views of the men employed by them the signing companies had done the utmost possible, and that further requests for increased pay cannot be considered."

REPLY OF MINERS' UNION.

From the *Rosslund Miner* it is learned that the reply sent to the mine managers by the executive of the Miners' Union shows that the best of feeling prevails between the mine managers and the men who are employed in and about the mines. It reads as follows:

To the Managers of the Different Mining Companies Operating Mines in and About the City of Rosslund—A. G. Larson, R. H. Stewart, Paul S. Coul-drey and J. F. DeMuth:

Gentlemen:—Your communication of April 16, addressed to the Executive Board of Rosslund Miners' Union, re increase of wages to shovellers, carmen, ore sorters and laborers, was read at our regular meeting last evening, April 17, before a large attendance, and was most heartily applauded by all present.

In reply will say that not only is the attitude of the present managements heartily appreciated by those of the employees who have been affected within the last year by raise of wages and shorter hours, but also that you are held in the highest esteem by the entire body of men working in the camp.

And further, that it is not the intention of the Rosslund Miners' Union to try to impose upon men who have shown such a friendly and fair spirit in dealing with the union and its members; but, on the contrary, will endeavour to at all times prove that we are conscious of the fact that all things have a limit, and that we realize that the members of a labour organization must use their best judgment in the transaction of their business the same as do the managements of the mines.

Thanking you for your prompt attention and fair consideration in all matters pertaining to the welfare of your employees, both the present and in the past, we have the honour of remaining,

Respectfully yours,

The Executive Board of Rosslund Miners' Union, No. 38, W. F. M.

Signed on behalf of the Executive Board,

James Ansen.

In eight years, 1899-1906, British Columbia has produced copper to the value of between \$34,000,000 and \$35,000,000. Production of this metal was commenced in 1894, in which year only about \$16,000 worth was obtained. In five years, 1894-1898, a total production of \$1,396,000 was made; since then the output has been largely increased.

BOUNTIES ON IRON AND STEEL.

IRON BOUNTIES will be paid over an extended period by the Dominion Government. Early in April Hon. W. S. Fielding, minister of finance, submitted to the House of Commons the following resolution, which was adopted. It will be observed that the payment of bounties to iron and steel smelted by electricity is also authorized. The resolution reads:

Resolved.— 1. That it is expedient to repeal chapter 8 of the statutes of 1899, chapter 68 of the statutes of 1903, and chapter 39 of the statutes of 1904, from and after January 1, 1907.

2. That it is expedient to provide that the Governor in Council may authorize the payment out of the Consolidated Revenue Fund of the following bounties on the under-mentioned articles manufactured in Canada for consumption therein, viz.:

(a) In respect of pig iron manufactured from ore, on the proportion from Canadian ore produced during the calendar years,—

1907.....	\$2 10 per ton;
1908.....	2 10 per ton;
1909.....	1 70 per ton; and
1910.....	0 90 per ton.

(b) In respect of pig iron manufactured from ore, on the proportion from foreign ore produced during the calendar years,—

1907.....	\$1 10 per ton;
1908.....	1 10 per ton;
1909.....	0 70 per ton; and
1910.....	0 40 per ton.

(c) On puddled iron bars manufactured from pig iron made in Canada during the calendar years,—

1907.....	\$1 65 per ton;
1908.....	1 65 per ton;
1909.....	1 05 per ton; and
1910.....	0 60 per ton;

(d) In respect of rolled, round wire rods not over three-eighths of an inch in diameter, manufactured in Canada from steel produced in Canada from ingredients of which not less than fifty per cent. of the weight thereof consists of pig iron made in Canada, when sold to wire manufacturers for use or when used in making wire in their own factories in Canada, on such wire rods, made after December 31, 1906, \$6 per ton;

(e) In respect of steel ingots manufactured from ingredients of which not less than fifty per cent of the weight thereof consists of pig iron made in Canada, on such ingots made during the calendar years,—

1907.....	\$1 65 per ton;
1908.....	1 65 per ton;
1909.....	1 05 per ton; and
1910.....	0 60 per ton.

3. That it is expedient to provide that no bounty shall be paid under the foregoing provisions in respect of iron or steel made in Canada by the electric process after December 31, 1908.

4. That with a view to the encouragement of the smelting of Canadian iron ore by electricity it is expedient to provide that the Governor in Council may authorize the payment out of the Consolidated Revenue Fund of the following bounties on pig iron and steel ingots manufactured in Canada, for consumption therein, when such pig iron and steel is the product of Canadian iron ores smelted in Canada by electricity, viz.:

(f) On pig iron manufactured from Canadian ore by the process of electricity smelting during the calendar years,—

1909.....	\$2 10 per ton;
1910.....	2 10 per ton;
1911.....	1 70 per ton; and
1912.....	0 90 per ton.

(g) On steel ingots manufactured by electric process direct from Canadian ore, and on steel ingots manufactured by electric process from pig iron smelted in Canada by electricity from Canadian ore during the calendar years,—

1909.....	\$1 65 per ton;
1910.....	1 65 per ton;
1911.....	1 05 per ton; and
1912.....	0 60 per ton.

5. That it is expedient to provide that bounty shall not be paid on steel ingots from which steel blooms and billets for exportation from Canada are manufactured.

6. That it is expedient to provide that the Governor in Council may make regulations to carry out the intentions of these resolutions.

7. That it is expedient to provide that the Minister of Trade and Commerce shall be charged with the administration of the foregoing provisions.

From a report of the Canadian commercial agent in London, England, lately published by the Dominion Department of Trade and Commerce, the following excerpt has been taken: "Minerals.—The fine display of the mineral resources of Canada made at international and other exhibitions where Canada has been represented have attracted a good deal of notice. We receive a number of inquiries from firms seeking supplies of particular minerals and metals which are known to exist in Canada. With the more universal appreciation of the great mineral wealth of the Dominion there is, however, an exaggerated idea as to the extent to which development has already taken place. We find many cases in which inquirers are disappointed to learn that deposits which they thought to be already worked and producing are practically untouched. In several instances where Canadians have applied to us to place them in touch with firms in this country buying particular kinds of minerals, it has subsequently turned out that they merely sought purchasers for undeveloped properties and not for the product of their mines. There is a very limited market in the United Kingdom for undeveloped mineral properties, but on the other hand, a very large trade in minerals of almost all kinds."

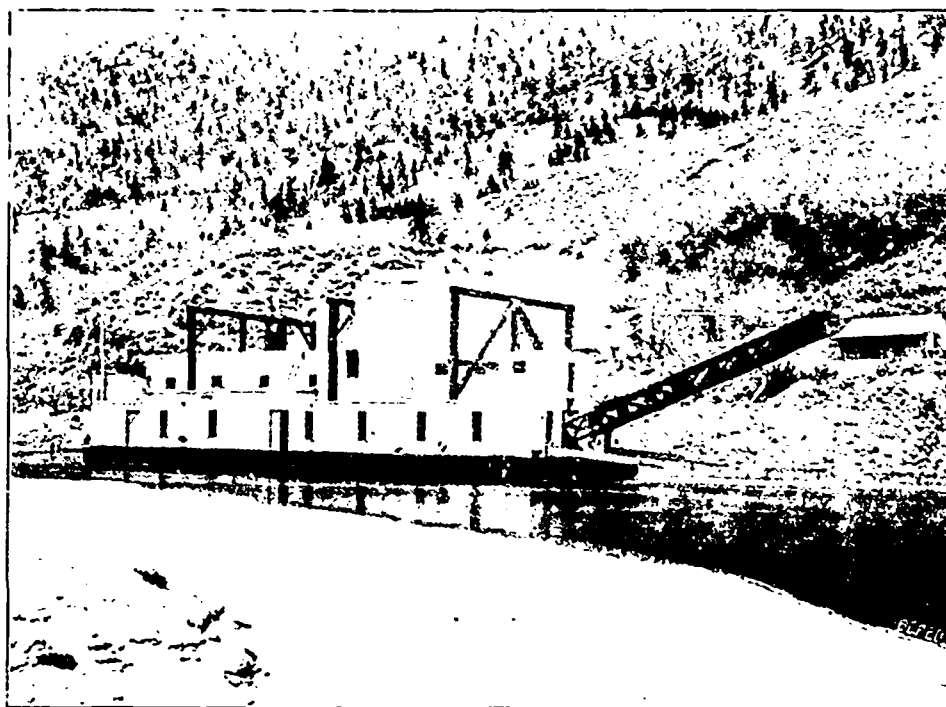
THE FRASER AS A DREDGING FIELD.

By H. G. Springer.*

THE FRASER, as most people are aware, is one of the largest rivers in British Columbia, some 800 miles in length, flowing into the Straits of Georgia a few miles below New Westminster. The Fraser came into prominence in the early sixties, at the time of one of the great gold rushes all along its banks and in the Cariboo country. This gold rush was the commencement of a new era for British Columbia, a country which was then chiefly inhabited by Indians, or Siwashas, as they are usually termed in that part. The influx of the white man, which brought civilisation to the natives, proclaimed

When the gold rush was over and the surface of the river beaches had been worked out, many of the old-timers cleared land with the aid of their "hard-earned" mining gains, and have now flourishing ranches, and in the finest climate in the world; whilst others are panning out their last days in that grand institution, the Old Men's Home.

To revert to the Fraser and its gold resources—it is somewhat of an open question as to the origin of the gold deposit, although it was probably planted in the glacier period. At all events, it was deposited in the bygone days, and but little, except the very fine gold is now in motion. Each river curiously possesses its characteristic gold. That of the Thompson, chief tributary of the Fraser, is nuggety; that of Bridge River, another tributary, is heavy, and more



Iowa-Lillooet Gold Mining Company's Dredge at Lillooet
Hull of Douglas Fir; dimensions 100x34 ft.

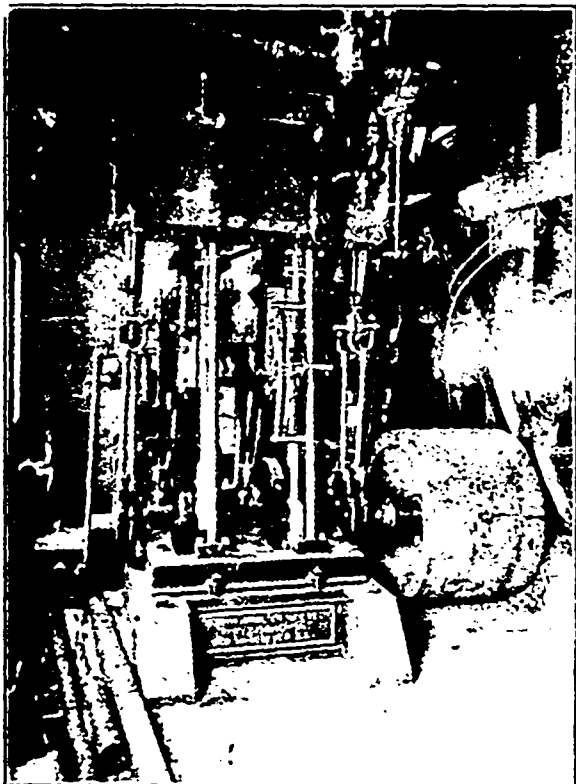
also their ultimate extermination; and it is probable that the red man of British Columbia who, fifty years ago, was a fine specimen of humanity, will in another decade become a race of the past. The white men who first "hit the trail" up the Fraser in the early sixties were, without exception, the finest body of men who ever left home in search of gold. At that time the country was practically inaccessible by any other route than from the Pacific Ocean, and the terrible hardships which these pioneers had to endure can only be realized by those acquainted with the country. Those days are now over, and the country has been opened up by the Canadian Pacific Railway, enabling it to be reached in 15 days from England, as against some six months in the early times.

in the form of slags; whilst the Fraser's gold is fine and flakey—few nuggets—and is, in consequence easily saved when dredging. The ordinary methods being adopted to save the gold are by tables covered with cocoanut matting and expanded metal and mercury, which latter is not always necessary.

The general conditions of the Fraser, and difficulties which have to be contended with are as follows: The river possesses an abnormal rise and fall, which is influenced by the snowfall in winter and the heat in summer. The rise and fall, generally speaking, is from 25 to 50 ft.; as a rule high water occurs in June and low water in March. The river seldom remains at one level for any lengthy period, and is continually rising and falling a few inches at a time, except after winter, when the breaking away of ice jams often creates a big and sudden rise of several

*In *The Mining Journal*, London, England, March 16th, 1907.

feet. The current is usually very swift, and at high water often runs up to 15 knots an hour; but it slackens off considerably at low water. The river, in consequence of its varying currents, back eddies, bad "rips," and sunken rocks, is practically unnavigable for steamers, except below Yale, which is about 100

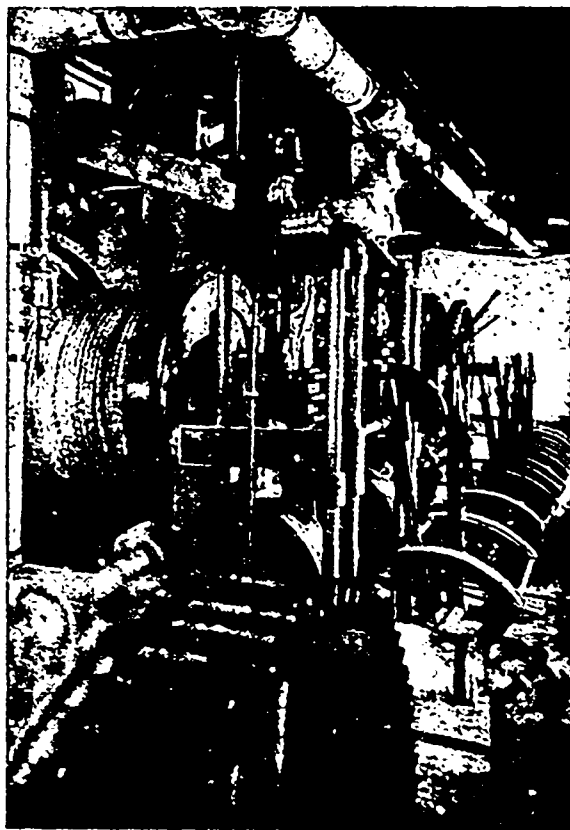


Dredge at Lillooet—Main Power Engine.

miles from the mouth. At very high water there is often considerable drift wood, rendering the crossing of boats dangerous. In the winter months there is periodically a considerable amount of heavy ice travelling, also "mush" ice, which is like rice in size, and apparently rises from the bottom of the river, and is, consequently, very difficult to guard against. This latter is a great drawback when dredging in mid-stream; it blocks the pipes and stops the pumps. The river does not naturally freeze solid from bank to bank, but in severe weather the ice sometimes jams in the narrow canyons, which arrests the travelling ice; the river becomes, in consequence, *en bloc* for several miles; one must then be on the alert for the breakaway. These are the principal dangers to contend with in dredging. The running of lines is always, of course, a source of danger in swift-running rivers, and the temperature of the water, even in summer, is not conducive to swimming.

The bars or beaches of the Fraser are all gold-bearing, and some of them are unusually large. These bars were nearly all surface worked from high to low-water level in the early days, and since re-worked by Chinamen by means of the "rocker" or "cradle," or by sluicing. It is no uncommon sight even now to see Indian women panning off gold at any time of the

year, and some good results have been obtained by these methods. The banks of the river are for the most part heavily timbered, and studded here and there with rock, which often juts right out into mid-stream. There is little or no silt in the river. The bed is paved with boulders of all sizes, and so tightly have they been packed by nature that it is very difficult to open up the ground, and nothing but the strongest machinery can be used. When the surface is broken through there is less strain, and fine gravel occasionally interspersed with boulders is struck; the best pay dirt is usually reddish or milk white in colour. Although rim rock has often been touched at the sides, I doubt if real bed rock has ever been actually struck, although dredges have worked to a depth of 40 ft. below water level. The bed of the river is at an extraordinary depth below the water level in most places, and is, in consequence, unworkable; and for this reason alone dredging operations will be confined generally to the bars or beaches; and as these mostly extend to high-water level, a dredge is sheltered from the running ice and timber, and can, in consequence, often work nearly all the year. These,



Dredge at Lillooet—Line or Warping Engine.

then, are the chief characteristics and conditions of the river.

As yet very little is known as to the Fraser's dredging qualities, as the industry has not yet begun to boom; but it will do. The want of knowledge of these conditions and the unsuitable dredges have so far kept this enterprising industry and cheapest form of

mining in the background. The chief reason why dredging has not as yet come to the fore is because the parties responsible for putting on dredgers have preferred to experiment with inferior or unsuitable machinery instead of treading on the mistake made by other people in other countries where very similar



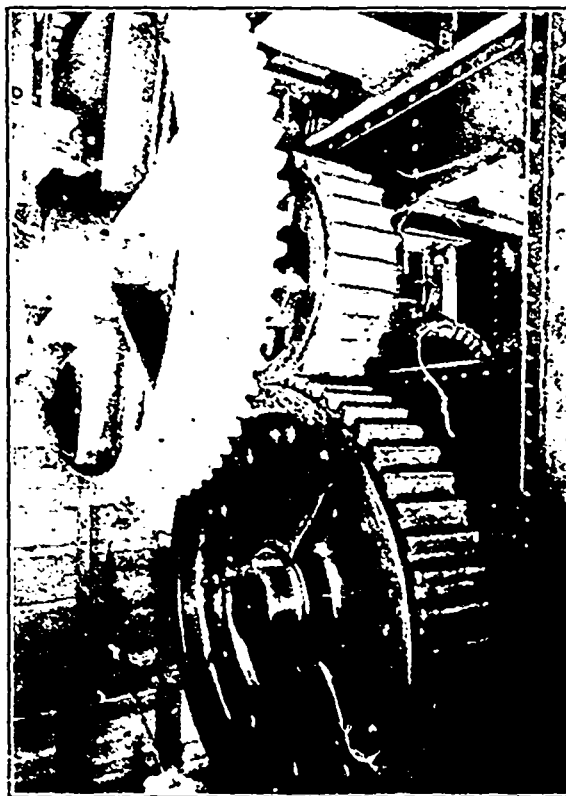
Dredge at Lillooet—72-ft. Steel Bucket Ladder. Buckets and Engines.

dredging conditions exist, and where the industry has reached a high measure of success. I refer especially, of course, to New Zealand, where dredging has been in vogue some 40 years. If the methods adopted in New Zealand had been carefully followed in the first instance, few mistakes could have been made, less money would have been thrown away, and success attained long ere this. In some cases New Zealand crews have actually been imported, but the experience and ability of these skilled practical men has been ignored in designing further dredges. But the time has now arrived when the responsible parties are beginning to see the error of their ways, and to recognize that success depends in taking these men into their confidence.

The "dipper," "clamshell," and suction dredge were all tried without success before the bucket dredge was introduced. The first bucket dredge (by Simons) was put in at Lytton, by the Cobeldick Dredge Co., in 1898. This was in many respects a good dredge, and has merited a far better fate than it has yet met with. The buckets had a capacity of 5 cu. ft., and the machinery was good and strong throughout; the winch, in particular, was ideal, and

suitable in every respect to the Fraser. The fault in this dredge was the design. It was not designed for bar working, in that it possessed neither a tailings stacker nor projecting ladder; but these were faults that might easily have been remedied. Although this dredge has been out of commission since 1904, it is still in existence, and may yet do good work.

