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THE PROGRESS OF MINING IN THE BOUNDARY DISTRICT.

IN this month's issue of the MINING RECORD an effort has been made to deal as fully as possible with the mineral and other resources of a section of British Columbia which in the short space of rather over two years has come to be regarded as the most important copper-producing area in British Columbia. The extraordinary industrial developments which have taken place in the Boundary Creek District since the completion of the Columbia & Western branch of the Canadian Pacific Railway in 1900, are in the following pages well described by our Boundary District correspondent, Mr. E. Jacobs, who, as most of our readers are aware, has earned and enjoys a high reputation, unfortunately not shared by many newspaper correspondents in Western mining camps, for careful, conscientious work. As a resident of several years standing in the district, and having watched the growth of the mines from the early prospect stage, he is exceptionally well qualified to take up the subject, and every dependence may be placed upon the accuracy of his statements. Mr. Jacobs in the following introductory article, in a general way sums up the progress that has been made in the Boundary District.

"When I proposed to the managing editor of the B. C. MINING RECORD that he place the May number of that journal at my disposal for a description of the Boundary District, it was my intention to make the descriptive matter as full and comprehensive as possible within the limits of that number. Unfortunately, after arrangements had been made in accordance with my proposal, a fortnight's unavoidable delay took place before the work of preparing the "copy" could be entered upon. This prevented the intended careful revision and condensation of the matter, since it had to be sent to the printer piecemeal, as written. If, then, it appears that in some instances mining properties or places have either been left out or given but scant notice, whilst others relatively less important have undue prominence, allowance should be made for such shortcomings, which under the circumstances necessarily occurred.

"The following pages have been so much increased beyond the number originally intended that introductory comment must of necessity be brief. It will, therefore, be restricted chiefly to the emphasizing of a few important points: (1) To the great benefit working mines and smelters and their numerous industrial accompaniments are, first to the country surrounding them, and next to the Province at large; (2) To the fact that the mining and smelting industries of the Boundary are steadily attaining to more important proportions, and (3) To their present value and future enormous possibilities.

"In connection with the first point as it relates to this district in particular, it appears only necessary to mention that during the last three years from $15,000,000 to $20,000,000 at least have been expended, much in the form of wages for labour, as a direct result of local mining operations—in the opening up and equipment of mines, the erection of smelters with their costly plants, the building and equipment of railways, the utilization of water powers, the carrying out of many public improvements, and the building up of several towns that are now populous centres. As to the benefit to the Province: The direct mining revenue received at the government offices at Greenwood and Grand Forks during the last three years exceeded $75,000, but there were in addition revenues large in the aggregate, from assessed taxes on land, pre-emption and purchase of lands, revenue tax, trade and liquor license fees, timber dues, ore tax and other sources of Provincial revenue.

"Next, the increasing importance of the mining and smelting industries of the Boundary:—Up to June 30, 1900, the aggregate of all shipments of ore to that date was little more than 4,000 tons. During the second half of that year the total tonnage was increased to 97,837 tons. During 1901 shipments totalled 386,675 tons — nearly four times the tonnage of the previous year. Up to the middle of April of this year about 135,000 tons had been sent out, this being at the rate of about 475,000 tons per annum, but there is good reason to estimate that this year's shipments, which are steadily increasing, will reach a total of between 600,000 and 700,000 tons. The quantity of ore smelted in the district during 1900 was 62,387 tons; during 1901 it was 348,493 tons. To the middle of April of the current year about 133,000 tons had been smelted, or at the rate of about 465,000 tons per annum, but with two more furnaces to be blown in shortly, the year's tonnage should reach a total of about 650,000 tons at the least. This leaves out of account the probability of still further additions to the number of furnaces.