The second dredge put on at Lytton, by the Fraser River Gold Dredging Co., in 1903, was far inferior to the Cobeldick dredge; and, although possessing a stacker and projecting ladder, the dredge was a lamentable failure on account of her lack of free-board, which made her dangerous to navigate, her want of strength, and bad design; the engines and boiler were the only redeeming features of this dredge. Although not suitable for the Fraser, she might be useful as a paddock dredge when reconstructed. She was wisely put out of commission in 1906. In 1903, also, another dredge was put on at Lillooet by the Iowa & Lillooet Dredge Co.; this dredge was a great improvement on all previous ones, although many of its parts were unsuitable, and needed reconstruction before getting into good dredging order. This dredge has now turned over a con-



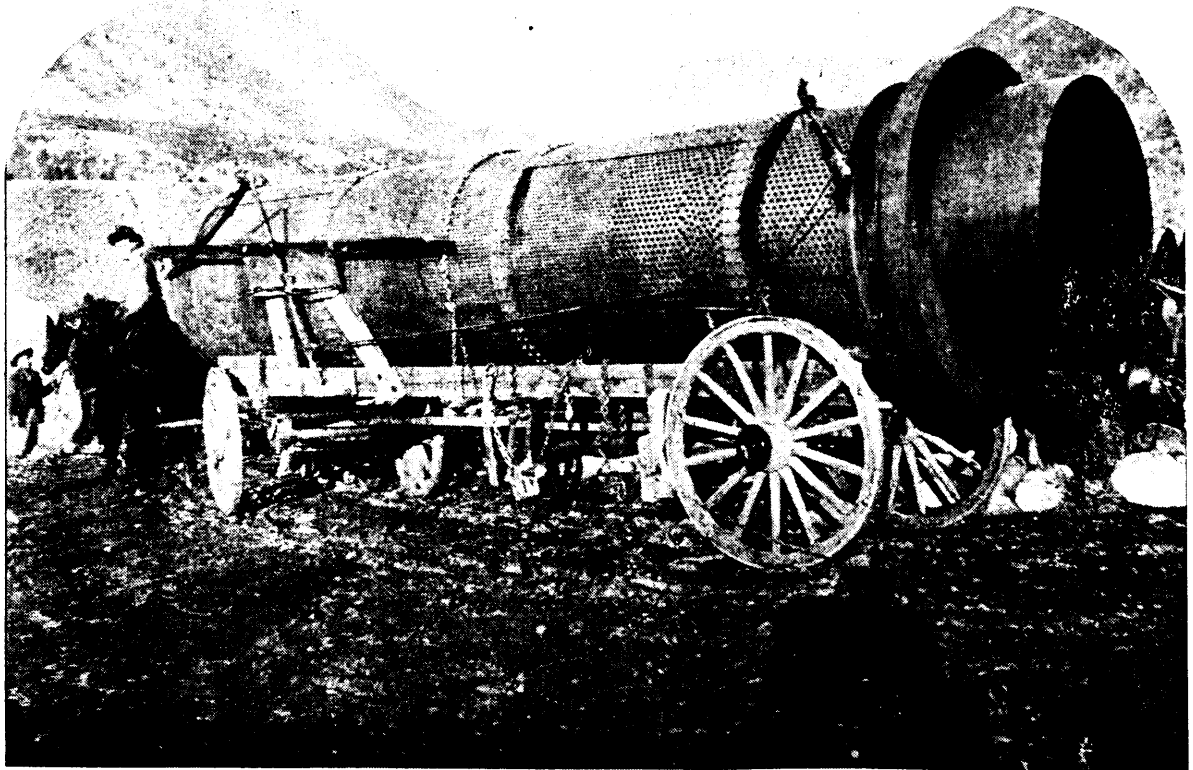
Dredge at Lillooet—Gearing for Operating Buckets.

siderable amount of ground with good results, although the company is now in a bad fix on account of internal trouble and extravagant management.

Another dredge has recently been put on at Yale by a party of New Zealanders, who brought their dredge over from New Zealand. This is the best dredge that has as yet been put on, although perhaps

not quite up to date, and is a typical New Zealand dredge. The buckets have a capacity of 5 cu. ft.; the stacker has so far not been placed into position. There is yet another dredge to be put on at Big Bar, above Lillooet. This new company is being run on sound business lines. The ground is, first of all, being properly prospected by means of a drill. New Zealand plans are to be adopted for the dredge design, and revised to suit the working conditions of the Fraser, by New Zealanders who were originally brought over by the Fraser River Gold Dredging Co., and who, besides their New Zealand experience, have

ing; and if a 7-ft. bucket would save any, the extra running cost would be immaterial. A good dredge should run at least 120 hours a week (six days). A 7-ft. bucket dredge should have a capacity of not less than 4,000 yds. a day (24 hours), which would mean in a week of 120 hours about 20,000 yds.; but as it is probable the buckets would only average half this capacity, this would mean 10,000 yds. a week, or, in a year of 40 weeks, 400,000 yds. General running expenses, including labour, fuel, supplies, etc., should not exceed £80 a week; this would mean in a year of 40 weeks an expenditure of £3,200. To this sum



Dredge at Lillooet—Revolving Screen of Perforated Steel Plate; Length 24 ft., Diameter 5 ft.

now worked several years on the Fraser. I confidently expect great things of this company.

The main key to bring the dredging industry on the Fraser River to a success is a suitable dredge, of which the principal features must be strength and simplicity, coupled with economical management. If these lines are followed, there is no reason why dredging should not boom in a few years. Overcapitalization must be guarded against; it is unnecessary, and is apt to encourage extravagance. Twenty thousand pounds (\$100,000) capital for one dredge should be ample. A really first-class and up-to-date dredge would cost from £10,000 to £15,000, ready to run on the river. So far, 5-ft. buckets are the biggest that have been employed; but it is probable that 7-ft. buckets would handle the heavy boulders better; more material would be treated, and less time lost. Much of time has been lost in shifting from the buckets large boulders which could not be passed through the screen. Time, of course, is everything in dredg-

ing; and if a 7-ft. bucket would save any, the extra running cost would be immaterial. A good dredge should run at least 120 hours a week (six days). A 7-ft. bucket dredge should have a capacity of not less than 4,000 yds. a day (24 hours), which would mean in a week of 120 hours about 20,000 yds.; but as it is probable the buckets would only average half this capacity, this would mean 10,000 yds. a week, or, in a year of 40 weeks, 400,000 yds. General running expenses, including labour, fuel, supplies, etc., should not exceed £80 a week; this would mean in a year of 40 weeks an expenditure of £3,200. To this sum

must be added rents, taxes, etc.; also allowance must be made for overhauling and renewing at the end of the dredging year; but the whole year's expenditure should not exceed 2½d. (five cents) a yard. Now, as to the value of the ground. As mentioned previously, I think that future operations will be concentrated entirely on the bars or beaches on account of the bed of the river being at too great a depth to allow it to be successfully treated. Very little is as yet known as to the general wealth of the river and its possibilities as a dredging field, as, except by dredging in recent years, only the surface has been worked, which has yielded an enormous amount of gold. The prospecting operations by dredging in recent years have yielded good results, and have averaged as much as 1s. (25 cents) a yard, some of the ground yielding as much as 6s. a yard, but this was only in patches. The general average may be taken at about 10d. (20 cents) a yard, which is a highly satisfactory dredging proposition; and, with a dredge

treating 400,000 yds. a year, would mean a return of more than £16,000. In taking up fresh ground, its value should first be ascertained by means of a drill before putting on a dredge. The risk in this case will be small; and if it pans out anything like the same value as mentioned above, success is assured, if the enterprise is carried out on the lines above indicated.

IMPROVEMENTS IN GOLD DREDGES.

Official Notes on Progress in New Zealand.

DREDGING FOR GOLD has long been more extensively carried on in New Zealand than in any other country in the world. A departmental return for 1905 shows that there were in that year 185 dredges employed in alluvial (placer) mining in that colony. The following excerpts from the annual report of Inspecting Engineer John Hayes, F. S. Sc., to the minister of mines for New Zealand, will probably be read with interest by many to whom the practical experience of others connected with the mining for gold by means of dredges may prove of some value. As the report for 1906 has not yet been published, the most recent information available is that contained in the report for 1905, received a few weeks ago. In this Mr. Hayes says, in part:

Since my last report there have not been any developments of note nor any alterations in working conditions which call for special comment with the exception of a new method of conveying power to



Dredge Working on Fraser River Bar near Lillooet.

dredges worked by water pressure, a description of which is given below.

As regards improvements in the construction, etc., of dredges, it may be remarked that the use of bulkheads in the pontoons for the purpose of dividing them into watertight compartments is becoming more general, and will tend to reduce the liability to sink in event of accident to the hull. Of late, experiments and additions have been made on some dredges with

the object of increasing the efficiency of the gold-saving arrangements.

It is worthy of mention that the planting of forest trees on dredged ground gives every appearance of proving a successful experiment, and also that so far as one is able to judge at present the dredging of the



Fraser River, Showing Gravel Bar in Distance.

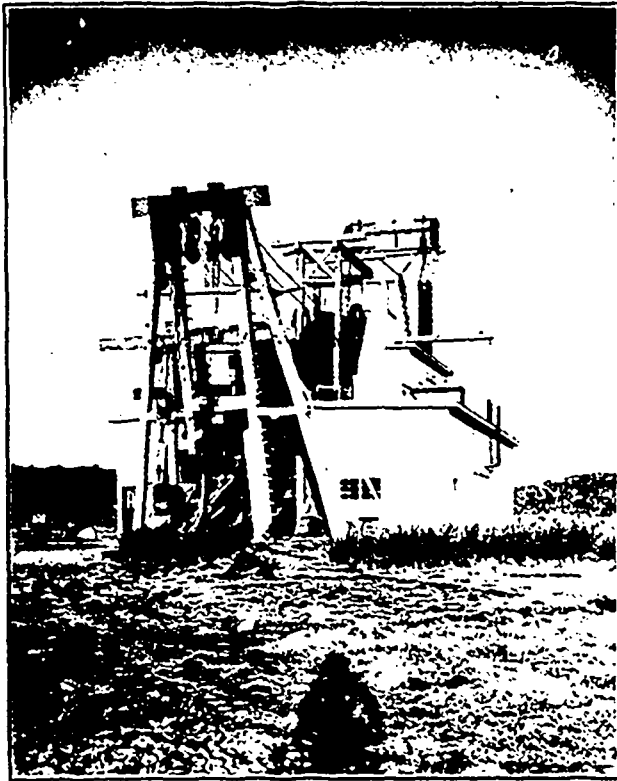
flats will not be nearly so detrimental from an agricultural or pastoral standpoint as many people imagine, but rather the reverse will hold good in some cases.

It may be interesting to note that as the result of the successful application of dredges for alluvial gold mining in New Zealand in the first instance, and more recently in several other countries, the method is to be adopted in Tasmania for the recovery of stream tin from alluvial deposits. The work of designing a number of large and powerful dredges for the purpose is in progress.

DREDGING BY WATER POWER.

During the past few years dredging for gold has been satisfactorily carried on in Otago with dredges run by water instead of steam. Where water is available at a sufficient elevation to provide motive power for a dredge, ground that would not pay expenses if the dredge were driven by steam can be made to pay well. Increased attention is now being given to water-power dredges, owing to the fact that a new and simple method of conveying the water on to the dredge has been adopted within the past six months, which method has given every satisfaction. A number of proprietaries whose properties are so situated as to enable water to be brought on to the ground to be worked are now moving in the direction of adapting their dredges to work by water power and towards discarding the steam plants which necessitate such a

large expenditure for coal and upkeep. The new method of conveying the power to the dredge was designed and adopted on the Argyle Dredge, Waikaia,



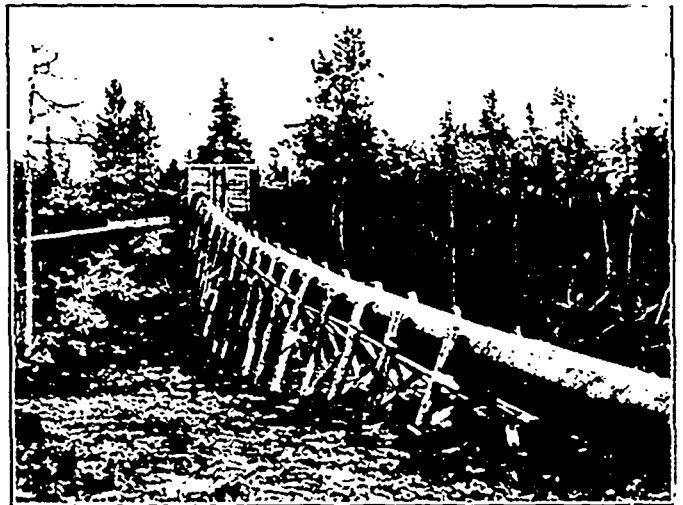
British Columbia Dredging Co.'s Bucket Dredge on Spruce Creek, Atlin—Operated by Hydro-Electric Power.

Otago, by R. T. Stewart, consulting engineer, and J. W. Stewart, dredge master and mine manager, members of the proprietary. In this instance the surface of the ground being worked is not above the level of the deck of the dredge. The water from which the motive power is derived is conveyed in an open race for a distance of 11 miles to a point 70 chains distant from the scene of operations and 170 ft. higher than the dredge. From this point the water is conveyed through 13-in. steel piping to within about two chains of the dredge, where the pipe is reduced in diameter to 9 in. and a swivel joint connected to the end of pipe line. To the other end of the swivel joint a length of 66 ft. of 9-in. piping is attached, the end of this length of piping being supported on a double-flanged trolley wheel 2 ft. 6 in. in diameter, which runs on a single rail curved to a radius of 66 ft. A second swivel joint is joined to the end of the pipe supported by the wheel, and to this is connected a length of 75 ft. of 7½-in. piping, the end of which is connected with a ball and swivel joint which is bolted to a beam on the bow of the dredge. From this point a distributing pipe 9 in. in diameter is carried along the deck to the stern of the dredge, branch pipes being taken therefrom to supply the water to the Pelton wheel, which is 4 ft. in diameter, running at 220 r.p.m. under full load and supplying power for driving all the machinery. The

water is directed on to the wheel through a deflecting nozzle having a tip of 1½ in. diameter, a hydraulic jet pump having a 2-in. jet and a 5-in. throat being used to lift water for the shoot. Its capacity is 2,600 gal. per min. to a height of 18 ft. The dynamo used for generating electric light for the dredge is also driven by water power, a ½-in. jet being used to drive a small Pelton wheel for this purpose.

The method of supporting the two long spans of piping is by a wire rope understay. The ground being worked is 30 ft. in depth and of a hard, cementy nature containing many large stones which, however, owing to the strength of the machinery and abundance of power, proves no bar to its expeditious and satisfactory treatment. The cost of running the dredge is less than £30 (\$150) per week.

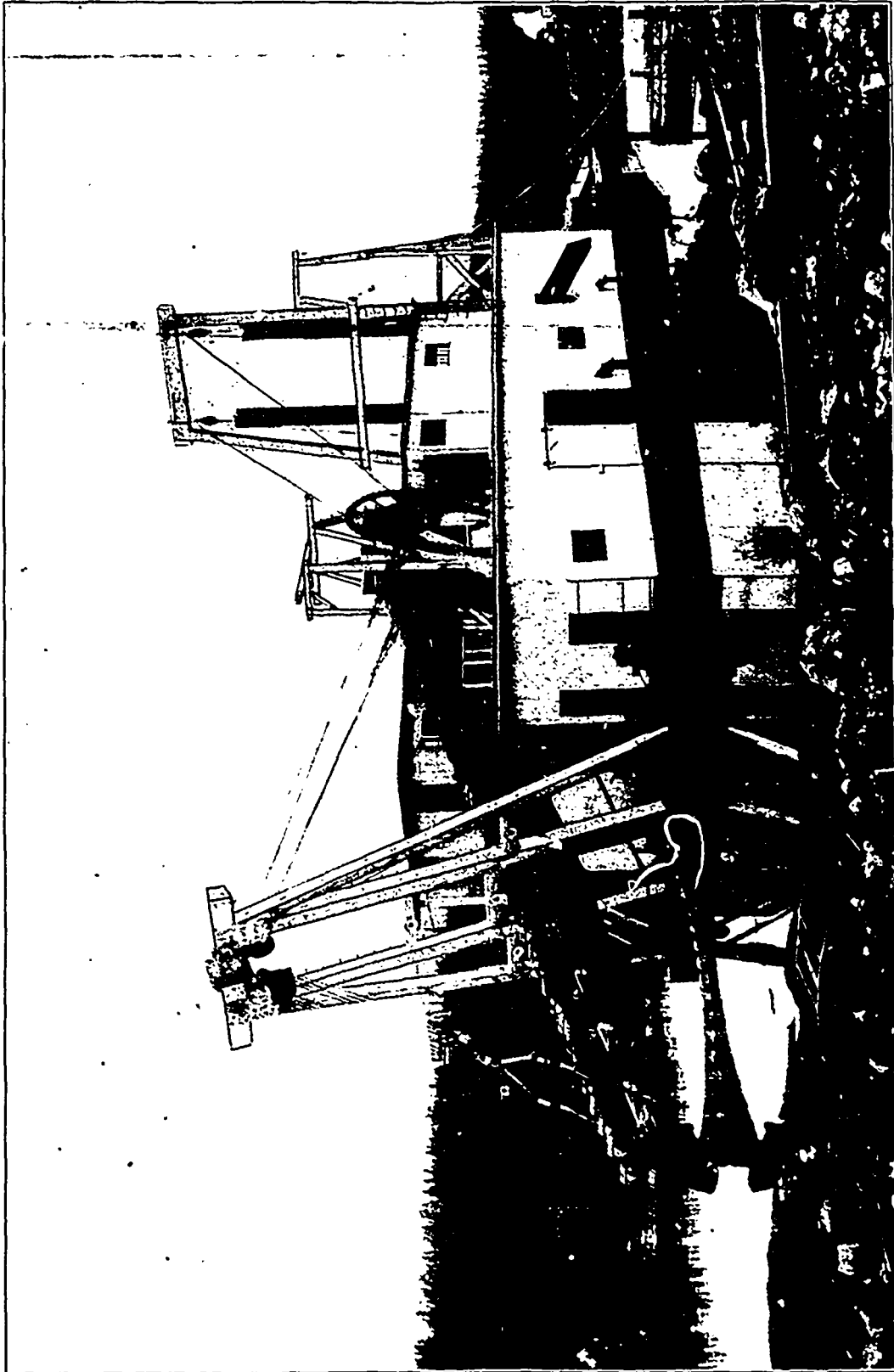
The application has also been made to the Golden Beach Dredge, Alexandra, which had previously been driven by a steam plant. The use of the engine and boiler has been discarded, and water installed as the motive power, with a result in its efficiency exceeding the most sanguine expectations of the proprietary. The water is brought to the claim by a 13-in. steel pipe line a distance of more than 4,000 ft., the fall being 240 ft. The depth of ground being worked is 56 ft., the face standing 36 ft. above water level. On account of the height of the face above the deck of the dredge a tower was built of four 7-in. pipes, 33 ft. in height, staved to the gantry by wire rope stays to prevent swaying, and bolted to the deck at foot. The water is conveyed from the main through two 80-ft. spans of 14 B.w.g. pipe, the one being 9 in. and the other 7½ in. in diameter, the latter being connected to a ball and swivel joint bolted to platform on top of tower. The water is conveyed from this point through a 9-in. distributing pipe down to gantry level, where



Hydro-Electric Power for Dredging—Pressure Box and Pipe Line at Atlin.

it is tapped by a 3-in. branch supplying water to the breaking-down nozzle, this nozzle being used only when necessary to bring a fall down and to obviate the necessity of the dredge working dangerously near the face.

The Pelton wheel which drives main buckets, screen, tailings elevator 80 ft. in length, and silt wheel 30 in. in diameter, and the dynamo by a 15-in. Pelton wheel with a 1/2-in. jet.



British American Co.'s Dredge on Gold Run, Atlin—A Modern Dredge Operated by Hydro-Electric Power.

elevator, is 4 ft. in diameter working under a 1 1/2-in. jet. The winches are driven by a reversible Pelton

The whole of the plant was designed by R. T. Stewart and erected by him personally.

THE SIMILKAMEEN DISTRICT OF BRITISH COLUMBIA.

Official Report by Charles Camsell.*

SIMILKAMEEN DISTRICT, a large area of country lying between the valley of the Fraser River on the west and the Okanagan country on the east, is a part of British Columbia that has long remained practically undeveloped by reason of lack of means of communication with markets for what it would produce under favourable conditions in this connection, and by the absence of transportation facilities requisite for the development of its minerals at a cost that would admit of mining being carried on at a profit. Its long period of waiting for these indispensable provisions for the exploitation of its varied resources on a scale in reasonable proportion to its comparatively large extent seems to at length be drawing to a close. As a consequence it has during the last year or two received more attention than at any time since the days of its placer gold mining activity. The following report by an official of the Geological Survey of Canada, relating to its geology and mineralogy, is therefore timely and will doubtless be read by many interested in the subjects dealt with. Mr. Camsell reported as follows:

The district in which the field work was this season (1906) carried out was that portion of the Similkameen mining division of British Columbia, lying about and to the south of the town of Princeton: the object being to commence a topographic and geologic survey of a sheet, which shall embrace the whole of the Similkameen district, to be eventually published on a scale of four miles to the inch with a contour interval of 200 ft. Interest in this section of southern British Columbia has been greatly increased in the last year or two by the probability of its being shortly traversed by a line of railway, if not two separate lines. Although it has long been known to contain valuable deposits of gold, silver, copper, platinum and coal, the lack of lines of communication with markets for these products prevented any extensive development of these deposits. With the advent of the railway, however, the country has a promising future, and already some of the principal claim owners are making preparations to open up their properties with a view to shipping ore in the near future.

The lack of any detailed geologic information has been a great drawback to the prospectors in the district, for up to this year no attempt had been made by this department to do much geological work since the publication of Dr. Dawson's map in 1877.**

The field work requisite for the compilation of a suitable map of the whole district must of necessity occupy several seasons, so that, to satisfy the immediate claims of the district, it was deemed best

to confine the work of this session to the more important sections where economic minerals had been discovered and mineral claims located. Commencing on the Boundary line where it crosses the Pasayton, and tying on to two prominent monuments of the Boundary survey, a skeleton triangulation was run northward to Princeton, taking in a belt five miles on either side of the Similkameen River. The mineralized areas of Roche River, Copper and Kennedy Mountain camps were connected together on this skeleton, and the geology of these camps studied more carefully than the rest of the country. The boundaries of the Tertiary coal basin about Princeton were defined, and this, with the Copper Mountain camp was plotted on a topographic map of half a mile to the inch with 100-ft. contours.

The early part of June was very wet, but no rain fell from the end of that month until early in September, so that the bush fires which started at the end of July remained unchecked for several weeks, during which the pall of smoke rendered it impossible to carry on the triangulation. For this reason the original intention of carrying the triangulation up the Tulameen River from Princeton had to be abandoned, and the important camps of Bear Creek, Boulder Creek and Champion Creek in this section were only done geologically, and not connected up with the other camps.

On May 28 I arrived at Penticton, where a pack train and outfit were obtained, and from here the journey of 75 miles to Princeton was made on horseback. The latter place was selected as headquarters for the season. Though it is quite possible to continue the field work in the eastern part of the district well on into October, operations were suspended in September, and on the 25th of that month I left Penticton for Rossland, Phoenix and Greenwood, where some days were spent in a comparative examination of their ore bodies with those which I found in the Similkameen district.

PHYSIOGRAPHY.

The Similkameen River forks at the town of Princeton, the west branch being known as the Tulameen and the south branch as the South Similkameen. Twenty miles up the South Similkameen again forks, dividing into the Pasayton and the Roche Rivers. The name, Roche River, was originally applied to a smaller branch of the stream flowing in 12 miles above the mouth of the Pasayton, but in recent years it has become customary to refer to this branch of the river as the Roche, while in reality it should retain its original name of South Similkameen.

Both the Roche and the Pasayton Rivers draw their water from the high range of mountains lying

**Dr. Dawson also spent a part of the season of 1888 in a study of the rocks of the Tulameen River, that district having come into prominence a year or two previously owing to the discovery of some very rich placers, and a short account of his observations appears in the "Summary Report of the Geological Survey" for that year.

*In "Summary Report of the Geological Survey for 1906."

on and to the south of the International Boundary line, their branches interlocking with those of the Skagit drainage, and the Methow which flows directly southward into the Columbia. The basin occupied by these two streams is enclosed between two spurs of the Cascade Range of mountains, which divide in the state of Washington, the true Cascades or Hozaheen Range forming the divide between the Roche and Skagit Rivers and running up northward to the west of the Tulameen River; while the eastern Cascades or Okanagan Range strikes slightly east of north and lies to the west of the Pasayton and Ashmola Rivers. The western of these two spurs is the more persistent and stronger range, and its summits show little or no diminution in elevation or ruggedness of relief beyond the limits of this sheet to the north. The eastern range, however, from summits at the boundary line with elevations of 8,500 ft., dwindles down north of the Similkameen River to elevations of 7,000 ft.

Taking as a central point the town of Princeton, the elevation of which above sea level has been variously estimated at from 1,885 to 2,120 ft., and which lies in a shallow depression occupied by Tertiary sedimentary rocks, there is a marked rise in the slope of the lines radiating to the west, south and east, while the gradient to the north is almost imperceptible. In this curve the hills have all been worn down below the limit of intense alpine erosion and appear as rounded ridges and dome-shaped summits of gradually increasing elevation towards the circumference. Only towards the periphery of this curve do the summits attain an elevation greater than the tree line, which in this district is approximately 7,000 ft. above sea level, but except in the immediate vicinity of Princeton these are usually well wooded with spruce, pine, balsam and tamarack. This rounded outline and regularity of form, while in the main due to erosion, is also in part the result of the filling in of old irregularities of the surface by the Tertiary lava flows which still cover such a large proportion of the surface. Glacial action—the action of erosion as well as deposition—has also been instrumental in reducing the vertical relief.

Many evidences of recent development in the topography occur. The South Similkameen from the Pasayton to Whipsaw Creek occupies a deep narrow V-shaped valley indicative of a comparatively recent uplift, which imparts to this portion of the stream increased vigour and power of erosion. The valley of the Tulameen also, above Otter Creek, as well as many of its tributaries, is narrow and steep, showing that the drainage has not been very long in operation since the change in elevation.

Numbers of terraces and deposits of gravel also occur at various elevations to a height of 1,100 ft. above the present level of the lowest ones. As a rule the higher of these only now occur as small remnants of more extensive terraces, formed in the period immediately following on the disappearance of the Cordilleran glacier, and which have since been reduced in size by the ordinary atmospheric agencies

of erosion, or by the action of streams which are now far below them. These are the most apparent evidences of comparatively recent changes of level.

Accompanying the changes of level and either a direct result of them, or of the blocking of ancient channels by recent volcanic flows, have been some striking changes of drainage. The most marked instance of this is the deep wide valley of Wolf Creek, now occupied by a stream inconsistent with the size of the valley. It seems probable that this valley, with its continuation through Swelter Lake, once carried a great part of the drainage of the Similkameen River which now flows through the Tertiary basin about Princeton. All the smaller streams entering the south side of this valley occupy hanging valleys, so that they debouch in waterfalls, or have been forced to cut deep canyons down to the level of the trunk valley.

GLACIATION.

During the glacial period the Cordilleran glacier covered all the summits north of the Boundary line in this belt. The results, however, show that the glacier was losing its great power of erosion and was rather depositing its load. This is evidenced by the small number of grooved and striated rock exposures, and by the thick deposit of rock detritus on the summits of the hills as well as in the valleys. Prospecting for mineral deposits on this account becomes more difficult than in a region where the strength of glacial erosion had been greater. At present no glaciers occur in the belt between the Boundary line and Princeton. Many of the highest summits, however, at the Boundary line, have beautiful glacial cirques carved out of the solid rock on the sides facing the north. These usually have small lakes in the bottom filled with water drawn from the snow, which lies on the sides and rims of the cirques until well on into the middle of the summer.

Though glacial material is widespread, boulder clay is rarely observed. Terraces of gravel and sand and some beds of clay are frequently found adhering to the sides of the main valleys.

Hanging valleys have already been referred to as occurring on Wolf Creek, and also on the Tulameen River above Otter Creek.

The thick deposit of glacial drift, though a hindrance to the speedy development of the mineral resources of the district, must be reckoned as a part of its economic resources in that it has produced a considerable extent of excellent farm and grazing land, which could be made to support a much larger population than it now holds.

SOLID GEOLOGY.

Geological work on the Similkameen becomes very difficult on account of the great variety and complexity of the rock formations, also the thickness and widespread covering of drift. Plutonic, volcanic and sedimentary rocks are all present covering a period from Palaeozoic to later Tertiary times. Fossils occur in the Tertiary lignite basin about Princeton, and in the Cretaceous sandstones of the Roche River, but

the remaining sedimentary rocks—limestone, argillite and quartzite—are either unfossiliferous or so badly crushed as to destroy any remnant of animal

except on the trails cut by prospectors through the bush. The latter difficulty, however, does not hold in the northern half, where access can usually be ob-



Valley of Similkameen River at Hedley, Where is Located the Daly Reduction Company's 40-Stamp Mill, Operated by Water-Power, and Treating Gold Ore from Nickel Plate Mine.

life they ever contained. Contacts between the igneous and sedimentary rocks are rarely exposed, so that it is difficult and often impossible to establish geological relations. Added to this is the difficulty, in the southern half of the belt, of travelling anywhere

tained to any part whether there is a trail or not. The geological boundaries that have been traced, then, and the ages in which the different rocks have been placed, are tentative and will be subject to revision at a later date.

The formations met with and their approximate or relative ages are as follows:

Glacial and Recent Deposits.—

Tertiary.—Volcanic flows, basalts, andesites, etc., intrusive sheets and dykes, sandstones, shales, clays and lignite beds.

Cretaceous.—Argillaceous sandstones, grits, conglomerates and slates.

Jurassic or Triassic?—Granodiorite and other batholithic intrusions, porphyrites, tuffs and breccias?

Palæozoic.—Limestones, argillites and quartzites, green, spotted and chloritic schists, talc and graphite schists, mica and hornblende schists, with some limestone and silicious bands.

The oldest rocks of the district are the Roche River schists, which cover an area about the junction of Roche and Pasayton Rivers. This area extends from the canyon below the junction of the two streams four miles up Roche River, and to a point eight miles up the Pasayton, its southern contact on the latter stream being the batholithic intrusion of Rimmel granodiorite; while on the Roche River it is in contact with a band of syenite gneiss. On all other sides the schists are overlain by recent volcanic rocks lying a short distance back from the river banks. The schists are very varied in character. On the south are micaceous and hornblende schists frequently very silicious and becoming gneissic, and holding some bands of greyish crystalline limestone. The northern part of the area is occupied by soft green, spotted and chloritic schists, with smaller bands of graphitic and talc schists, the latter being frequently mineralized and traversed by quartz-filled fissures. It has been impossible to determine the age of these rocks, and though they have some lithological resemblance to the Archæan of the Shuswap series, they may also be only very highly metamorphosed sedimentaries and porphyrites as found in other parts of the district to the north.

The limestones, quartzites and argillites cover a very limited area, but are important as occurring with some of the ore bodies in the southern part of Copper Mountain. They also form a highly-altered and metamorphosed band crossing the Similkameen River below Allison, and lying between or under young volcanics on the west, and the great mass of granite on the east. They also extend some distance south of Copper Mountain until they are covered by Tertiary volcanics. They appear to resemble closely the Cache Creek series of the Kamloops district. They have been cut and greatly disturbed by later intrusions of igneous rock, and so much of these beds has been destroyed that they now frequently appear only as islands or "roof pendants" in batholithic masses of rock. The limestone is often white and crystalline, and the argillites and quartzites are highly altered, and in many cases have probably taken on a crystalline structure. In addition to the metamorphism they have undergone some fracturing, and become brecciated. Much of these sedimentaries is

probably covered by volcanic flows, and much has been digested and assimilated by eruptive masses of plutonic rocks. The parts that remain are only remnants of once extensive sediments that covered a great part of southern British Columbia.

A small area of green porphyrites, tuffs and conglomerate occurs in the bottom of the valley of Sunday Creek. These are shown in the bed of the stream as cutting through the enclosing parts of the limestones and argillites. They are so intimately associated with volcanic rocks, which are of undoubted Tertiary age, that it is very often difficult to separate the two, and for the present, or until they have been studied in more detail, all that can be said with regard to their age is that they are later than the limestones and older than the Tertiary. The porphyrite is much weathered and decomposed on the surface and appears to be an augite-porphyrite. The tuff and conglomerate are greenish in colour and consist of rounded pebbles of earlier volcanic rocks. They also contain some fragments of fossil wood.

Batholithic Intrusions.—Under this head are classed the Rimmel granodiorite of the Pasayton River, the syenite and syenite gneiss of the Roche River, and the igneous complex of the Copper Mountain. The Rimmel granodiorite is cut across by the Pasayton River and extends northward from the Boundary line for a distance of four miles to its contact with the mica schist. South of it is a large area of Cretaceous rocks. The typical rock of this area is composed of hornblende, biotite, quartz and orthoclase feldspar. On the same strike of the Rimmel granodiorite on the Roche River is a band of syenite and syenite gneiss about two miles wide. This is not so coarsely crystalline and is so much more basic in composition as to be almost a diorite, but it is possible the two may have been produced from the same magma.

The composition of the igneous complex of Copper Mountain is variable, ranging from silicious in the north and west to a more basic variety in the south and east. The typical rock is hornblende diorite. This is best developed in the south and east, where it has not been affected by mineralizers or altered by later igneous intrusions. In places where this is in contact with some remnants of the older sedimentaries, a gneissic structure has been induced in it. To the centre and north it has been fractured and brecciated, and is now traversed by many little veins of calcite-magnetite and feldspar. The rock has also become finer in grain. Large crystals of biotite are often developed in the zone of fracture. The contact between the diorite and the sedimentaries is very irregular whenever exposed. It is rarely sharply defined and in many cases no definite boundary can be assigned to the igneous rock. It occurs under so many different types of dykes, with which it becomes intimately mixed, that it is often difficult in the field to separate the different intrusions.

Lower Cretaceous.—These rocks cover a wide area in the southwest corner of the district. They appear on the Pasayton River just north of the Boundary

line and striking about 330 deg., cross Roche River about six miles above the junction of that stream with the Pasayton. At both these places they are seen to overlie the eruptive rocks. The beds consist of hard sandstones and grits, interbedded with black and red argillaceous slates, all of which appear to have suffered much stress and pressure, for the angles of dip are now all high, being usually about 50 deg. On the Roche River the bottom bed is a conglomerate, which rests directly on the syenite to the north of it.

Tertiary.—The remaining rocks are all of Tertiary age; and, grouping the sedimentary rocks with the volcanic, it is found they cover the largest proportion of the district. The sedimentary rocks alone in the northern part of the district cover an area of nearly 50 sq. miles—the basin being 14 miles long with a variable width of from three to five and one-half miles. These sedimentary rocks consist of thick beds of sandstone, with clay, shales and several seams of coal. The base of the series appears to be a coarse-grained sandstone containing many large rounded white feldspars in a matrix of calcareous material. This rests, on the eastern side of the basin, on the Copper Mountain series of rocks; while on nearly all other boundaries, the sediments dip under the more recent volcanic rocks, which lie as sheets on them. In parts, also, these volcanics have thrust themselves through the sediments and now appear as islands in the older rocks. The strata do not now lie horizontally, but have been tilted at low angles, making an irregular series of folds. Some faults also occur.

Many drill holes have been bored in this Tertiary basin in search of coal seams, and with some good results. Most of them, however, were put down at or near the edge of the seam and only one near the western edge of the basin. By the kindness of Mr. Ernest Waterman, manager of the Vermilion Forks Mining and Development Company, copies of the records of these drills have been obtained. These have disclosed the thickest coal seams to be in the vicinity of the town of Princeton, where a bed more than 18 ft. in thickness was struck at a depth of 49 ft. The hole, in which this seam was found, was sunk near the bridge over the Similkameen River to a depth of 280 ft. In this hole coal seams aggregating 35 ft. 7 in. were crossed in the first 90 ft., while the rest was in shales and sandstones. Four miles up the Similkameen River a bore hole sunk to a depth of 257 ft. only went through 2 ft. 5 in. of coal; while a drill hole near the south end of the basin at Ashnola, which penetrated to a depth of 398 ft., gave no workable seam at all, and only a few bands of what is called in the record "coaly shale."

A bore hole was also drilled near the western edge of the basin, where the sediments dip under the volcanics, and not far from where there is an outcrop of coal 4 ft. thick. The depth of the hole is 863 ft., and in that distance 17 seams of coal were cut through with an aggregate thickness of 50 ft. 6 in., of which the thickest seam was 9 ft.

From a study of these records it would appear that

most, though not all, of the workable seams are within 300 ft. of the surface. It must be noted, however, that no prospecting by drilling has been done north of the Similkameen River, yet the basin undoubtedly extends as far north at least as the forks of One-mile Creek.

Coal outcrops in many places both on the Similkameen and Tulameen Rivers, also on Summers Creek, Bromley Creek and Nine-mile. At the last-named place a cut in the bank made by the stream discloses a bed 15 ft. in thickness of fairly clean coal, with five thin partings of clay, all resting on white clay.

A sample from the big seam at Princeton worked by the Vermilion Forks Mining Company was sent to Mr. Hoffmann of the Survey department. He calls it a lignite, but one of the better class. Analysis by fast coking gave:

	Per cent.
Hygroscopic water	16.17
Volatile combustible matter	37.58
Fixed carbon	41.67
Ash	4.58
	100.00
Coke per cent.	46.25

Character of coke, pulverulent; colour of ash, brownish-yellow.

Though the age of these beds is put down as the same as the Coldwater group of the Nicola Valley in which coal occurs, there is a difference in the quality of the fuel contained in each. The Nicola coal is considerably higher in fixed carbon and lower in water, but the amount of ash is also higher. Some of the beds of the Princeton coal basin are only in a primary stage of formation, and they still show the brown woody fibre of the slightly altered vegetable remains. Some also have been completely destroyed by combustion, and it is to the combustion of an underlying bed of lignite that Dr. Dawson attributed the metamorphism and colour of the rocks at the Vermilion bluffs.

The volcanic rocks of Tertiary age have a wide distribution, and prove that this part of the country was the scene of tremendous volcanic activity during that period. Their area must have been considerably diminished during the Glacial period, so that the present distribution cannot be taken as indicative of their original extent. These are the youngest rocks in the district, for they are seen in the Tulameen River, also in One-mile and Summers Creeks, to rest on the rocks of the coal series. On the Tulameen River the stream cuts through beds of clay and sandstone overlain by these volcanics for a distance of at least two and one-half miles. The schists of the Roche River are overlain to the north and east by these volcanics, which also overlie the Copper Mountain series on the north and west. They consist of rhyolites and trachytes, andesites, basalts, tuffs and breccias. The darker lavas are often amygdaloidal, the vesicles being filled with chert, chalcedony or

zeolites. Some agates and wood opal were found in the volcanic area east of Coldwater Creek.

Some of the dykes cutting the Copper Mountain rocks appear to be contemporaneous with these volcanic rocks, and in some way connected with them.

ORE DEPOSITS.

In the Roche River district the mineralized area is confined to a belt of soft talc, chloritic and hornblende schists, lying about the junction of the Roche with the Pasayton River. The ore bodies are of two classes: (1) Small gold-bearing fissure veins; (2) larger bedded veins, copper-bearing. The first are usually quartz veins from 3 in. to 4 ft. in width, cut-

Red Star and Anaconda claims. On these there is a belt of soft talc and chloritic schist about 400 ft. wide, striking 125 deg. dipping vertically, and lying between mica schists. It appears to be traversed by a fault plane, along which bunches and lenses of white feldspar and quartz were found, and which were first worked for their gold content. On development the vein ran into the talc schist, which proved to be highly mineralized with copper carbonates and cuprite, and which was farther on replaced by bornite and chalcopyrite. With these were pyrite and arsenopyrite, siderite and some blende. A shaft has been sunk from the tunnel to a depth of 60 ft., but this



Valley of Tulameen River in Similkameen District.

ting across the strike of the schists, and dipping at angles from 60 to 90 deg. Beside gold, they carry bornite, tetrahedrite, chalcopyrite and pyrite. Sylvanite was also reported to occur, but an assay of a selected sample of one of the veins supposed to carry this mineral gave no trace of tellurium. The second class contains larger ore bodies, lying parallel to the strike of the schists. These may be either quartz veins or mineralized bands in the schists. These carry some gold, and copper and iron sulphides. The highest values are in copper.

Only two claims have been Crown-granted and surveyed, and the amount of development work done on all of them is not sufficient to prove the ore bodies, or test their permanence. The surveyed claims are the Pasayton and the Sailor Jack. On both these are small fissures, on the Pasayton one 4 in. wide, from which the samples were taken to test for tellurides, and on the Sailor Jack one 2 ft. wide cutting across a hornblende schist.

The greatest amount of work has been done on the

had to be abandoned on account of the gases. Some native copper occurs as sheets in little slips and fault planes in the schist.

Several other claims have been staked in this district, and though there are some indications of high-grade ore occurring, the only work done on them has been just sufficient to enable the Copper Mountain owners to hold their claim.

Copper Mountain was reported on by Mr. W. F. Robertson, provincial mineralogist, in August, 1901, and his report appears in the "Annual Report of the Minister of Mines for British Columbia" of that year. Since then development work has been extended farther to the eastward, but little more has been done in the neighbourhood of the river. In speaking of Copper Mountain camp and Copper Mountain ore bodies, it will be distinctly understood that Kennedy Mountain will be included as well, for no distinction can be drawn between the two.