"Now, in regard to value of these industries—without authentic information as to actual values of the ores and the cost of producing them and extracting their value contents, it is idle to speculate as to these, but it is here asserted with confidence that the statement is reliable, the two companies operating on a large scale in the district are certainly making a profit above cost

of mining transportation, reduction and marketing their product. Assuming a net profit of $1.00 per ton, this means on the year's output of say 650,000 tons a total of $650,000. Since the total cash capital invested in the mines and smelters of these two companies cannot be above $4,000,000 it is easily seen what the percentage of interest return is. As to future possibilities—leaving entirely out of consideration the probability of the Dominion Copper and Snowshoe companies shortly maturing their plans for the provision of smelting facilities for their own ores, also of the requirements of half a dozen other district mines, and taking into account only that the Granby Co. intends to put in two more furnaces shortly, and the B. C. Copper Co. expects to this year add a third, there is every probability that by the end of 1902 the aggregate treatment capacity of the three district smelters will be not less than 3,800 tons a day, or at the rate of 1,387,000 tons a year. Taking the above-mentioned rate of profit this would give a net return for a year to the three companies concerned, on an investment that by then will hardly not have exceeded $5,000,000, of $1,387,000. There is this further fact (for it will shortly be an accomplished fact) to keep in mind, viz.: That the total cost of mining, transportation and treatment of their ores, will, in the case of these two companies be reduced to between $2.00 and $2.50 per ton. It may be added that this last statement is made only after careful enquiry from those well informed on the subject."

"WILD-CATTING" IN THE SIMILKAMEEN.

THE fact that "wild-catting" methods are again becoming prevalent in British Columbia is from a certain point of view a favourable sign. During the past two years or more there has been little outside speculation in the mines of the Province, the lack of interest being largely attributable to an inevitable reaction following the Rossland "boom" and the consequent wholesale wild-catting from 1896 to 1899. During that period hundreds of worthless companies were promoted and thousands of people in Eastern Canada and elsewhere were impoverished by purchasing stock which had no intrinsic value whatever. The bubble at length burst, and with it confidence was entirely withdrawn. Speculation ceased, and the most legitimate undertakings were hampered by the difficulty of securing the necessary capital to carry on operations. In the interim, however, the mining industry has become established on a firmer and a more permanent footing, production has steadily increased and speculation has given place to investment on the part of individuals or syndicates, with, in the majority of instances, more gratifying results. Most of the capital thus invested has originated from the United States, but American promoters of an unscrupulous type have not been slow to recognize the disposition of their countrymen to look upon British Columbia as a rich and promising mining territory, and a number of largely capitalized "wild-cat" companies have been recently floated in New York, Minneapolis and other large centres, with the alleged object of exploiting mines in this field. A most flagrant example is that of a concern styling itself the Olalla Copper Mining and Smelting Co. of New York, modestly capitalized at eight million dollars in $25 shares. This company's shares are being extensively advertised in the New York daily papers, 20,000 shares now being offered for public subscription at $12.50 per share, in "easy monthly instalments." To quote from the advertisement in the New York *Sunday World*:

"The present allotment is being rapidly sold. The next allotment will be offered only at a largely advanced price. This is done (sic) to enable people of moderate means, who are ordinarily excluded from participating in safe enterprises of this magnitude, to invest in the practically unlimited profit-producing resources of our mining properties in Olalla, B.C. Our faith in the enterprises we are championing is such that we are quite willing to take payment for stock in easy instalments, well knowing that the substantial values of the property will bear out this policy with profit to everybody concerned. Many a man with a small bank account has wished to identify himself with the great modern enterprises, but the terms have been so close that he has been unable to do so. We have opened a new way to wealth for the man with a short purse and a long head. The man who knows that large enterprises like this must be built up carefully, step by step, is the man we want, and who wants us. One thousand shares of "Olalla" will be worth an independent fortune and earn a permanent income of from $2,500 to $7,500 per year within five years, but one share will be worth equally as much in proportion. If you can secure 1,000 shares do so, but subscribe for at least one, five, ten, twenty-five, fifty or one hundred. But by all means secure an interest in the company and make that interest as large as possible."