The camp includes about 130 Crown-granted mineral claims, covering an area five miles long from east

to west, and about four miles from north to south. Combination camp lies to the south of Copper Mountain, but the ore bodies are much the same in character.

The country rock is a batholithic intrusion of igneous rock of very variable composition, which has been intruded into and has almost entirely digested the older overlying sediments—limestones, argillites and quartzites—so that these only now appear as inclusions or remnants in the igneous rock. To the north and west it is overlain by recent volcanic rocks. Along the southern and eastern border of the mineralized area the igneous rock is a diorite, which sometimes has a gneissic structure, and which frequently holds segregations of the dark minerals. To the north this rock becomes more acid, and is cut by narrow veins of pink feldspar and quartz. Both the sediments and the igneous rock are intimately mixed with, and cut by later dykes of different ages, the sequence of which cannot yet be perfectly worked out. These dykes have a general north and south trend and are quartz-porphry, rhyolite, andesite, felsite and diabase, of which the first-mentioned are apparently the most recent. The whole series, except the later dykes, is traversed by a set of fracture and fault planes running in an almost east and west direction.

Two classes of ore bodies have been made out—(1) those occurring at or near the contact of the sediments with an igneous rock; and (2) those occurring in the zones of fracture. Both are of a very indefinite character without well-defined boundaries. Examples of the first class are found at the southern end of Copper Mountain, and on the west side of the Similkameen River. In this class ore bodies are frequently found at the contact of the diorite with a limestone, which may be much altered. The ore here generally occurs as infiltrations in the small fracture planes with which the rock is traversed. The fissures cut the igneous as well as the sedimentary rocks, and the metallic sulphides are found in both, but only in the neighbourhood of the contact. The fissures have been filled with secondary calcite which acts as the gangue of the sulphides. Rhyolite and quartz-porphry dykes cut both kinds of rock, and have apparently been injected after the fracturing and fissuring had ceased, for they are not themselves affected by any such dynamic action. The intruded rock alone has been fissured to allow of the flow of mineralized solutions. These dykes are not in themselves mineralized, and do not appear to have had anything to do with the formation of the ore bodies. In the Jeannie Silkman claim a highly-mineralized diabase dyke, which cuts an altered sedimentary rock along with a quartz-porphry, seems to be responsible for the formation of the ore. The minerals occurring in this class are chalcopryrite, pyrite, bornite and calcite with a little magnetite. Bornite is confined to the southern portion of the camp. The Sunset, Helen H. Gardner, Jennie Silkman and Copper Farm claims are examples of this class.

The second class of ore bodies occurs in the centre of Copper Mountain and eastward across Wolf Creek.

In this case the ore occupies a zone of fracturing, which strikes about N. 75 deg. E. It often happens that the country rock has been brecciated and the fragments cemented together by calcite, or it is traversed by a net-work of small calcite veins with a N. 75 deg. E. trend. These fissures are most abundant about the middle of the mineralized area, and die out to the north and south. They sometimes attain a width of 2 ft., but are more often only an inch or two. They cut all the rocks except some of the later dykes. These dykes strike at right angles to the course of the fissures, cutting off the ore bodies, and do not seem to have been affected by any strains or stresses, except those which are consequent on the cooling of an igneous body. Pyrite, chalcopryrite, mispickel and magnetite occur in the calcite veins. Magnetite sometimes replaces the calcite altogether in the veins and forms the gangue for the other minerals. The Triangle Fraction, Red Eagle, Ada B., Frisco and other claims running east and west across the middle of the camp are examples of this class. In the northern part of the district the little fissures are filled with feldspar, quartz, or magnetite, to the entire exclusion of calcite.

Besides being concentrated in the zones of fracture, the copper and iron sulphides appear often to be original constituents of the country rock, for they appear as idiomorphic crystals disseminated through it without any connection with each other; and until a great deal more work is done on the claims it will be difficult to give a correct history of the formation of the ore bodies. At present not many claims have been explored to a depth lower than the limit of surface oxidation, but it may be possible to throw more light on the origin of the ore bodies, when the numerous samples obtained have been thoroughly examined under the microscope.

Owing to the nature of the occurrence of the ore on Copper Mountain it is a difficult matter to make estimates of the average values that the rock would give on assay. The ore bodies have no definite boundaries, in fact the whole mountain is more or less mineralized, with concentration taking place along certain lines, and what is classed as ore today may be too low grade to give a profit tomorrow, depending altogether on the price of copper and the cost of mining. The boundaries then will be merely commercial ones. Mr. W. F. Robertson made assays of samples from many of the different claims in 1901, and the results he obtained were from 1.5 to 3 per cent. in copper of average samples, with selected samples going up to 8 per cent. Most of them carried a small amount in gold. It will be seen by this that these ore bodies are very low grade, but this is compensated for by their great size and the ease with which they can be worked.

In the country lying between One-mile and Five-mile Creeks, and on the slope of Five-mile Creek, several claims have been located, but only the western portion of this area came within that examined. The United Empire group, consisting of nine claims, is on Allison Mountain, and occurs in the same series

of metamorphosed sediments as found on Kennedy Mountain. The whole hill is heavily covered with wash and the rock wherever exposed is decomposed to a much greater extent than in any other part of the country, due perhaps to a covering of volcanic flows during the Glacial period, which prevented the decomposed rock from being removed by the scouring action of the glacier. At the base of the hill is a thick deposit of clay and detritus washed down from the hill: it is heavily charged with copper carbonate which has probably been derived from the leaching out of a quartz vein higher up the hill carrying the sulphides of copper. Evidence in support of this is obtained from a shaft 40 ft. deep, sunk about half-way up the hill, at the bottom of which blocks of quartz carrying chalcopryite occur in the decomposed rock. It is probable there is a vein of quartz carrying copper sulphides at this place, but not enough work has been done to demonstrate the size of the vein or its strike. Surface indications, however, point to its having an east and west strike across the strike of the fracture planes on Copper Mountain.

BEAR CREEK.

At the end of the season a hurried reconnaissance was made of a mineralized belt of rocks running from the Tulameen River at Champion Creek northward past the head of Bear Creek to the Coldwater River. Some promising mining properties are being exploited in this region, and this belt of rock well warrants a more extended study next year.

Briefly stated, the geological conditions are as follows: Stretching across in a northerly direction from the mouth of Champion Creek to the head of the Coldwater is a belt of light-coloured granite. In contact with this on the east side is a series of metamorphosed sediments, limestone, quartzite and schists, extending from Coldwater River to Fish Lakes. From Fish Lakes to the forks of Eagle Creek the granite is in contact with a dyke-like mass of peridotite one mile to two miles wide, which then strikes southeasterly at a sharp angle with the strike of the granite. In this angle between the granite and the peridotite is another small area of quartzite, limestone and mica schist, which extends south to the Tulameen River and terminates at Champion Creek. Bordering the peridotite and schists on the east is a large body of pyroxenite, which extends from the falls on Bear Creek, where the wagon road crosses it, southward across the Tulameen River, where it comes in contact with granite. The pyroxenite is succeeded on the east by enormous masses of volcanic rocks, which have undergone considerable metamorphism, and are earlier in age than those volcanic rocks previously referred to in this report as occurring on the Similkameen River. Dykes of diabase, quartz-porphry, granite-porphry and rhyolite cut all the other rocks, and consequently are later in origin.

Contacts between the granite and schists, between the granite and peridotite, and between the schists and peridotite and pyroxenite, were discovered and studied in the field, and from these geological relations were worked out. The schists which are prob-

ably metamorphosed limestones and quartzites are the oldest rocks in the district, for they are cut by all the others and are found as inclusions in the granite and peridotite. Next in age comes the peridotite, and with this must be included the pyroxenite, though the latter is slightly the younger, for on Eagle Creek dykes of pyroxenite were found cutting the peridotite. Prof. J. F. Kemp (of Columbia University, New York), who examined the district in 1900, reported similar conditions on the south side of the Tulameen. The next rock in sequence is the large batholithic mass of granite lying to the west. Contacts between this and the older rocks are well shown on Tulameen River and Eagle Creek. Following the granite intrusion are the sheared and metamorphosed volcanic flows, and later again are the dykes which have penetrated all the preceding rocks.

Mineral claims have been located all along this granite contact, from Champion Creek across to Coldwater River, and for many years the placers of Tulameen River and its tributaries below Champion Creek have been profitably worked for gold and platinum. These placers are being gradually exhausted, and Tulameen River from being the principal producer of platinum on the North American continent, now supplies an annual output of only 30 or 40 oz. of that metal. Mining activity, however, is being revived and the production from lode mining will probably soon be far greater than it was in the best days of the placer miner.

Most of the mineral claims have been located in the area of schists, limestones and quartzites, and some in the peridotite and pyroxenite belt. The metals for which they have been staked are gold, silver and copper; and the minerals occurring are pyrrhotite, pyrite, galena, chalcopryite and calcite, with some zinc blende and molybdenite.

Molybdenite is found in several places along the granite contact. At Independent camp at the head of Coldwater River it occurs in fine scales in the large porphyry dyke, and at Champion Creek it is found in little quartz stringers cutting the schists at and near the contact with the granite.

Among the most promising claims in the district are the St. Lawrence group, owned by the Similkameen Mining and Smelting Company, of Vancouver, B. C. These were located in the fall of 1900 by a party of Swedes, and are situated on the western side of Bear Creek, and on the contact of the granite with the schists and limestones. The schists are mica schists and enclose narrow bands of white crystalline limestone. They dip at about 65 deg. towards the granite, and are cut by some large and highly-mineralized dykes of granite-porphry, which have a north and south trend approximately parallel to the trend of the granite. The ore is always found associated with the limestone, and frequently replaces the lime bands entirely. The granite-porphry dykes appear to be the source of the ore. The limestone bands, being the most soluble rocks, have acted as channels for mineralized solutions emanating from the dykes, and have become at times entirely replaced

by sulphides. These solutions ascending from below, and following the lime bands have deposited their sulphides against the mica schists, which always act as a hanging wall to the vein. Two veins have been opened up on this group, each of them from 7 to 8 ft. wide, and the ore in them appears to be almost pure pyrrhotite. The values are high in copper, gold and silver, and altogether the property gives promise of developing into a permanent producing mine.

Another important group of claims is the Independent, owned by Johnson, Holmes & Henning, and situated on the summit of the divide between Bear Creek and Coldwater River. This group is also on the contact of the granite body with mica schists. Here the ore body is a highly-mineralized zone of rock extending from the edge of the schists about 1,000 ft. westward into the granite. Some 2,000 ft. away from the schists the granite becomes gneissic, though still holding inclusions of the mica schists. No sharp line of contact could be discovered between the ore body and the unaltered granite, only that the mineralization by sulphides seems to gradually decrease until at 1,200 ft. away from the schist it disappears. The ore body is highly altered and kaolinized, where mineralization is greatest, and it appears to be of the nature of a dyke of granite-porphphyry intruded between the schists and the granite, though it is possible it may only be a mineralization and alteration of the same granite at and near the contact with the schists. Inclusions of mica schist occur in the unaltered granite as well as in the ore body. The greatest alteration is about the centre of the mineralized zone, where a small vein of pure iron and copper sulphides cuts the porphyry at an angle of 45 deg. The feldspar here is kaolinized, though the quartz is unaltered, and some secondary calcite has been developed. Mineralization throughout the body of the porphyry is usually by individual crystals of iron and copper pyrites, more rarely by veins and bunches of these minerals. Only in the highly-altered zone does oxidation extend to a depth of 20 ft. from the surface. Some molybdenite occurs in thin seams and flakes near the contact with the mica schist. The values are entirely in copper and are low, but the ore body is an enormous one. The group consists of 10 claims, which have all been staked on the same contact, running down into the Coldwater River.

Numerous other claims were visited in this section of country, among them being the Keruna group on Bear Creek, and Boulder Creek camp east of Bear Creek. The former lies in the same series of altered sedimentary rocks as were described on the St. Lawrence group. These are cut by dykes of a porphyritic character which strike about 330 deg. The ore occurs as little veins and bunches in the sediments at and near the contact of the dykes. The minerals found are pyrite, chalcopryrite and pyrrhotite, and the values are in gold and silver.

At Boulder Creek the claims are located in a soft green serpentine, which often has a schistose structure developed in it, and which appears to be an altered volcanic rock. The ore bodies are in blanket

veins interbedded with the country rock, and the minerals occurring are pyrite, chalcopryrite and some galena. The values are in gold, or copper, or both, the one increasing as the other decreases.

Owing to the enormous rise in the price of platinum in the last year, and to the fact that the basin of the Tulameen River once produced a larger amount of platinum than any other part of North America, it is probable that attempts will again be made by interested parties in the near future to locate the source of the metal in this district, or to work some of the higher bench deposits of gravel which are known to carry platinum, but which formerly necessitated too large an outlay of capital to work. Prof. Kemp spent about three months of the summer of 1900 in investigating the geology of the platinum, and though not successful to the extent of finding any large bodies of rock which could be profitably mined for platinum, was able to throw a great deal of light on the origin and occurrence of the metal. His results are embodied in Bulletin 193, of the United States Geological Survey.

The Tulameen section of the country presents many more difficulties to the prospector than the Similkameen country. The former is very heavily timbered, and trails are few and rough. Rock exposures, however, are more common, except where the country is underlain by the schists and limestones, as in the upper parts of Bear Creek. Here the growth of timber is heavier than usual, and the country is so heavily covered with drift that rock exposures rarely occur, and it has only been by much labour that ore bodies have been located. Conditions for the formation of ore bodies are so favourable, though, that other important discoveries are to be expected.

Wolframite occurring in quartzite overlying gold-bearing conglomerates at Lead City, South Dakota, U. S. A., states the *Mining and Scientific Press* of San Francisco, was first recognized by an amateur mineral collector, who was a teacher in the High School at Lead. He properly determined the black granular ore to be wolframite. Miners had for 20 years thrown it away, thinking it was only an ordinary iron ore.

Concerning platinum the *San Francisco Mining and Scientific Press* says: All the platinum that has ever been produced from all countries of the globe, since the first discovery of the metal, would barely exceed 100 tons of the fine metal. You could put all, in a single block, in a room 10 metres cube. The largest nugget of platinum ever found weighed 9½ kilos—about 20 lb. Never in its history was there so great a demand for platinum as today, yet, with the mining world keenly alive to its importance, with its double-the-price-of-gold present-day incentive, with experts searching for it here and there the world o'er, and mine-owners urging the output "to the limit," still the annual platinum "crop" of the globe barely touches half-a-dozen tons. Three decades ago the value of platinum was \$2 per oz. Today it is above \$32.

THE SPITZEE MINE AT ROSSLAND.

Property Recently Bonded by Le Roi Mining Co.

MINING AT ROSSLAND will probably ere long be extended over a wider area of the camp than that in which operations have been in progress during recent months. Work is to be resumed on the Jumbo and as well on the consolidated California-Giant properties; while on the Spitzee the Le Roi Mining Co., Ltd., which recently bonded this promising property, has already placed a working force. Concerning the last named mine, the *Rossland Miner* a few weeks ago gave the following information:

"The Le Roi Mining Co., Ltd., has taken an option on the group of claims owned by the Spitzee Gold Mines, Ltd., located in the southwestern portion of the city limits and having an area of 110 acres. The Le Roi already owns the Le Roi and Black Bear claims, and some fractions and, with the Spitzee, will control about 210 acres of the most promising mining areas in the Trail Creek mining division. The Spitzee has sent 6,000 to 7,000 tons of ore to the smelter and is considered, in conjunction with the other properties of the Spitzee Co., to have the makings of a valuable mine. It is the intention of the Le Roi Mining Co. to at once begin work on the property acquired under the option with a good sized force of men, under the superintendence of A. G. Larson. Compressed air will be conveyed in a pipeline from the Le Roi air compressor at the Black Bear power house. The plans for machinery and development have not yet been decided on.

"The tendency in this and other camps in Kootenay and Yale districts is in the direction of consolidation and the acquisition of large areas of mining territory, so that mining can be carried on on a large and comprehensive scale, so the Le Roi Co. in this deal is but following the prevailing custom. It gives renewed confidence in the camp and its future to see companies like the Le Roi, the Consolidated Mining and Smelting Co. and the Le Roi No. 2, Ltd., acquiring adjacent properties, as it shows that they have faith in the future and expect to realize profits by their purchasing these properties or they would not be troubled with them. A. J. McMillan, the managing director of the Le Roi, is a far-seeing man, knows Rossland camp like a book, and it is almost certain he will make the Spitzee group yield a large profit to the shareholders of the Le Roi Mining Co. The addition of the number of men who will be employed on the Spitzee group means considerable to Rossland, which is now moving along with rapid strides towards a largely increased prosperity.

HISTORY OF SPITZEE GROUP.

"The ore shoot on the Spitzee was exposed when the Canadian Pacific Railway Co. changed the gauge of the Columbia and Western railway from narrow to broad gauge. It was necessary to make a new cutting at that point when the work was done, and this exposed a large ore shoot. Kenneth Bur-

nett, provincial land surveyor, staked the Spitzee fraction, in which there were 14 acres. This was in 1899. Ernest Kennedy, mining promoter and broker, formed a syndicate and bought it from Mr. Burnett, paying on behalf of the syndicate \$6,000 for it. The syndicate acquired the charter of the Indian Chief Mining Co. and began to sell stock. George Pfunder was appointed superintendent, and under his direction a shaft was sunk on the property to a depth of 50 ft. At about the time the shaft had reached this depth the mining boom collapsed, and, as the company was unable to sell shares, work was ceased and the mine was shut down for a couple of years. F. A. Hewer, the president of the Indian Chief Mining Co., and a member of the original syndicate and of the firm of Marsh, Hewer & Masters, went to the workings of the Spitzee one day and sampled the ore shoot and had the ore assayed. He showed the assay certificates to A. S. Goodeve, and they agreed to extract and ship a carload of the ore, which was done. The smelter returns were so satisfactory that Mr. Goodeve called a meeting of the Indian Chief Mining Co. and offered \$6,000 for all the treasury stock, provided the amount was expended in development work. The offer was accepted and the Spitzee was placed under the superintendence of Alexander Sharp, M. E., now the mining expert of P. Burns & Co. After considerable work had been done under the direction of Mr. Sharp, Bernard McDonald, then in charge of the Le Roi, made an expert examination of the property, and recommended the acquisition of the adjoining properties. The company was then re-organized under the name of the Spitzee Gold Mines, Ltd., and Mr. Hewer was sent to England for the purpose of raising funds with which to purchase the adjoining properties, and successfully carried out his mission. The result was that the Fool Hen, the Darby and the Nelson No. 2 were acquired, and these with the Spitzee gave the company an area of 110 acres. The Darby and the Nelson No. 2 having been located under the old law carried with them surface rights, and so among the assets of the company are a large number of townsite lots and blocks. The Spitzee was operated continuously for a couple of years, but was closed down about 18 months since. The shaft had by then been sunk to 200 ft., and from the shaft drifts had been run; there are besides several upraises. The returns from the ore sent to the smelter have always been satisfactory, showing that it is of a good grade. The Spitzee Co. realized that in order to make the property yield a profit, a larger plant, a deeper shaft and much more development work was necessary, but as it did not have sufficient capital to buy the plant and do the work it was thought the wisest plan to hand it over to a company having ample capital to develop and operate it and make it yield dividends."

"This load, like the previous one, is bedded in porphyries considerably delapidated above and extremely degenerated below."—Extract from a Russian mining engineer's report, translated into 'English' by a German.—*London Mining Journal*.

EXPLORATIONS IN A PORTION OF THE YUKON, SOUTH OF WHITEHORSE.

Official Report by D. D. Cairnes.*

YUKON TERRITORY gives much promise of proving rich in lode minerals as well as placer gold. From time to time the *MINING RECORD* has published articles relating to the development of lode mines in the Whitehorse and Windy Arm sections of Southern Yukon. The report of Mr. Cairnes, of the Geological Survey staff, of his explorations in this district in 1906, here reprinted, gives additional information, which being official and reliable will probably be of general interest. He says:

I left Ottawa on May 18, with instructions to proceed to the southern part of the Yukon to investigate primarily, the economic resources of certain areas and, incidentally, to gather as much information as possible concerning the general geology and natural resources of the district, and to make such surveys as were required for a map to accompany the work.