In large type above is printed:

"A practical mining man writing us says: 'If I owned two of your properties I would undertake to pay the national debt of Canada in ten years,'"

and after a description of some mining claims held by the company, the following:

"In addition to our mining properties we also hold a valuable railroad franchise, entitling us to build and operate a railroad through the mining fields, besides the telephone and telegraph franchises of the district, and a charter for the townsite of Olalla, B.C. With these remarkable permanent money-making sources at our command, our experts have formulated the following conservatively correct estimate of the net earnings of our combined properties per annum, each particular estimate being as low as it can consistently be made:

Profit on the company's preliminary mining operations—1,500 tons per day, yielding a net profit of $2 per ton equals	$ 900,000
Profit on smelting operations	900,000
Railway earnings (net)	690,000
Net annual profit	$2,490,000

"This sum of almost two and a half million dollars will enable us to pay an annual dividend of 25 per cent. on the capital stock of the company, besides creating a reserve fund of nearly half a million dollars a year."

The whole thing is so transparently and grotestequely ridiculous that it appears almost a waste of time to do more than laugh. But, strange as it may seem, there are many who will swallow a hook even so unskilfully baited as this, and it is the duty of the press of British Columbia to do what is possible to remove the bait altogether, so that nothing is left but the naked hook, and if any foolish gudgeon is prepared to bite at that, he can blame no one when he suffers the necessary penalty for his rashness. It will have been noticed from the advertisement that the Olalla Copper Mining & Smelting Co. desires an impression to be conveyed that it already is in possession of property capable of immediate profitable operation. The mineral claims are described as "Sixty-three high-grade copper-gold mines, situate in Similkameen and Keremeos valley . .

not merely rich in the ordinary sense of mining phraseology, but huge mountainous deposits stocked with precious copper ore from 'the grass roots down into the depths of the earth's bowels.'" The facts are, that of these "sixty-three high-grade mines" not one has been developed or proved to any extent, and many have not been developed at all. The claims have been divided into eight groups, and it is amusing to compare the description of them in the advertisement with the report of an expert employed by the company. Mr. Watson, an assayer of Vernon. For example, the Opulence group is thus referred to in the advertisement:

"A solid block of four claims, assaying $1.20 gold and 17.1 per cent. copper, equal to $52.50 per ton. The richest copper ore found in this district has been exposed by sinking a shaft 45 feet (!) and the quantity appears to be almost unlimited." (!)

Mr. Watson states:

"The Opulence . . . has a ledge containing native copper. I saw some of the ore, but owing to a violent snow storm I was unable to visit it."

But again the advertisement thus speaks of the Golden Rule group:

"Five big claims containing practically inexhaustible supplies (!) of easily treated ore, assaying 3.6 per cent. copper, equal to $11.50 per ton. The ore is visible on the surface for several hundred feet."

And Mr. Watson:

"I visited the Golden Rule claim. This claim lies about two miles north of the Bullion, is on the east side of the valley, and has a 40-foot iron capping running east and west. No work has been done on it, and I therefore did not take any samples for assay, as it is necessary to get underneath the capping before any copper makes its appearance."

Is further comment required? It may, however, be added that, although the company publishes a booklet containing five separate reports on the properties, Mr. Watson's alone is prepared by a professional man of any standing, and he although a geologist and an exceptionally clever chemist is certainly not entitled to rank, nor does he style himself a mining engineer; among the other contributors are prospectors belonging to the Keremeos district, including one of the vendors; the general manager of the the company, also a vendor; and the deputy mining recorder of the district. So far for the mining properties and the "conservatively correct estimate of their net earnings of $900,000 per annum." The railway and the smelter, from which also so much is promised, are at present unfortunately so high in the air that they are actually out of sight. In conclusion, another significant circumstance. Why has the company so early in its career elevated Mr. William J. Brewer, of New York City (a most unprepossessing gentleman, judging from his portrait in the New York *Herald*) to the lofty and responsible position of president in substitution for the Hon. W. L. Douglas, of boot and shoe manufacturing fame, who, according to the booklet containing the "excerpts from the official reports of eminent experts" already alluded to, originally occupied that proud post?"

In a leading article, entitled, "Boundary Ores and the Price of Copper," published in our last issue, a statement from the *Engineering and Mining Journal* (New York) was most annoyingly misquoted in the following paragraph: "The copper ores throughout the district yield on the average about *one-third* per cent. copper." This should have read: "The copper ores throughout the district yield on the average 1.3 per cent. copper." A material difference.