Windy Arm, Tagish Lake, was reached by the usual route and after surveys were completed in the vicinity horses were procured from Whitehorse and work commenced to the north. Just at this time some discoveries of rich gold- and silver-bearing quartz were reported from 15 or 20 miles west of Robinson, which is about 20 miles north of Caribou Crossing. We examined a great number of the most likely looking claims and continued south to connect with our previous work. Thence work was extended north of the Watson River to within about 10 miles of Whitehorse, including the area of the Whitehorse coalfield.

By this time, about September 18, the weather became so severe as to prevent further field operations. We therefore travelled down the river and examined the Tantalus and Five Finger coal mines, as well as the coal on Tantalus Butte, and the surrounding country, securing sufficient detail by transit and compass surveys for a sketch map of the district. Afterwards, on the way south from Whitehorse, two days were spent in the Windy Arm district inspecting the latest development in the different mining properties.

GENERAL DESCRIPTION OF DISTRICT.

The country, generally, consists of wide valleys separated by ridges and groups of mountains, the valleys often containing lakes running, for the most part, in a northwest and southeast direction, approximately parallel to the coast line to the west, but often intersecting in an intricate manner.

In the Windy Arm district the mountains are quite rugged and rise to from 4,000 to 5,000 ft. above the valleys. The principal trees are black pine, fir, spruce, aspen and balsam poplar. Some of the valleys, as the lower part of the Wheaton River valley, are very thickly timbered, the tree-line being at an

elevation of about 2,000 ft. Farther north, in places, the hills become lower and more rolling and west of Cowley and Robinson rock outcrops are often difficult to find. Extensive muskegs exist in places.

AREA SURVEYED.

The district surveyed this season comprises an area of about 50 miles long and 20 miles wide, extending from the British Columbia boundary on the south in a northwesterly direction to within about 10 miles of Whitehorse, the eastern boundary running from Dugdale in a southwesterly direction to the east side of Windy Arm to connect with the northwest corner of Mr. J. C. Gwillim's map of the Atlin mining district, British Columbia. The western boundary is approximately parallel to this direction and extends from the west side of Lake Bennett on the south to about 20 miles west of Dugdale on the north. In addition to this the sketch map, above referred to, in the vicinity of the Tantalus and Five Finger mines, is being prepared.

GENERAL GEOLOGY.

The geology, particularly in the southern part of the district, corresponds generally with that in the Atlin district, and the geological subdivisions as made by Mr. Gwillim are practically those which have been found best to adopt here.

Extending along the eastern side of the district, sometimes included in this area and at times lying to the east of it, is a rather straight range of limestone hills, probably of Carboniferous age. A few fossils were collected, but have not yet been determined. The limestones overlie a series of older slates, cherts and limestones, which outcrop in a number of places on both sides of Windy Arm and on Nares Lake.

Overlying the limestones is a series of altered sediments including some fine-grained generally greenish rocks, which are at times difficult to distinguish from igneous rocks of later age; also some rocks presenting the appearance of much altered slates, although their slaty structure has disappeared. These sediments are in a few localities quite extensively altered to serpentines. The cherts, slates, and altered sediments are included in Mr. McConnell's Tagish series.

Along the western edge of the district are later rocks, the Coast granites, with outlying areas to the east, the granites themselves often becoming quite porphyritic, especially towards the edge of the series. Following along their eastern edge are some older schists, which are partly altered sediments and partly altered porphyries and may correspond respectively to Mr. McConnell's Nasina and Klondike series, in the Klondike goldfields.

Newer than the granites is a somewhat complex series of porphyrites, porphyries, diorites, gabbros, etc., which apparently represent rocks from the same magma, but differ considerably in character on account of segregation, cooling under different conditions, etc. Towards the edge of this series is a rather complex porphyry, presenting on weathered surfaces the appearance of a conglomerate, due to portions of a harder porphyry being included in a more easily weathered one. The mines of the Windy Arm dis-

*In "Summary Report of the Geological Survey of Canada for 1906."

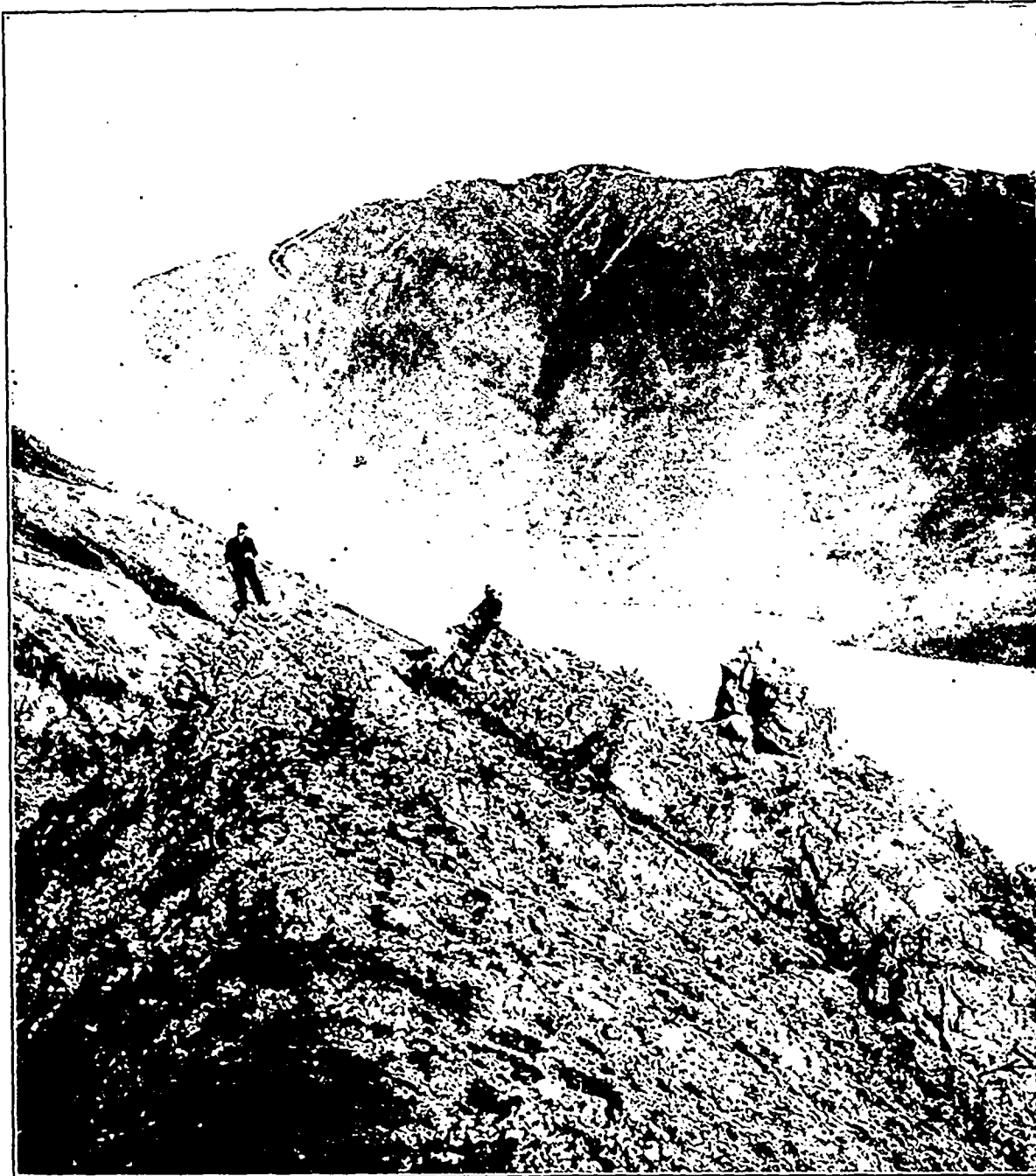
triet are in this series, and for this reason I have called these rocks the Windy Arm series.

Overlying them are some sediments of Cretaceous or Jurassic age, consisting of sandstones, shales and conglomerates, the lower shale beds being consider-

feldspar crystals is very common. Overlying all, particularly towards the north, are basalt and scoria of recent eruption.

ECONOMICS.

Although numbers of claims had been staked at



Windy Arm, Southern Yukon.

"In Windy Arm District the Mountains are Rugged and rise 4,000 to 5,000 ft. above the Valleys."

ably altered. A number of fossils were collected, but have not yet been determined. Towards the northern end of the district these sedimentaries are quite extensive and carry valuable coal deposits.

Porphyry dykes cut the sediments and the underlying formations. These later intrusives vary greatly in appearance, but, one, carrying very large, long

on any time or another, quartz mining, except a certain amount of development on the copper properties just west of Whitehorse, was scarcely attempted until the latter part of the season of 1905, when Col. J. H. Conrad commenced work on the Windy Arm properties, and though so short a time has elapsed a great deal has been accomplished. The little town of

Conrad, on the west shore of Windy Arm, has now several hotels, stores, restaurants, churches and so on, and a mining recorder's office. The whole southern part of the Yukon was formerly included in the Whitehorse mining division, but this summer the district became of sufficient importance to warrant subdivision, and the Windy Arm portion, including most of the Watson and Wheaton Rivers district is now in the Conrad mining district. A number of properties were worked continuously last winter and this summer, and considering the amount of development done, several look promising.

Many difficulties were encountered. In addition to the fact that the mines are situated high up in the mountain, wood for fuel and timbering was difficult to secure; supplies and wages being high, prospecting work was expensive; and experienced miners were exceedingly scarce. The current wage paid is \$3.50 (including board) per day of eight hours.

The district is very accessible. Once the ore is landed on the beach by the aerial tramways now running, it is only a matter of 10 or 12 miles around by Windy Arm and Nares Lake to the railway at Caribou Crossing, and a railway spur can easily be built along the shore for this distance. A good route is also possible from Log Cabin, on the White Pass & Yukon Railway, via Whynton, British Columbia, to Conrad.

Practically all the mining claims in the area surveyed this season were examined and a detailed account of each will be given in the final report; at present, only a few of the most important points in connection with the more promising properties will be given.

WINDY ARM PROPERTIES.

Some of the most important claims in this district, commencing at the north, are, respectively, the Big Thing group, Montana, Joe Petty, Aurora, Thistle, Uranus, M. and M., Vault, Venus No. 1, Venus No. 2, all owned by the Conrad Consolidated, the Ruby Silver, owned by private parties, and the Venus Extension, Beach, Red Deer and Humper No. 1, owned by the Anglo-American Company.

Big Thing.—This property is situated about five miles in a northwesterly direction from Conrad, and differs from all other properties in the district, in that it is in granite formation. In the rest, quartz veins run in true fissures in the porphyrites, etc., of the Windy Arm series. The principal vein on the Big Thing was struck this summer at the end of an 8-ft. cross-cut. A drift was then run 60 ft. on the vein, and a winze was sunk which was down about 55 ft. at the time visited last, early in October. The vein, which dips into the hill and appears to be of the elongated lens type, was widening rapidly in the bottom, becoming almost flat, and was about 10 ft. wide. The ore is chiefly secondary quartz and is very porous near the surface, showing considerable leaching action. The minerals are mostly oxides and carbonates, which will eventually change to the sulphides, etc. A considerable amount of stibnite, arsenopyrite and pyrite was found near the bottom.

Occasional very high assays, running into the hundreds, are obtained in gold and silver, and it is claimed that the ore body will average close to \$30 per ton.

The Montana is about four miles south of the Big Thing and, like it and most of the other Windy Arm properties, is situated high up on the bleak mountain side, and all wood, supplies, machinery, etc., have to be packed or pulled up, or carried up on the tramways. A \$90,000 double-cable aerial tramway runs from the northern extension of the Montana, the Mountain Hero, to Conrad, a distance of 18,697 ft. and has its upper terminal 3,464 ft. above the lower.

A drift was run for about 700 ft. in on the vein which is from 2 to 5 ft. in width, with a streak of rich ore 8 to 18 in. next the hanging wall, assaying about \$90. The rest of the vein is much leaner and may run \$20. The strike is about N. 45 deg. W., with low dips to the southwest. An incline shaft is being sunk on the lead, and about October, when last seen, at a depth of 320 ft., the vein was about 8 ft. from wall to wall, containing, however, over 4 ft. near the centre, of almost barren, leached, and somewhat decomposed porphyrite intersected by quartz stringers.

The values are chiefly in silver, the chief mineral being galena, though native silver, silver chloride, lead carbonate, argentite, pyrrargyrite, tetrahedrite, pyrite and arsenopyrite are also found.

The Joe Petty is situated on the north side of Uranus Creek, and contains a strong vein about 6 ft. wide composed of alternating layers of decomposed iron-stained quartz and mineralized country rock. A shaft about 50 ft. deep has been sunk on the lead and drifts run each way; at the end of a 40-ft. cross-cut that cuts the vein in the hill, drifts were also run. No work was done on the property this season.

The M. and M., to the east of the Joe Petty, holds a vein varying in width from 12 to 15 in., but it is high-grade ore, and can be traced for a considerable distance. The high-grade silver minerals, argentite, pyrrargyrite, and stephanite were seen here.

The Uranus is situated just across Uranus Creek from the Joe Petty. The vein is quartz and is traceable for at least 2,000 ft., with an average width, where seen, of about 3 ft. 6 in. The chief minerals are arsenopyrite and galena.

On the Thistle and Aurora, higher up the creek, above the Uranus and Joe Petty, surface work was being carried on, for the greater part of the summer, and very rich ore is reported to have been found. The ore is chiefly quartz, carrying chalcopyrite, zinc blende, malachite, and the rich silver mineral stephanite.

The Vault is situated on the south side of Pooley Canyon, about 3,000 ft. from the beach. When last seen, in October, a drift on the vein was in over 300 ft. This is the same vein, in all probability, as the Venus No. 2, and can be traced for over 4,000 ft. It is in places 20 to 23 ft. in width, being

nearly all well mineralized quartz. In places there are 4 to 6 ft. of almost solid galena. The vein here, as on the Venus, varies greatly in width, and at times is not more than a foot or so, but on the Vault, so far, except at the surface, at the entrance to the tunnel, it is fairly uniform, much more so than on the Venus. An aerial tramway to the beach is under construction, and a shorter one spans the canyon for the transport of wood and supplies. On

arsenopyrite, chalcopyrite, malachite, pyrite and a good deal of jamesonite and antimony ochre. The ore is chiefly argentiferous galena. Where the vein is wide it consists of alternating bands of quartz and more or less mineralized country rock.

A 50-h.p. gasoline engine operates a compressor here to run the machine drills used on this property, but water-power from Pooley Canyon is being installed. An aerial two-bucket tramway 1,525 ft.



In Montana Canyon, Windy Arm District.

First Camp on Mountain Hero Mineral Claim. Elevation above Tagish Lake about 3,500 ft.

the whole, this is the most promising looking property in the Windy Arm district.

Venus.—A cross-cut taps Venus No. 2 about 100 ft. from the entry and drifts were run in the lead about the same distance each way. Some stoping also was done, the vein being 18 in. to 16 ft. in width. In the stopes there are 4 to 8 ft. of good ore which will probably average over \$20 in gold and silver. A cross-cut intersects the vein at 544 ft. where drifts were also run. The vein where opened up in the lower level is narrower and leaner than above, but the narrowing is not likely to be very extensive as the vein looks well both to the north and south.

The chief minerals are galena, lead carbonate,

long runs from the lower Venus tunnel to the beach, the upper terminal being 958 ft. above the lower.

Some very rich ruby silver ore is found on the Ruby Silver claim to the west of and adjoining the Venus No. 2. The vein is from 3 to 18 in. in width.

On the Venus Extension are two veins about 30 ft. apart. The upper seam has about 4 ft. of good ore, over half of which was being sacked, when visited in October. The sacked ore will probably run \$50 to \$60 per ton. An incline sunk on the vein was down about 40 ft. The lower seam has about 2 ft. of ore, which is chiefly argentiferous galena with considerable arsenical iron and pyrite.

The Beach claim, lying to the south of the Venus Extension, and supposed to be on the same lead as

the Humper No. 1, has over 10 in. of ore claimed to average about \$150 in silver with probably \$5 in gold. The chief minerals are galena, argentite, zinc blende and pyrite.

The Red Deer has about 6 in. of, in places, almost solid galena, which is claimed to run over \$90 per ton.

The Humper No. 1 is a particularly promising property, though only about 70 ft. of work, which was chiefly in drifts, had been done at the time of my visit. The vein, which can be traced for at least 1,700 to 1,800 ft., is from 18 in. to 4 ft. in width and carries a large amount of argentite, ruby silver and stephanite, as well as native silver, galena, and pyrite. About 8 in. of the vein will average over 300 oz. in silver and a narrow streak of argentite, which is quite persistent and has a width of half to three-quarters of an inch, runs 3,000 oz. in silver.

WATSON AND WHEATON RIVERS PROPERTIES.

Considerable excitement was caused this season by the finding by D. Hodnett and J. Stagar of quartz carrying free gold and telluride minerals between the Watson and Wheaton Rivers. The first claim, the Gold Reef, was staked, on June 25, on Gold Hill, which is situated about 15 or 20 miles southwest from Robinson siding. Within 90 days of the staking over 700 claims had been located.

A belt, or belts, of schists, approximately half a mile wide, outcrops in a northwest and southeast direction, near the eastern edge of the granites, which often become porphyritic. Dykes of greenish porphyry and porphyrite occur in the granites, also near their eastern edge, and it is in this disturbed belt that the quartz veins were mostly found. They are, as a rule, very persistent and can sometimes be traced for several miles. Outcrops of quartz closely resembling each other are seen in almost straight lines, at short intervals, and with the same general strike from the Watson River to about 5 or 10 miles south of the Wheaton River, a distance of nearly 20 miles, and although most of the veins found were in this narrow belt, about two miles wide, Mr. Porter and others discovered, towards the close of the season, some deposits of quite pure stibnite, and other minerals, at a considerable distance to the west.

The first discoveries on Gold Hill, Hodnett Mountain and Mineral Hill are all in the line of strike of the veins and just south of the Watson River. The main lead is for long distances 10 to 14 ft. of almost solid quartz, in places fairly well mineralized with galena, argentite, chalcopyrite, malachite, and pyrite. The vein on the Gold Reef which is in the schists, and is well defined on the surface, appears to be 4 or 5 ft. in width. A pocket or seam of very rich ore carrying coarse gold was found in this vein from which came also the rich telluride minerals, sylvanite, hessite and telluric ochre. Further work on this claim has disclosed, as yet, no more of the rich minerals.

A group of claims, the Custer, Alice M., and Ramon, staked south of the Gold Reef on a grey copper

lead looked somewhat promising, although no work had been done when seen. The width of the vein was somewhat indefinite on account of wash and slide rock, but is probably about 6 ft. and appears to be well mineralized.

The Legal Tender, staked by J. Perkins, lies to the northwest of these properties, and is on a very steep rugged hill on the south bank of the Watson River. The vein is in a fissure in the granite, and is three to three and a half feet in width where exposed; it is quartz carrying a considerable amount of argentiferous galena with some chalcopyrite, malachite, and pyrite. The values are chiefly in silver and the vein is claimed to average about \$40 per ton.

On Big Bend Mountain to the south of the Wheaton River and seven or eight miles southeast of Gold Hill, and in the line of strike of the mineral belt, a number of claims were staked by L. Belnew, O. Dickson, J. Perkins and others on strong well-defined quartz veins carrying galena, chalcopyrite, pyrite, etc. Also southwest of this again, in the same direction, on Stevens Mountain, and to the west of it, a number of similar looking claims were located by Messrs. Stevens, M. Gilliam and others.

In addition to occasional assays running as high as \$300 or over, a number of fairly average assays—from \$20 to \$60—were obtained in this section, but, with the exception of a small amount of work done on the Gold Reef, no attempt has been made to prove to what extent the veins are mineralized or what values they really carry.

Taking into consideration the large quantity of mineralized quartz in this part of the country and the small amount of prospecting done, the results appear encouraging and should stimulate both prospectors and capitalists to investigate this belt more closely, particularly to the northwest and west. There are certainly some rich ores in this section.

Coal, also, was found about two miles to the east of Gold Hill, at the same horizon as that in the Whitehorse coalfields to the north, but whether it will be in payable quantities remains to be seen.

A group of four claims known as the Union Mines is situated on the hills just to the west of Annie Lake, about nine miles due west of Lansdowne siding and about three or four miles east of Gold Hill. These claims were first staked by W. P. Schnobel in 1898, and are supposed to cover the ground known as the "Lost Mine." Some development has been done on them and preparations are being made to work through this winter. A 10-ton shipment of ore gave, according to Mr. Schnobel, returns of over \$20 per ton. The values are chiefly in silver, with a little gold.

WHITEHORSE COAL.

Several seams of anthracite coal are located in an area known as the "Whitehorse Coal" and outcrop about 12 or 14 miles in a southwest direction from Dugdale siding. A tunnel about 60 ft. long has been run on one of these seams and a few open cuts

have been made; otherwise the coal is entirely undeveloped. The strike at the tunnel is true north 63 deg. west with 42 deg. dip to the northwest. The general strike of the measures, which are quite regular and were traced for over 12 miles, is about north 74 deg. west. The seams measured were 9 ft. 8 in., 10 ft. 4 in., 2 ft. 6 in. respectively. The samples taken run high in ash, but they were surface samples and with depth the ash will be very considerably less. Probably a number of other seams exist, as the measures have not been prospected to any extent, although they are very favourably situated for so doing, and a small amount of work should give much definite information. There is a very good grade from the White Pass & Yukon railway into these claims and, considering their proximity to the Whitehorse copper deposits, the town of Whitehorse, and the Watson and Wheaton Rivers claims, this coal should prove of considerable value in the near future.

TANTALUS MINE.

This mine is situated on the west side of the Lewes River, about 190 miles down the river from Whitehorse, being somewhat less than half way to Dawson. As the coal outcrops here on the river banks it is well situated for economic working. The cars are run out of the tunnels, pulled by cable up an incline, from which the coal is dumped into bunkers, ready for loading. Most of the river steamers burn this coal, of which about 7,000 tons will be loaded this season.

Three workable seams are opened up though only the lower two are being mined at present; others may yet be found as the formation is heavily covered in most places. The coal is worked by the stall and pillar system from two tunnels, which were in about 700 ft. when visited in October. Although the seams are dirty, the coal can easily be sorted, but as wages are \$5 with board for underground, and \$4 with board for surface work, this has not been done as yet.

The following section was measured near the end of tunnels:—

Bottom seam—		
Coal	2 Ft. 4 In.	
Shale	0 " 7 "	
Coal	2 " 0 "	
Shale	0 " 6 "	
Coal	2 " 11 "	
Shale	4 " 0 "	
Middle seam—		
Coal	2 " 3 "	
Shale	0 " 2 "	
Coal	0 " 7 "	
Shale	0 " 2 "	
Coal	2 " 0 "	
Shale	0 " 2 "	
Coal	1 " 8 "	
Shale	7 " 0 "	
Top seam—		
Coal	3 " 0 "	
Shale . . . . .	.. ..

These measures are quite regular, and can be traced for over 20 miles down the Nordenskiöld River to the south and over 10 miles to the north, showing that there is an enormous amount of coal in this district; when the measures shall have been prospected they may be found to extend much farther. Only coal near the river is, at present, of economic value. The dips are to the east and vary from 24 deg. to 40 deg. Samples taken show the coal to be a bituminous coal that yields an average of about 75 per cent. of a firm coherent coke.

At Tantalus Butte, across the river from the Tantalus mine, the same measures again outcrop, but dipping to the west, showing the presence of a synclinal fold in between. The coal outcrops are near the top of the butte about 400 ft. above the river, having wash and terrace material covering the formation lower down. The best seam seen had 5 ft. of good, firm, clean looking coal with a foot more of coal and shale on the bottom. Other seams seen were dirty and narrow, but there may be good ones obscured by the drift, etc., as practically no work has been done, except small surface cuttings. Altogether, the general conditions of the measures are quite similar to those at the Tantalus mine and this property will probably be worked in the near future. The surface samples obtained did not give a firm coke, but this coal is likely to coke with depth.

FIVE FINGERS MINE.

This is situated on the east side of the river about eight miles north of the Tantalus mine. A considerable amount of coal has been shipped from here, but the old workings, being dangerously situated on the steep clay and sand banks of the river, are not now used. The slope, at present being sunk, is to the north and in safe ground, and at the time visited was down about 525 ft., dipping to the east at 16 deg. The seam at this depth was about 2 ft. wide, and was apparently becoming wider. It had once narrowed to about 6 in. An average of 2 ft. yielded 55.5 per cent. of firm coherent coke. These measures are not the same as those at the Tantalus mine, but are below them. The upper measures outcrop in the valley to the east of the ridge of hills just above the mine.

CONCLUSION.

Considering that quartz mining has so lately commenced in the southern part of the Yukon, the results are exceedingly encouraging. Just to the north of the Windy Arm and Watson and Wheaton Rivers properties are the rich and extensive copper deposits west of Whitehorse. The Pueblo, in particular, after this season's development, presents an enormous surface showing of copper ores. A Whitehorse smelter is a probability in the near future, especially as there is plenty of available coal in the Yukon for metallurgical coke. Plenty of water power is also obtainable from Miles Canyon.

Official records show British Columbia's mineral production to the end of 1906 as having reached an aggregate value of \$273,000,000.

DR. ROBERT BELL, F.R.S.

Official Career of Distinguished Geologist and Geographer Who Recently Completed His Fiftieth Year in Government Service.

DR. ROBERT BELL, new chief geologist of the Geological Survey of Canada, on March 1, 1907, completed his fiftieth year of active official service. An appreciative article published a short time ago in the Montreal Star closed with the following paragraph: 'Dr. Bell has been engaged in governmental scientific work for half a century, and is still good for many more years of ardent labour, as he retains all the health and energy of youth. No other man living or dead has done anything approaching the amount of good geographical and geological work which he has already accomplished in all parts of the Dominion east of the Rocky Mountains.'

Another tribute to the good work done by this eminent scientist was paid by the same newspaper in the following words: "Dr. Bell has been fortunate in his opportunities for making extensive surveys of two kinds, the work having been done first for the Government of old Canada, and since 1867 for the Dominion Government. The geographical part was done as being essential to the geological, which was the principal object. It is well known that the former has been appreciated for many years, wherever geography is studied, but the latter has really been the more important service to Canada from the utilitarian economic point of view, and it will be found of the highest value as the information acquired becomes more and more needed in the progress of mining and practical geology in the Dominion."

In view of the great service Dr. Bell has rendered to Canada during his long and eminently useful official life, the MINING RECORD deems it fitting that in the West, which has benefitted materially by Dr. Bell's practical interest in its economic geology, much publicity shall be given to the fact that the chief geographical societies of the English-speaking world have recognized the extent and value of the geographical part of his work and have in consequence honoured him as it falls to the lot of but few men to be honoured. In furtherance of this idea a comprehensive review of Dr. Bell's official career, which appeared in the Ottawa *Free Press*, is here reprinted, as follows:

"Dr. Bell's extensive work during his long connection with the Geological Survey of Canada has been of an original and practical character, and has been carried on largely in the wilder parts of the Dominion. Great zeal, perseverance and patience, as well as courage and endurance, were required for its successful execution. Very extensive topographical and geological explorations and actual surveys were made, comprising sea coasts, many of the larger rivers and great numbers of the smaller ones, as well

as hundreds of lakes, all over the territory northward nearly to the Arctic Circle. The performance of these duties involved innumerable risks and much hardship and suffering from fatigue, cold, wet and hunger. In connection with the foregoing work, investigations were constantly made as to the mineral resources, the forests, the contour of the country, the soil, climate, fisheries, the fauna and flora in general, and everything which might constitute the natural wealth of these immense and almost unknown regions. Dr. Bell's great opportunities have enabled him to publish several valuable papers and maps on the forestry of Canada. It is everywhere acknowledged that the outcome of this pioneer work is now proving most valuable in promoting the rapid development of the Dominion and in bringing the country to its present condition of advancement and prosperity.

'Among the most important advantages already derived from Dr. Bell's surveys and maps have been their use in the general location of parts of the Canadian Pacific Railway, and of long stretches of the Grand Trunk Pacific Railway in the extensive territories between Quebec and Winnipeg. His numerous reports describing accurately that country constituted the "mountains of information" available at the time of the inception of the transcontinental railway scheme, and enabled the parliament of Canada to decide, at once, to construct the proposed line, thereby saving the time which would otherwise have been required to exploit the country before this enterprise could have been authorized with any degree of confidence.

"Dr. Bell's extensive work was recognized in May last by the Royal Geographical Society, when its council unanimously awarded him the Patron's or King's Gold Medal, its highest prize, with the cordial approval of His Majesty, and in the month of November of the same year, the American Geographical Society also awarded Dr. Bell its principal distinction, the Cullum Gold Medal, which had not previously been given to any geographer in Canada. He has also done good service to geography as a member of the Dominion Government Geological Board. He was president of the International Congress of Americanists, which held such a successful meeting at Quebec last September, and was re-elected president for the next congress which is to meet in Vienna in 1908.

"Dr. Bell holds many scientific and academic distinctions, among which may be mentioned: F. R. S., D. Sc. (McGill), Sc. D., Hon. (Cambridge), LL. D. (Queen's), M. D., C. M. (McGill), F. G. S. (London and Am.), foundation Fellow of the Royal Society of Canada, Member of the American Institute of Mining Engineers, Hon. Member of the Medico-Chirurgical Society of Montreal, etc., and he has been honoured by the King with the Companionship of the Imperial Service Order 'for faithful service.' He was professor of the natural sciences at Queen's University, Kingston, for five sessions, and served

as one of the Royal Commissioners on the Mineral Resources of Ontario (1888-89), whose report was so welcomed and highly esteemed by the public, as supplying a long-felt want. He has published more than 200 reports and papers on the geology, geography, biology, forestry, etc., of Canada.

"Dr. Bell accompanied the three Canadian Government expeditions into Hudson Bay by the respective steamships 'Neptune,' 'Alert,' and 'Diana,' as naturalist and geologist, and also as medical officer on the two expeditions first-named. He has also navigated Hudson Strait in other vessels and has made a total of nine through passages.

"On being placed in charge of the Geological Survey early in 1901, Dr. Bell was presented with an address, signed by all the staff, expressing their satisfaction and assuring him of their hearty and unanimous co-operation in the various branches of the work. Immediately after assuming the duties of this office he set about the task of giving a more directly practical character to the operations of the Survey and confined its researches as much as possible to economic geology, as shown by the reports. A series of bulletins on the 'Economic Minerals of Canada' was commenced, and sixteen of them were issued, while a number of others were written and now await publication.

"While acting as director for more than five years, Dr. Bell inspired enthusiasm and the survey accomplished every year fully double the amount of original work in both field and office which had been done in previous years. Instead of about a dozen field parties, as formerly, more than 30 on an average were sent out each season to those districts where he knew they were most needed. The annual 'Summary Report' was greatly improved, and the arrears of printing were all brought up to date. Money was obtained for preparing a necessary index to the whole series of annual reports.

"Grants were also procured for increasing considerably the draughting and the engraving of the Survey, so as to keep pace with the field-work. Of the total number of maps which have been published during the 63 years from the commencement of the Survey almost half were produced during the five years Dr. Bell was in control. The library of the department has been greatly improved by the purchase of much needed books, for which a special grant of \$2,700 a year was obtained. The distribution of specimens of rocks and minerals to educational institutions throughout Canada was improved and systematized.

"Dr. Bell originated the International Committee of the Canadian and United States Surveys which has already accomplished so much in geological correlation and in harmonizing the results of geological work over the whole continent.

"At the time British Columbia was incorporated with the Dominion, Dr. Bell suggested the clause in the agreement which requires a geological survey to be constantly maintained and in 1904 he obtained,

through the minister of the interior, an additional grant of \$19,000 a year to enable him to carry on additional work on the economic geology of British Columbia and the Yukon Territory.

"Dr. Bell has enjoyed exceptional opportunities for examining a great number and variety of mines, not only in the older provinces of the Dominion, but also in British Columbia and Yukon Territory; and outside of Canada, in the northern United States, in California, Arizona, Mexico, in Great Britain, Germany and eastern Europe. Long study and extensive observation are essential to enable a geologist to judge of the probable value of undeveloped mineral prospects. For many years before the Survey began to collect mining statistics officially, Dr. Bell had every year gathered full information on this subject and now possesses a record of mining operations since 1863.

"A considerable number of Dr. Bell's former assistants or students occupy distinguished scientific positions in Canada and the United States, including a number of professorships in the universities of both countries. Although the members of the staff were poorly paid, not one of them left the Survey during his administration.

"It was owing to Dr. Bell's initiative that the offices and museum of the Geological Survey were removed from Montreal to Ottawa in 1881."

THE KING'S GOLD MEDAL.

Regarding the respective medals of which Dr. Bell has been the honoured recipient, it may be mentioned that the Patron's or King's Gold Medal, which is the chief yearly prize of the Royal Geographical Society, was founded when the society was established, in 1830. The medal itself is a beautiful work of art and is paid for by the King. Some of its recipients in the earlier days were Enderley, Burns, Chesney, Carl Ritter, Fitzroy, and later Sir George Nares, for geographical services in various parts of the world. Among those who have won the Patron's Medal for their explorations and surveys in North America were Thos. Simpson, Dr. Rae, Captain Back, John Ross, Captain Palliser, Sir Robert McClure and Sir Leopold McClintock. This medal or other award of the Royal Geographical Society has been bestowed upon the more noted African explorers, such as Dr. Livingston, Captains Speke, Grant and Burton, Sir Samuel Baker and Sir Henry M. Stanley.

THE CULLUM MEDAL.

Like the Patron's Medal of the British society, the Cullum Medal of the American Geographical Society is the principal prize the latter has to bestow. It is a magnificent gold medal, artistically executed, and its cost is defrayed by the revenue from \$5,000 bequeathed to the society by the late General George W. Cullum of the United States army. His will directs that the income from the above bequest is to be used for the presentation annually of a gold medal "to those who distinguish themselves by geographical discoveries or in the advancement of geographical

science, particularly citizens of the United States of America." The recipient is to be chosen by at least a two-thirds vote of the whole council of the society.

The fact that this is the first time the Cullum Medal has been voted to a geographer in Canada gives great additional value to its award to Dr. Bell. Among those who in other years received this coveted prize are Captain R. E. Peary, of the United States navy, and other distinguished men, who have done special service to geography on this continent and in other lands.

Sincere congratulations have been tendered to Dr. Bell from all parts of Canada, and these are heartily joined in by many in the West who hold him in high esteem, both from a personal standpoint and in appreciation of his eminent services.

COALS AND COAL FIELDS OF ALBERTA, SASKATCHEWAN AND MANITOBA.

By D. B. DOWLING.*

ANY DESCRIPTION of the coal fields of the three prairie provinces to be complete would necessarily be lengthy, but the present paper is an attempt at a resume of the extent and character of the coals to be found there.

The rocks in which these coals are found all belong to the sediments of the Cretaceous sea and the coal horizons are in three successive portions of the period. Each one marks a time when the surface was not very much above the sea but high enough to support a luxuriant flora. The history of the period seems to be as follows: At the beginning of the Cretaceous time the land surface consisted of limestone beds which extended westward to the Selkirks. This began to sink along its western margin, concurrently with an elevation in the Selkirk region. The sinking went on to below sea level but the subsidence was made up by a heavy deposit of sand and mud derived mostly from the elevated land to the west. This then gradually spread eastward but was very intermittent, so that large land areas were formed and covered by vegetation. A great submergence beneath a muddy sea next occupied a long portion of the Cretaceous time, but again the crust was sufficiently elevated to bring the muddy bottom to sea level. The western portion did come to the sea level or even above it and coal deposits were formed; but it is not definitely known how far east they extended. One total submergence succeeded another, but for shorter time, before this new muddy surface rose above the sea for the last time; and again in its transition period coal beds were formed.

This threefold coal-forming period gives us three horizons in which to look for coal: At the base; above the middle; and at the top of the Cretaceous sea deposits.

The first we call the Kootanie; the second the

Belly River; and the third the Edmonton or Laramie.

In the three formations the quality of the coal varies under two fairly good rules. The first is that in the same district coals of the lower horizons, owing to age and pressure of the beds above them, should show a greater percentage of fixed carbon and also be more compact. The second is a general tendency to increase both the fuel ratio and the compactness in going toward the mountains, mainly on account of the increase in the thickness of all the deposits in that direction and thus the load over the seams. The fuel ratio is the fixed carbon divided by the volatile combustible matter and the term porosity is here taken to mean the percentage of water absorbed by the coal.

KOOTANIE MEASURES.

The lowest horizon is exposed in the raised and tilted blocks of the crust shown in, and in the neighbourhood of, the Rocky Mountains. The quality of the coal, as given by the fuel ratio, varies considerably; and from a number of analyses the following notes will show the general range:

In the Elk River region the variation shown at Morrissey ranges from 3.2 to 6.12. At Fernie the ratio increases from 3.22 to 4.60 in the lower seams. At Michel two seams differ slightly, the ratios being 3.5 and 3.7. The eastern outcrops of some of these seams on Marten Creek evidently show less change in the physical structure as the ratio falls from 2.08 to 1.86. In order to bring all the areas under notice lists are added giving full rate and thickness of seams arranged in order of hardness. The areas within the mountains may briefly be outlined as:

(1) Elk River basin with 22 workable seams containing 216 ft. of coal. This, with a slight gap, extends north to the head of Elk River.

(2) Crow's Nest areas, several narrow blocks known as the Coleman-Blairmore areas, with 21 seams and 125 ft. of coal and extending north ending with the Sheep Creek area in front of Mount Rae.

(3) Moose Mountain area, south of Morley, with 2 seams, 7 and 8 ft. respectively.

(4) Cascade area, running from the mountains north of the Elbow River northward to near the Saskatchewan, having mines at Canmore and Bankhead. In the vicinity of the Bow River there are 10 to 14 workable seams and 75 to over 100 ft. of coal. Its extension north of Red Deer River has 15 workable seams with 114 ft. of coal.

(5) Palliser area on Panther Creek, east of Cascade coal basin, several seams known. Area not extensive.

(6) Costigan area on Panther Creek, five seams known with 27 ft. of coal.

(7) Bighorn area running from Saskatchewan River north to past Brazeau River, only about 5 seams yet located, largest 16 ft.

(8) Other areas in foot-hills, or farther north, not yet discovered.

The Kootanie coals are all so well compacted that less than 2 per cent of water, as a rule, is absorbed

*Of the Geological Survey of Canada. Paper contributed to the annual meeting of the Canadian Mining Institute, held at Toronto, Ontario, March, 1907.

Comparisons of the fuel ratios in the Kootanie coals give us what might be called a scale of their hardness. The same comparisons in the fuels of the upper horizons show only the degree of alteration that has taken place in them during their change from vegetable matter toward the more stable condition as coals. They all show, in a marked manner, that their substance has not been so compactly pressed, as they all absorb much greater percentages of water. The Belly River coals are slightly denser than the Edmonton coals of the same district, but it is not until the seams outcrop near the mountains that this character is well marked.

In the western upturn they carry less than 3 per cent. of water, while the Edmonton coals run from 3 to 7 per cent. For the Lethbridge area the difference is not so strongly marked except at one or two localities.

COALS OF BELLY RIVER FORMATION IN WESTERN
UPTURN OR FOOTHILLS.

Localities	Fuel ratio. Per cent.	Porosity. Per cent.	Thickness of seam.	
			Ft. In.	
Head of Mill and Pincher Creeks	2.96	1.99	8	0
Mill Creek, 4 miles above mill..	2.02	1.63	8	0
Sheep Creep, Tp. 19, R. 4 west of S.	1.62	2.16	5	0
Sheep Creek, Tp. 19, R. 4 west of S.	1.57	2.50	7	0
Morley, on Indian Reserve.....	1.18	1.26	6	0

COALS OF BELLY RIVER IN LETHBRIDGE AREA.

Localities	Fuel ratio. Per cent.	Porosity. Per cent.	Thickness of seam.	
			Ft. In.	
Taber Coal Co.....	1.83	10.8	3	3
McPhee mine near Taber.....	1.72	11.35	2	7
10¼ miles above Medicine Hat..	1.62	17.70	4	0
Belly River, Driftwood Bend..	1.40	9.18	3	3
St. Mary River, 7 miles from mouth	1.38	7.02	3	8
10 miles above Medicine Hat...	1.38	16.82	4	0
Bow River, Grassy Island.....	1.34	11.96	4	6
Red Deer River, 9½ miles below Bull pd.	1.32	5.58	3	0
Milk River Ridge, north side..	1.26	6.50	5	6
Lethbridge, main seam	1.25	20.54	5	0
Stair, main seam	1.15	13.63	1	6
Red Deer River, 4½ miles below Bull pd.	1.15	13.63	1	6
Red Deer River, 2 miles be- low Bull pd.	1.19	12.62	1	3

LARAMIE—EDMONTON AREA.