AS IT WAS IN THE BEGINNING.

By Clive Phillipps-Wolley.

WE are so used to hearing the "kickers" grumble that "the d——d place has not gone ahead one bit" since they first came here, that it is worth while, from time to time, to look back upon any record of the past which is in our possession and to compare what was with that which is.

If we happen to be one of those who make a journey across the C. P. Ry. once every four or five years you will hardly need to look back upon such records. The country lying alongside the track supplies an object lesson which is sufficiently convincing. Man in his fight against a gigantic Nature cannot make any very apparent impression in a day or in a week, but the result of his efforts is sufficiently obvious to those who give him reasonable time in which to do his work. I do not want to silence the kickers. It is good that they should kick. If they have sufficient energy to do that, they may have sufficient energy to try to remedy that of which they complain, though that by no means follows. It is easier to kick at creation than to create a slapjack. My business, however, is not to write the natural history of the kicker, a mean beast but a useful irritant, so much as to prove that the world moves in British Columbia.

In a paper which is defunct, probably because what the gods love die young and because that paper was too good to live, it was written in 1895 that "the inhabitants of Boundary were few, though they included two barmaids and a barber, and a man in white flannels, tennis shoes and a blazer, walking about quite free with nobody to lead him on a string."

The writer appears to have been a little uncertain of his geography, confusing Midway and Boundary, and horribly irreverent in his language for I have been assured, as I happen to know that he has been, that there never was a barmaid in British Columbia, and that what he mistook for a man in a blazer was a literary light under a bushel.

As Miner was my own *nom de plume* at that time I may as well make a clean breast of it and admit that as far as the details went I was as accurate as you would expect a man to be who took his figures from poor old S——— who lived in a cabin, dreamed dreams and extracted wonderful assays which he gave away cheap. They were worth what he asked for them. I owe him no grudge. He gave me a letter to the "boys," I think I have it still, which stated that "the Cap was all rite, you can trust the Cap and show him all you know," and they did.

But I claim that though no expert then or now I was right in my main contention that Boundary district had a great future before it and that the energy of its men would make a rich camp of it in a comparatively short time, and deserving of some credit as the first correspondent who devoted any special attention to the district.

Where my old hosts, "Jimmy Wilbur, Ewing Keithly, Johnny Lind and Tom Humphreys, used to live in a little log cabin at the corner of the 'road going to the summit," there is now I understand a suburb or a rival

town to Greenwood; where some of those cut a pine pole to measure off the surface width of the Showshoe ledge (I think we made it 120 feet) and where we blundered about in the dense small pines looking for the Gold Drop, all is now a big clearing; where hundreds of prospectors roamed the hills are now thousands of settled residents. The prospecting era has passed and the fun of it I fear, but instead I learn that there are three smelters, big towns, compressors, big producing mines, and if I was wrong in prophesying that two railways would soon be competing for the ores, it is not because the ores are not there but because they are

Main Kettle River.

treated on the spot which is better for Boundary.

Five years ago we went a prospecting and prophesied great things, worked like men and may be erred a little about our assays, but last year the rough hills gave up 390,000 tons of ore and have produced 140,000 already this year, and the population of the district according

Valley of the Upper Kettle River.

to the census is somewhere near 10,000. Is not this good growth for five years?

There is one fact brought out strongly by Miner in his article of 1895 which cannot be refuted. To the knowledge of the best informed mining men in Boundary Falls, there is no English or Canadian money invested in the camps around here. That was true there and was true, too, of Rossland. But times have changed.

My old friend the Snowshoe is being developed on a large scale by an English company; the principal mines of the camp such as the Knob Hill, Ironsides, Jewel, belong either to Canadian or English owners, as do the principal mines of Rossland and three-fourths of the capital invested in Boundary is British.