The larger coal areas of both Alberta and Saskatchewan are of the above formations and are practically on one and the same horizon, which occupies the dividing line between sea deposits below and

fresh water and land deposits above. Some of the coal seams are in the upper fresh water stage—the top of the Laramie; but the majority are in beds separated by sands and clays, holding remains of organisms which lived in brackish water—the Edmonton or Lower Laramie. In Saskatchewan the divisional lines between these deposits are not worked out; but in Alberta, the beginning of fresh water stage is drawn at about the horizon of the "Big Coal Seam" on the Saskatchewan. The formation originally probably covered a very large area, but the uplift of the western edge and the subsequent denudation of a great part of the plateau formed of these soft beds, has left remnants only of the upper coal rocks. In Saskatchewan these remnants occupy the high lands in the Cypress Hills and Wood Mountain and a triangular area eastward from the Coteau.

A great excavated depression running outward from the mountains, branching to north and south of the Cypress Hills, separates them from the plateau running north and south and sloping eastward from the foot of the mountains. The western coal area occupies a belt near the eastern edge of this slope, narrow at the south but widening northward reaching its maximum in the latitude of Edmonton. The coal rocks are then covered farther up the slope by heavy beds of sandstone, but emerge from under them along a narrower band just in front of the foot-hills in some parts and in others, generally in the south, nearer the mountains. There is thus one part of the field which has suffered much pressure and in this the coals show the effect of the compression. The thickness of the seams in this area appears to increase to the north. Thus in the vicinity of Bow River, seams of 4 ft. 6 in., 6 and 9 ft. are the best that are known; but in the vicinity of the Saskatchewan, seams of 8, 18, 4 and 6 ft. occur near Edmonton and at the Pembina River the horizon of the Big Seam shows three seams, 13, 13 and 6 ft. or 32 ft. of coal.

In the Saskatchewan areas, the coal seams of the Cypress Hills and eastward to Wood Mountain, are all thin; but a 4-ft. seam south of Cypress Hills may prove fairly persistent. In Wood Mountain two seams of 6 and 8 ft. respectively will probably be utilized. On the eastern side of the Coteau at the Dirt Hills three seams, 7, 3 and 6 ft., are reported. In the Souris district seams of 5 and 8 ft. are being mined, the latter reported as thickening to 15 ft. toward the east.

In the following list which is here, for uniformity, arranged as the others in order of fuel ratio, the porosity runs somewhat at variance with this scheme; but if the arrangement had been by porosity only a regular progression from west to east would have been nearer secured, since all the coals absorbing water 3 to 7.1 per cent. actually come from the beds in the disturbed western part of the field. All those absorbing from 8 to 14 per cent. are from the eastern portion of the Edmonton field, while all with a porosity of from 14 to 22 per cent. are from the Saskatchewan areas.

LIST OF LARAMIE AND EDMONTON COALS IN ORDER OF THEIR FUEL RATIO.

Localities	Fuel ratio. Per cent.	Porosity. Per cent.	Thickness of seam. Ft. In.
Shaws Coal mine, Fish Creek...	1.66	3.76	2 0
Blackfoot Reserve, 6½ miles below Crossing	1.6to1.5	12.31	4 8
Big Seam, Saskatchewan River...	1.6to1.3	11.14	18 0
Indian Farm, Pincher Creek....	1.58	5.38	3 0
North Fork, Highwood River...	1.56	6.12	1 6
Athabaska River, above McLeod River	1.53	10.58	3 0
Athabaska River above McLeod River	1.49	11.47	10 0
Edmonton, just below town....	1.49	12.89	6 0
Pembina River Tp. 53 R. 7 west of 5th lowest	1.48	13.07	6 0
Pembina River Tp. 53 R 7 west of 5th highest	1.47	13.78	13 0
Red Deer River in foot-hills...	1.46	4.97	9 0
Rocky Mountain House seam...	1.45	7.01	2 0
Red Deer River 4 miles below Tail Creek	1.41	10.02	5 11
Red Deer River, mouth of Rosebud	1.40	13.08	6 0
Battle River, Meeting Creek...	1.39	11.68	4 6
Sheep Creek Coal mine, Lincoln P. O.	1.38	3.08	4 0
Coal Creek, west of Cochrane, Alta.....	1.38	4.93	4 6
Edmonton, The Ross seam....	1.34	11.47	4 0
Red Deer River, 12 miles above Tail Creek	1.33	7.66	7 0
Knee Hills Creek.....	1.33	9.86	4 0
Crowfoot Creek, 4 miles from Bow River	1.33	11.25	6 0
Bow River, 4 miles below Blackfoot Crossing	1.31	10.72	8 11
Big Island, 12 miles above Edmonton	1.30	8.92	3 8
Egg Creek, near Victoria, Alta..	1.24	11.91	1 1
Borehole on Souris River, east of mines	1.26	17.78	6 0
Dirt Hills, upper seam.....	1.24	14.80	7 0
Dirt Hills, lowest seam.....	1.24	15.50	6 0
Dirt Hills, middle seam.....	1.11	17.53	3 0
Souris River, mouth of Short Creek	1.10	21.84	5 0
Long Creek, one mile north of Wood End	1.08	15.11	7 0
Bow River, three miles south of Horseshoe Bend	1.06	11.13	4 6
Poplar River Tp. 1, R. 28 west of 2nd.	1.01	12.05	18 0
Willow Creek, south of Cypress Hills	1.05	16.37	4 0
Wood Mountain, lowest seam..	1.04	12.26	8 0
" " Hay flat.....	.99	13.73	6 0
" " Upper seam....	.96	18.61	8 0
Turtle Mountain, from locality in Dakota .....	.90	13.98	. .
Long Creek, opposite Estevan..	.63	17.97	6 6
Long Creek, near Wood End..	.70	14.73	7 0
Big Muddy Creek, south of Willow Bunch .....	.58	16.28	5 0
Big Muddy Creek, south of Willow Bunch .....	.55	15.51	4 0
Big Muddy Creek, south of Upper seam .....	.54	15.20	3 0

THE SHINING BEAUTY GROUP, GOLDEN.

THE GOLDEN STAR lately obtained from the manager of the Laborers' Co-Operative Mining Co. a statement concerning that company's Shining Beauty group of mineral claims. The greater part of this dealt with results obtained from sampling and assaying, both of which were, it is stated, systematically and carefully done last year by the late Frank N. Anderson, who up to the time of his recent death was the company's mining engineer.

In addition to the somewhat full particulars above-mentioned, the following information was given:

The upper tunnel, designated No. 1 of the Shining Beauty group, is located about 280 ft. below the summit of the mountain range. No. 2 is situated about 175 ft. perpendicularly below No. 1; its mouth is distant from that of No. 1 down the mountain 212 ft. at an angle of 65 deg.

Mr. Anderson outlined a mode of development work, which he believed would successfully and economically develop the Shining Beauty group of mineral claims into an early dividend-paying property, and at no great outlay of money. Accordingly he advised the installation of an electric drilling plant at an early date, which would hasten development work, and save the company much money. It was his opinion that the tunnel should be driven into the mountain at least 1,000 ft. further to fully determine the general character of the ore body, as it is changing. He had scientific reasons for believing that some of the present ores would disappear and the others become stronger, while the lodes of mineral would become more valuable, so for him to advise, at this time, the installation of a mill, cyanide or reduction plant, was premature, for if now installed, it might in the near future require some radical and expensive changes at the cost of the stockholders.

The manager advised the board of directors of the Laborers' Co-Operative Co. to first develop the mines to ascertain the true character of the ores and their intrinsic values, and then, when the proper time shall come, no mistake will be made in the installation of a reduction plant.

Between \$17,000,000 and \$18,000,000 is the aggregate value of all lead produced in British Columbia in twenty years, 1887-1906. The total for the first half of this period was only \$1,581,000; that for the latter half was \$16,044,000. The highest year was 1900 with a total value of \$2,692,000.

In twenty years, 1887-1906, silver to the value of \$25,586,000 has been mined in British Columbia. The yearly production has ranged from a minimum of \$4,000 in 1891 to a maximum of \$3,273,000 in 1897. The aggregate for nine years, to end of 1895, was \$1,928,000; a substantial increase was made the next following year, for which the total was \$2,100,000. Since then the annual production has varied in amount between that of \$1,521,000 in 1903 and that shown above for 1897.

COMPANY CABLES AND NOTES.

CABLES.

British Columbia.

Le Roi—March: Shipments amount to 12,310 tons, containing 2,330 oz. gold, 5,200 oz. silver and 230,000 lb. copper. Estimated profit on this ore after deducting cost of mining, smelting, realization and depreciation, \$2,000. Expenditure on development work during the month, \$16,500. (Office note.—Coal and coke supplies are now available, and two furnaces are being operated at the Northport smelter. An option has been taken by the company upon the Spitzee and certain other mineral claims adjoining the *Le Roi* property.)

Le Roi No. 2—March: Josie mine report: Shipped 2,100 tons. The net receipts are \$31,630, being payment for 1,874 tons shipped and \$1,815 being payment for 67 tons of concentrates shipped, in all \$33,451. Vancouver mine report:—Shipped 57 tons. The net receipts are \$855, being payment for 18 tons shipped, and \$3,075 being payment for 37 tons concentrates, in all \$3,930. The mill has been running since the flume was repaired, March 21.

Slough Creek—Early in April the manager cabled from British Columbia: "New machinery started working on 2nd inst." A few days later he advised by cable: "New machinery running well."

Tyce—March: Smelter ran 19 days, and smelted—Tyce ore, 1,823 tons; custom ore, 2,649 tons; total, 4,472 tons. Matte produced from same, 432 tons; gross value of contents (copper, silver and gold), after deducting costs of refining and purchase of custom ore, \$21,281.

U. S. A.

Alaska Mexican—March: 120-stamp mill ran 25 $\frac{3}{4}$ days; crushed 18,100 tons of ore; estimated realizable value of bullion, \$28,476. Saved 290 tons sulphurets; estimated realizable value, \$20,755. Working expenses, \$40,886.

Alaska Treadwell—March: 240-stamp mill ran 27 $\frac{3}{4}$ days; crushed 30,100 tons; estimated realizable value of bullion, \$32,190. Saved 750 tons sulphurets; estimated realizable value, \$43,245. Working expenses, \$73,225.

Alaska United—March: Ready Bullion claim 120-stamp mill ran 27 $\frac{1}{2}$ days, crushed 18,870 tons ore; estimated realizable value of bullion, \$20,859. Saved 274 tons sulphurets, estimated realizable value, \$10,362. Working expenses, \$33,563.

DIVIDEND.

The customary quarterly dividend at the rate of ten per cent. per annum on the issued capital stock of the Consolidated Mining and Smelting Co. of Canada, Ltd., has been declared payable to all shareholders when the company's share books closed on April 22. The amount of issued stock is \$4,833,800 and the dividend \$120,845.

NOTES.

Notice is given that three months after May 3, 1907, the British American Dredging Co., Ltd., will apply for authority to change its name to that of the British Columbia Electric Mining Co., Ltd.

At a meeting of shareholders in the Morrison Mines, Ltd., held recently at Greenwood, Boundary district, the sale of the company's property to the Dominion Copper Co. was ratified and confirmed.

The adjourned annual general meeting of shareholders in the Crow's Nest Pass Coal Co., Ltd., has been called for May 2, in Toronto, Ontario.

The annual general meeting of the Reward Gold and Silver Mining Co., Ltd., is to be held in St. Paul, Minnesota, U. S. A., early in May. Fred C. Elliott, barrister, of Trout Lake City, Lardeau, the company's representative in British Columbia, has gone to St. Paul to attend it.

The Ferguson Mines, Ltd., has resumed work at its Silver Cup mine, after a suspension of about a month. This mine is situated a few miles from the town of Ferguson, northern Lardeau.

In the matter of the Consolidated Mining and Smelting Co. of Canada, Ltd., plaintiff, and the Rossland Red Mountain Consolidated Gold Mining Co., Ltd., defendant,

the latter being a judgment debtor to the former in the amount of \$26,589.39 and costs, the Red Mountain mineral claim, situated near Rossland, was on April 10 sold by auction by the sheriff. The purchaser was R. H. Stewart, mine manager for the plaintiff company.

On April 14 the *Rosland Miner* stated that all ore from the *Le Roi* mine will hereafter be sent to the *Le Roi* Co.'s smelter at Northport. The contract with the Consolidated Mining and Smelting Co. of Canada has been cancelled by mutual agreement, so no more ore will be sent to the latter company's smelter at Trail.

The Canadian Marble and Granite Co. of Nelson has secured the contract for the supply of the dressed stone required for the new post office to be erected at Fernie, Crow's Nest Pass, East Kootenay.

The contract for driving 200 ft. of tunnel on the Dominion Copper Co.'s Crown Silver claim in Deadwood camp, Boundary district, has been completed. It is claimed that a district record for tunnel-driving was made with 65 ft. driven in two days, working two 8-hr. shifts.

John Leask of Cranbrook, official liquidator, requires all creditors of the Payroll Gold Mining and Milling Co., Ltd., to prove their debts or claims.

The Phoenix Amalgamated Copper Mines, Ltd., owning a group of mineral claims situated in Phoenix camp, Boundary district, has issued a circular notifying its shareholders that an offer has been received from a New York syndicate of \$1.75 per share for the 200,000 shares held as treasury stock. A further offer of \$1.50 per share for 200,000 additional shares is made; the remaining 100,000 shares comprising the balance of the stock in the company (which is capitalized at \$5,000,000 in 500,000 shares at \$10 each) to be deposited with the Eastern Townships bank and held in trust for a period of two years from the time the options shall be executed in favour of the syndicate.

CERTIFICATES OF INCORPORATION.

Bornite Company, Ltd., with a capital of \$20,000, divided into 20 shares of \$1,000 each.

British Columbia Gypsum and Plaster Company, Ltd., with a capital of \$100,000, divided into 1,000 shares of \$100 each. Included in the objects for which this company has been incorporated are the following: To purchase the Marie, Flora, Bell, and Hart mineral claims, situated on the west side of Thompson River, opposite Spatsum, B.C.; to carry on the business of a mining, smelting, milling and refining company.

Cranbrook Fire-brick and Terra Cotta Company, Ltd., with a capital of \$50,000, divided into 50,000 shares of \$1 each. Included in the objects for which this company has been incorporated are the following: To acquire the mineral claims, etc., of Frank L. Byron, at or near Old Town, Perry Creek, East Kootenay; to carry on at Cranbrook and elsewhere the business of manufacturers and vendors of fire bricks, crucibles, scoriifiers, and all fire clay products for metallurgical, building and other uses; and to locate or otherwise acquire mineral or petroleum properties, and to work the same.

Giant-California Mining Company, Ltd., with a capital of \$5,000,000, divided into 50,000 shares of \$100 each. The following are included in the objects for which this company has been incorporated: To adopt and carry into effect a certain agreement made on December 10, 1906, between Jay P. Graves, for and on behalf of the California Gold Mining Company (foreign), and Stuart Charles Cumberland, for and on behalf of the Giant Mining Company, for the purchase by and sale to this company of the whole of the assets of the Giant Mining Company, Ltd., and the California Gold Mining Company (foreign), free from incumbrances; to carry on the business of a mining, smelting, milling and refining company in all or any of its branches.

REGISTRATION OF EXTRA-PROVINCIAL COMPANIES.

Quesnelle Hydraulic Gold Mining Company—Head office at Camden, New Jersey, U. S. A. Capital, \$1,700,000, divided into 170,000 shares of \$10 each. Head office in British Columbia at Vancouver. Attorney, William Ernest Burns, barrister, Vancouver.

Crozon Coal and Coke Company—Head office at Spokane, Washington, U. S. A. Capital, \$2,000,000, divided into 2,000,000 shares at \$1 each. Head office in British Columbia at Victoria. Attorney, Oscar Chapman Bass, barrister, Victoria.

Brown-Alaska Company—Head office at Seattle, Washington, U. S. A. Capital, \$1,000,000, divided into 1,000,000 shares of \$1 each. Head office in British Columbia at Maple Bay, near Port Simpson. Attorney, A. A. Wakefield, mining engineer, Maple Bay.

COMPANY REGISTERED IN ENGLAND.

Walker's Fork Gold Dredging Company, Ltd.—Registered in London February 28, by Keith & Humphries, 43 Chancery Lane, W.C. Capital £70,000, in £1 shares. Objects: To adopt an agreement with R. H. Milvain and J. G. McLaren, to carry on the business of a dredging, mining, prospecting, and exploration company in Alaska and elsewhere, and in particular to acquire the placer mining claims in the Forty-Mile district. No initial public issue. The first directors (to number not less than three nor more than five) are: J. R. King, L. L. Cox, and C. Fearn. Qualification, 1,000 ordinary shares. Remuneration (except managing directors), not more than £300 per annum, divisible, unless increased by the company. Registered office: Grove House, Harrogate, Yorks.

MACHINERY AND CONSTRUCTION NOTES.

The Consolidated Mining and Smelting Co. of Canada has purchased six 12-ton electric locomotives from the Jeffrey Manufacturing Co. of Columbus, Ohio. These are for underground work in the company's mines—three for the Centre Star-War Eagle mines at Rossland, two for the St. Eugene at Moyie, and one for the Snowshoe at Phoneix.

Wm Waldie of Nelson, owner of the Queen mine near Salmo, Nelson mining division, has purchased from the Jenckes Machine Co a 7x10 Blake crusher to replace a Comet crusher which was lately broken at the mine.

The Canadian Rand Co is supplying to, and installing at, the Lille colliery of the West Canadian Collieries, Ltd, near Frank, southwest Alberta, a haulage plant consisting of a 4-stage air compressor, locomotive, and pipe-line storage, complete. The capacity of the compressor is about 700 cu. ft. per min. compressed from atmosphere to 1,000 lb. gauge, which nominally means sufficient for four locomotives. The capacity of the locomotives is, generally speaking, a train of 40 cars of coal up a 1½ per cent. grade. The company is supplying a similar system each to the H. W. McNeill Co.'s colliery at Canmore and the Hilerest colliery near Frank. These systems are almost identical with those previously supplied by the Canadian Rand Co. to the Crow's Nest Pass Coal Co.'s Michel colliery, and the International Coal and Coke Co.'s colliery at Coleman, Alberta.

The Dominion Copper Co. about the end of April commenced operating the 25-drill Rand duplex tandem compound electrically-driven air compressor, the installation of which at the company's Idaho mine at Phoenix, Boundary district, had just been completed. The compressor is to furnish compressed air for the Idaho, Brooklyn, Stemwinder and Rawhide mines, all in Phoenix camp. A full equipment of Little Giant Rand machine drills has also been obtained for each of the mines named.

At its Centre Star mine power-house at Rossland the

Consolidated Mining and Smelting Co. of Canada has changed over from steam to electricity. On April 28 the 650-h.p. Canadian Westinghouse induction motor was started. This drives both the Centre Star 40-drill air compressor and the War Eagle 25-drill engine. The latter is an Ingersoll machine lately changed to a 2-stage engine by putting in Rand compound cylinders.

Early in April a hoist for the Maggie mine was received at Ashcroft with instructions to forward it to the mine as soon as practicable, for prompt installation.

TRADE NOTES AND CATALOGUES.

Bulletin No. 12 issued by Mussels Limited of Montreal, Quebec, gives a description of double-cylinder single-drum hoists; also information relating to mine cages, landing chairs and self-dumping mine buckets.

The Hill Publishing Co. of New York, publisher of the *Engineering and Mining Journal*, *Power* and the *American Machinist*, has issued a 168-page catalogue of technical books and other of its publications. It is of handy pocket size and its contents are so arranged under various headings as to be convenient for reference. It can be obtained gratis on application to the publisher at 505 Pearl Street, New York, U. S. A.

An illustrated account of a visit to the works of the Canadian General Electric Co., Ltd., at Peterboro, Ontario, and to the factory of the Canada Foundry Co., Ltd., near Toronto, has been published in pamphlet form. This is a reprint of an article that was published in the *Toronto Globe*. It is interesting and well worth reading.

The orders for gas engines in large units the Westinghouse Machine Co. secured during the first three months of the present year exceeded by far the aggregate of the business for the same period of last year. There is every indication that the company's business during 1907 will show a healthy increase.

The Spokane & Inland Empire Railway Co. of Spokane, Washington, U. S. A., has concluded negotiations with the Westinghouse Electric and Manufacturing Co. for furnishing eight more 72-ton single-phase electric locomotives, making 15 in all. This is an important contract for the reason that this railway was one of the first in the country to adopt the alternating-current single-phase system. The Spokane & Inland runs from Spokane to Lockport, Idaho, a distance of 130 miles.

The possibilities of concrete block construction are apparent to everybody. The rich appearance of concrete blocks, their durability, their resistance to heat and cold, the ease and rapidity with which they can be put into their place, and lastly their cheapness, has made them the most efficient building material in existence. Anybody can make blocks with little experience with the "Ideal" machine. It is capable of 57 varieties of blocks which are adaptable to any style of architecture and ornamental effect. This machine can never break or wear out in service. Instantly adjusted to make any style of block. Write for catalogue, Mussels Limited (formerly W. H. C. Mussen & Co.) Montreal.

Two more circulars—No 1028, Rotary Converters, and No. 1067, Air-Blast Transformers—have been issued by the Canadian Westinghouse Company, Ltd. The rotary converter has bridged the gap between alternating and direct-current practice and made possible an effective union of the two systems which has largely contributed to the tremendous advance in electrical application experienced during the last few years. Circular No. 1028 describes in detail and fully illustrates a number of installations of these converters. The other circular deals similarly with air-blast transformers, the advantages claimed for which are—cleanliness of operation, low fire risk, and small floor space. Some idea of their popularity will be conveyed by mention of the fact that Westinghouse air-blast transformers of more than 300,000 kw. combined capacity are now in operation in New York City alone.

PRODUCTION NOTES.

The ore receipts at the smelting works at Trail of the Consolidated Mining and Smelting Co. of Canada, Ltd., during three months ended March 31, ulto., were as follows:

	Lb.	Lb.	
East Kootenay—			
North Star	496,816		
St. Eugene	3,372,403		
		3,869,219	
Amsworth division—			
Baltimore	12,211		
Spokane	338,886		
Trinket	60,361		
Whitewater	15,230		
Whitewater Deep	544,896		
		971,584	
Nelson division—			
Arlington (Erie)	404,210		
Eureka	570,536		
Granite	52,485		
Hall Mines (matte)	260,146		
Hunter V.	513,546		
Kootenay Belle	69,981		
LaPlata	1,795,896		
Queen (Salmo)	130,007		
Queen Victoria	468,097		
		4,264,904	
Slocan division—			
Colonial	76,148		
Jessie Bluebird	128,547		
Last Chance	408,244		
Lone Bachelor	256,577		
Midnight	15,968		
Northern Light	68,501		
Richmond	79,833		
Sunset	82,972		
Washington	44,877		
		1,161,667	
Slocan City division—			
Lorne Doone	670,060		
Mountain Boomer	40,188		
Myrtle	26,180		
Ottawa	201,066		
Vancouver	120,516		
		1,058,010	
Rossland—			
Centre Star	32,378,660		
Iron Mask	425,310		
Josie (Le Roi No. 2)	10,226,389		
Le Roi	36,409,179		
War Eagle	7,600,321		
White Bear	416,684		
		87,456,543	
Boundary—			
Providence	774,712		
Sally	81,541		
Snowshoe	13,768,483		
Strathmore	43,198		
		14,667,934	
Miscellaneous—			
Aberdeen	21,913		
Central	25,570		
Lightning Peak	41,758		
Refinery	912,020		
		1,001,261	
Total			114,451,122

ROSSLAND.

The output of ore from Rossland mines for the first quarter of the current year was rather more than 62,000 tons. The *Rossland Miner* has published the following figures:

Mine.	Tons.
Le Roi	33,551
Centre Star group	19,842
Le Roi No. 2	4,890
Le Roi No. 2, concentrated	2,320
White Bear	255
White Bear, concentrated	1,200
Total	62,058

BOUNDARY.

The Phoenix *Pioneer* gives the following ore-production statistics for the quarter ended March 31:

Month.	Tons.
January	60,003
February	53,965
March	100,219
Total	214,187

The unusual severity of the weather experienced in January and March, and the shortage of railway cars for hauling ores and coke, together with the lack of sufficient fuel for mines and smelters, were accountable for the comparatively small production.

COAL MINING NOTES.

The Western Fuel Co. is erecting a sawmill at Harewood, near Nanaimo, for cutting timber for use at its coal mines.

The Norwegian steamer "Hornelen" of 7,000 tons register has been placed under charter to the Western Fuel Co. for one year. She will carry coal from the company's colliery to San Francisco, California.

The rapid progress being made in driving the tunnels at the Pacific Coal Company's Hosmer mines, which, so far, have proceeded without an accident, is a matter of remark among visitors and resident miners, says the *Fernie Free Press*.

The *Armstrong Advertiser* states that some coal from Nicola is being used on the Shuswap & Okanagan railway, two cars having been received. The engineers are said to claim that it is a splendid steam coal, with little ash and no clinkers.

The men employed at the coal mines at Lethbridge and Taber kept strictly out of the recent strike trouble. They are under term contracts and believed that their assistance at this juncture at the expense of a breach of faith would do actual harm to their fellow miners' cause.

Before the recent suspension of operations the Crow's Nest Pass Coal Co. was making progress with the work of opening a new mine, known as No. 11 and situated near the rock cut half way between Fernie and the Coal Creek mines. A tunnel had been driven between 200 and 300 ft. on a seam of about 5 ft. of domestic coal of good quality.

Several cars of fire-brick have arrived at Hosmer, Crow's Nest Pass, for the construction of test coke ovens for the Pacific Coal Co. at that place. The company intends shortly commencing the erection of a large boarding house for the accommodation of its mine employees, in accordance with plans already completed.

Several Spokane men have organized a coal company under the name of the Atlas Coal Mining and Coke Company for the purpose of developing 3,200 acres of coal lands near Lundbreck, which have been acquired. Offices of the company will be in Spokane. Exploration on the property has proved the occurrence on it of domestic, steam and coking coal. It is expected that the Atlas Company will put its coal on the Spokane market next winter.

At a meeting of the directors of the Diamond Coal Company, says the Calgary, Alberta, correspondent of the *Labour Gazette*, reports were presented calling for the expenditure of nearly \$300,000 in development of the company's property at Diamond City, six miles from Lethbridge. The contemplated development will be completed

in about 18 months, and includes the installation of a plant sufficient to raise 1,000 tons of coal per day, and a spur line to the projected Canadian Pacific Railway branch in the vicinity.

The Galbraith coal mine at Lundbreck, Alberta, has been purchased by Andrew Laidlaw of Spokane, Washington, for himself and associates. The mine has been shipping coal for years. It was acquired from the Hudson Bay Co. about 14 years ago by R. J. Galbraith. The Spokane *Spokesman-Review* says it is estimated there are between 2,000,000 and 3,000,000 tons of semi-bituminous coal on the property. It is intended to incorporate the Galbraith Coal Co. with an authorized capital of \$250,000. Its headquarters will be at Spokane.

A press dispatch from Medicine Hat, Sask., states that the Rockford mines there, which fell into gradual disuse as the natural gas system was installed and extended, are reopening, and the management has made arrangements to supply the Canadian Pacific Railroad with 30 tons of coal a day, providing teams can be secured to haul it in from the mines, a distance of about four miles. The railway authorities are preparing estimates with a view of ascertaining the cost of constructing a spur line to the shaft, but the existence of a number of deep coulees will make this an expensive undertaking.

Development operations on the property of the Nicola Valley Coal and Coke Co., Ltd., continue and another contract for tunnelling has been let. So far the development work has been successful and proves the existence there of a large body of excellent coal. That taken from the tunnels as development proceeds is finding a ready market, and is giving much satisfaction. A pipe line from the Coldwater River is being laid. Machinery for the mines is on the way and soon a large number of men will be employed mining coal on a commercial basis, contracts having already been arranged with this end in view.

From the Nicola *Herald* it is learned that at the Diamond Vale Coal and Iron Mines, Ltd.'s, Diamond Vale mine the work of completing the construction of the necessary houses, offices, etc., is going steadily on, and the plant for operating the machinery is being placed in position. A dam has been put in to catch the logs which will be run down the river, the company having several million feet now in readiness for its sawmill, which will be in running order shortly. Owing to trouble with water the work of sinking the shaft was stopped for a short period, but B. P. Little, assistant manager, now has things in shape for a resumption of sinking.

B. C. GAZETTE NOTES.

James R. Brown of Fairview, Okanagan, to be gold commissioner for the Osoyoos mining division. Appointment to date from February 1, 1907.

Howard A. Turner to be mining recorder for the Osoyoos mining division, with office at Fairview, Okanagan. Appointment to date from May 1.

The names of John Hirsch, of Victoria, and Harry Lyon Cummins, of Nelson, have been added to the annual list of registered members of the Corporation of Land Surveyors of British Columbia.

Reginald C. S. Randall to be mining recorder for the Cariboo mining division, with office at Barkerville. Appointment to date from May 1.

The Hon. Henry Esson Young, provincial secretary, to be acting minister of mines during the absence of the Hon. Richard McBride from the Province.

Francis H. Bacon of Golden, to be mining recorder for the Golden mining division, with recording office at Golden, from April 1, 1907, in place of F. C. Lang, resigned.

Rather more than one-third of the mineral production of British Columbia in 1906 was from the Boundary, the output of which district was between \$8,500,000 and \$9,000,000, chiefly in copper.

MINING MEN AND AFFAIRS.

Barclay Bonthron of Vancouver has been visiting mining properties at Otter Valley, Nicola district.

At the annual business meeting of the American Institute of Mining Engineers John Hays Hammond of New York was elected president of the council.

J. C. Drewry, managing director of the Canadian Gold Fields Syndicate, Ltd., has returned to the Kootenay from Montreal, Quebec, where he spent the winter.

Superintendent R. Green of the West Canadian Collieries, Ltd.'s, Lille coal mine, near Frank, southwest Alberta, is away on a trip to Montreal and New York.

J. J. Campbell, general manager of the Hall Mining and Smelting Co., Ltd., lately made a business trip to Victoria, where he remained two or three days before returning to Nelson.

A. W. Geiger, lately assistant to the manager of the Alaska Smelting and Refining Company's smelter at Hadley, Prince of Wales Island, southeast Alaska, has gone to Nevada.

James Cronin of Spokane has returned from his visit to Ireland and has been looking over recent developments at the several mines in southern Kootenay in which he is interested.

James McEvoy of Fernie, East Kootenay, geologist and chief engineer for the Crow's Nest Pass Coal Company, has been recuperating at Victoria after an attack of pneumonia.

J. D. Sibbald of Revelstoke started for the McCullough Creek Co.'s hydraulic gold mining property in the Big Bend district, but had to return to Revelstoke, his feet having been injured while en route.

H. S. Sibley of Detroit, Michigan, and Capt. T. H. Tretthewey of Nelson have been looking over coal lands on Livingston River, Alberta, owned by the Stamford syndicate, in which they are interested.

Norman Fraser, mine inspector for the province of Alberta, and E. Heathcote, district inspector, recently held at Frank an examination of applicants for certificates of efficiency as coal-mine fire bosses.

Laurent Muller has returned to Cariboo from Victoria. He will superintend the forthcoming season's hydraulic operations on John Hopp's placer gold mines in the neighbourhood of Barkerville, Cariboo.

The professional card of F. W. Groves, civil and mining engineer, of Princeton, who has an extensive knowledge of the Similkameen, obtained during several years of surveying and engineering in that district, appears on another page.

Blainey Stevens and H. D. Reynolds, who are interested in a large copper property in Alaska, have been investigating methods in vogue at the Granby Consolidated M. S. and P. Co.'s big mines and smelting works in Boundary district.

H. S. Reed, who has been superintendent of the crushing and concentrating plants at the Daly Reduction Co.'s stamp mill at Hedley, Similkameen, has resigned on account of ill health. Arthur Clare has been appointed to succeed him.

J. B. Hobson, general manager of the Cariboo Gold Mines, was at his home in Victoria during the latter part of April. Gravel washing for the season has been commenced at the company's big hydraulic gold mine at Bullion, Cariboo.

J. M. Turnbull of Trail, one of the mining engineers of the Consolidated Mining and Smelting Co. of Canada, Ltd., during April took a trip to the west coast of Vancouver Island for the purpose of examining a mining property there.

W. H. Aldridge of Trail, general manager of the Canadian Pacific Railway Co.'s mining properties and managing director of the Consolidated Mining and Smelting Co. of Canada, Ltd., will visit Toronto and eastern Canada early in May.

Daniel Davies of Fernie, comptroller and purchasing

agent for the Crow's Nest Pass Coal Co., has gone to Toronto and other Canadian cities. He was accompanied by Mrs. Davies, and they may visit Virginia before returning to southeast Kootenay.

The *Rossland Miner* says: "The many friends of W. S. Keith in the Boundary and Rossland will be pleased to learn that he has been appointed to the position of superintendent of the smelter at Sumpter, Ore., owned by the Oregon Smelting and Refining Co."

O. L. Liegeart of Lille, France, who is a director of the Canadian Metal Company, has been visiting Frank, southwest Alberta, where the company has erected a zinc smelter, and the Blue Bell mine on Kootenay Lake, near Ainsworth, also owned by his company.

A. P. Low, director of the Geological Survey of Canada, has returned to Ottawa from a visit to Arkansas, Arkansas, U. S. A., convalescent after the serious illness that for several weeks incapacitated him from attending to the duties of his responsible office.

Captain T. H. Trethewey of the La Plata mine has resigned the managership of that property to look after some mining interests in the coalfields of Alberta. His place has been taken by his son, W. J. Trethewey. Captain Trethewey remains a director of the La Plata company.

Chas. Dunderdale of London, a director of the Le Roi Mining Co., has returned to England after having visited that company's mine at Rossland and smelting works at Northport, Washington. Before coming to British Columbia Mr. Dunderdale went to Cobalt, northern Ontario, where he and associates are largely interested in mining properties.

News has been received at Rossland that Allan McLean, managing director of the Portland-Velvet mines, and director of the Rossland Kootenay Co., died recently in London, England. Mr. McLean was well known at Rossland, having visited that camp twice during the past three years, his last visit having been made about sixteen months ago.

W. W. Leach of Ottawa, one of the geologists of the Geological Survey of Canada, will go north early in May to continue the work of delimiting the coal and copper areas in the Telkwa Valley district in which he was engaged last year and on which he made the report published in the "Summary Report of the Geological Survey Department of Canada for 1906."

Richard F. Jones of Seattle is to have charge of mining operations on the Arctic Chief and Best Chance copper properties near Whitehorse, southern Yukon, under the direction of W. J. Elmendorf of Spokane, consulting engineer and manager for the owning company. It is stated that modern machinery will be installed and the mines worked on a comparatively large scale.

S. F. Parrish has removed from Los Angeles, California, to Tonopah, Nevada. Mr. Parrish's numerous friends in the Kootenay and Boundary districts of British Columbia will be glad to know that his residence on the Pacific coast, in California, during about a year and a half, has had a most beneficial effect upon his health so that he is now, to use his own words, "as good as new again."

Paul Johnson, who lately resigned the management of the Alaska Smelting and Refining Company's works at Hadley, southeast Alaska, left Seattle on April 30 by steamer for San Francisco, en route to Nevada. He will be in New York, accompanied by his family, about the middle of June, sailing thence for Europe about June 21. He will probably remain at Lund, Sweden, until late in the fall.

W. C. Thomas, for some time past superintendent of the Dominion Copper Company's smelter in the Boundary district, has been appointed the company's resident general manager, in succession to T. R. Drummond. Geo. Williams, for several years superintendent of the British Columbia Copper Company's smelter in the same district, is now filling a similar position at the works of the Dominion Copper Company.

O. A. Caldwell, chief accountant at Rossland for the

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Consolidated Mining and Smelting Co. of Canada at its Centre Star-War Eagle group of mines, has left Rossland for Van Trent, Placer county, California, to there fill a similar position at one of the Guggenheim mines. He will be succeeded at Rossland by E. G. Herr, formerly at the Trail smelter and for some months paymaster at the Centre Star-War Eagle mines.

T. A. Jaggat, Jun., professor of geology in the Massachusetts Institute of Technology, Boston, is stated to be at the head of a party which arranged to leave Seattle, Wash., on May 1, for the Aleutian Islands to there study seismic and volcanic conditions. The party was to include Prof. H. V. Summers of Drexel Institute, Philadelphia; Prof. A. S. Eakle, mineralogist, University of California; Dr. E. C. Van Dyke and several scientists associated with Prof. Jaggat in Boston.

Upon his retirement from the position of acting general manager for the British Columbia Copper Co., Ltd., at Greenwood, Boundary district, George F. Beardsley was the recipient of a presentation, made spontaneously by the company's smelter employees in acknowledgment of the pleasant and harmonious relations that had existed during the period he had been in charge. J. E. McAllister's health so much improved during his recent visit to Europe that at the beginning of April he was able to return to his duties as general manager with renewed vigour.

J. W. Astley, formerly superintendent of the Snowshoe mine at Phoenix, Boundary district, and afterwards general superintendent for the Le Roi Mining Co. at Rossland, who went to England for the benefit of his health early last year, intends shortly returning to British Columbia. Writing recently to a friend in British Columbia he stated that he planned to leave England on May 17 by the C. P. R. steamship "Empress of Britain." En route from Montreal to British Columbia he would probably stop over at Winnipeg a day or two and reach Van-



EXAMINATION FOR ASSAYERS FOR LICENCE TO PRACTISE IN BRITISH COLUMBIA.

AN EXAMINATION for Assayers will be held in Victoria on the 27th May and following days.

Entrance for any examination must be made in writing to the Secretary of the Board of Examiners, at least ten days before the date set for beginning of examination, and must be accompanied by the prescribed fee (\$15).

Any additional information desired may be obtained from Herbert Carmichael, Secretary, Board of Examiners, Victoria.

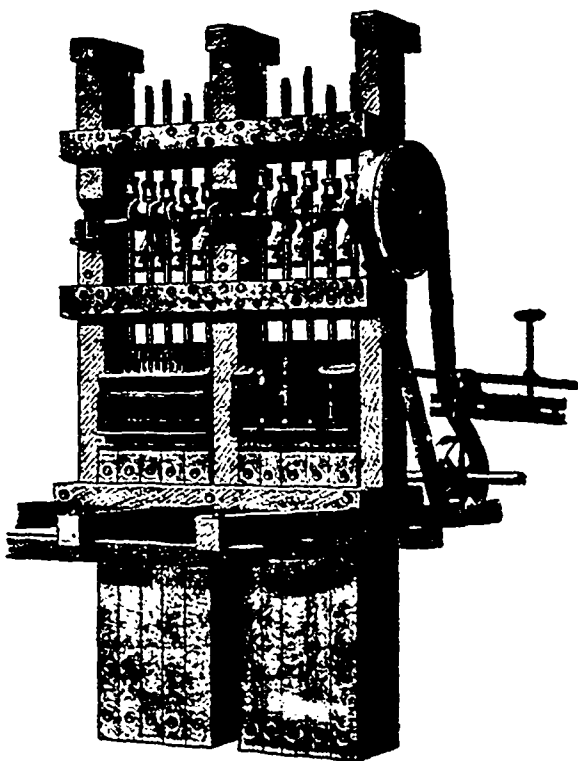
RICHARD McBRIDE,

Department of Mines, Minister of Mines.

Victoria, B. C., 15th April, 1907.

cover by the end of May. He may possibly make Victoria his headquarters hereafter.

O. E. LeRoy, who last year examined that part of the coast of British Columbia extending from the International Boundary north to Powell River and made the report thereon that was printed in the "Summary Report of the Geological Survey Department of Canada" for 1906, has resigned from the Survey. It is understood that this work will shortly be taken up by a gentleman who has been assistant to Dr. Frank D. Adams, professor of geology at McGill University, Montreal, Quebec. Mr. LeRoy has received an appointment with a mining company operating in the Cobalt district, northern Ontario.



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Entry must be made personally at the local land office for the district in which the land is situate.

The homesteader is required to perform the conditions connected therewith under one of the following plans:

(1) At least six months' residence upon and cultivation of the land in each year for three years.

(2) If the father (or mother, if the father is deceased), of the homesteader resides upon a farm in the vicinity of the land entered for, the requirements as to residence may be satisfied by such person residing with the father or mother.

(3) If the settler has his permanent residence upon farming land owned by him in the vicinity of his homestead, the requirements as to residence may be satisfied by residence upon the said land.

Six months' notice in writing should be given to the Commissioner of Dominion Lands at Ottawa of intention to apply for patent. Coal lands may be purchased at \$10 per acre for soft coal and \$20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of ten cents per ton of 2000 lbs. shall be collected on the gross output.

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