We were new to mining in Canada when Miner first began his tramps through the new camps between 1891 and 1995, but we have learned much since then and if B. C. mining keeps on growing as it has done in the past ten years we shall see our own people owning and developing our own mines as rapidly and as successfully as their neighbours to the south, and as their well-

First Prospector's Cabin on Boundary Creek.
(Built in '86).

wisher Miner hopes they may, even if the old fallacies that "rock improves with depth," and that properties can be made to pay from the grass roots without money for development "have been exploded and left behind as a delusion of our childhood."

THE BOUNDARY'S EARLY DAYS.

THE placer miners who worked Rock creek in the early sixties were the pioneers of the Boundary. Shortly afterwards Boundary creek also had their attention. There is much of interest told of those early days, but probably romance is now mingled with the truth. John Thornton, familiarly known as "Old Jolly Jack" is still "on the crik," but his placering days are over. He is always ready to talk of the old times.

In 1884 Camp McKinney had its beginnings. Two years later a pioneer, Mr. W. T. Smith, prospected up Boundary creek from Midway, known in the early days as Eholts. Mr. Smith staked the Non Such, above Boundary Falls, and this is the oldest claim in the district on continuous record. It, with three adjoining claims, is the property of a Spokane company, Mr. Smith retaining an interest. On the west bank of Boundary creek, Mr. Smith built the first cabin in this vicinity, and this primitive structure stands there to-day, almost within a stonethrow of the Montreal & Boston Copper Co's smelter, the ancient and the modern contrasting strangely. In 1887, George D. Leyson, a prospector, now resident of Greenwood, accompanied by his father, David Leyson, and Geo. Y. Bowerman, prospected from Kettle river above Rock creek, across the mountains towards Boundary creek. In what is now Copper camp they located the Blue Bird claim, afterwards re-located and now known as the Big Copper. They went thence to Trail creek, but though they found mineral outcrops, Trail was then too far from everywhere to make it seem worth while to stake mineral claims there. In other places in this number mention is made of later locations, such as the Mother Lode, Crown Silver and Sunset, in Deadwood camp, and the Old Ironsides, Knob Hill, Brooklyn and Stemwinder, in Greenwood camp (now Phœnix).

Space limitations forbid further mention of the earlier days of a district that is only now justifying fully the

Old Jolly Jack—A Boundary Pioneer.

great expectations of the plucky and hardy men, who through many trying years "stayed with her," to use their own picturesque language. A few of them reaped a rich reward. More did not, but such is the common experience of the prospector.

COLUMBIA & WESTERN RAILWAY.

THE Columbia & Western railway was built under a charter granted by the Provincial Legislature, in the spring of 1896, to Mr. F. Aug. Heinze, who first connected the towns of Rossland and Trail by means of a narrow-gauge line, since standardized and otherwise improved by the C P. R. Co., and next built a standard gauge extension from Trail to West Robson. Then the C. P. R. Co. bought out Mr. Heinze's interests in this railway, having first matured its plans for extending its system westward from Robson to Midway, with a prospective later extension thence to its main line at Hope or Spence's Bridge, via Camp McKinney, Fairview and the Similkameen.

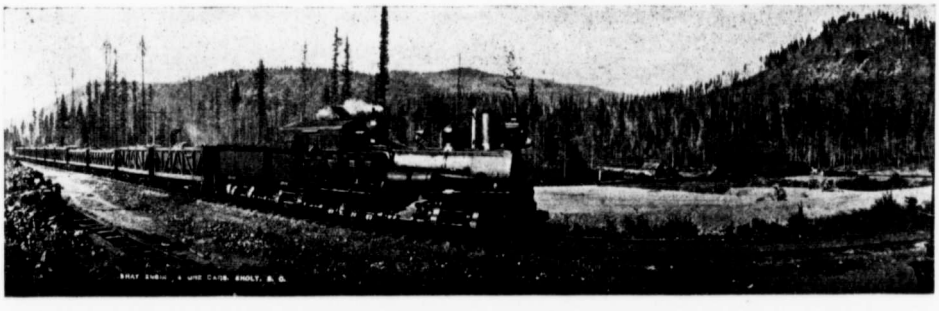
The contract for the construction of the Robson-Midway portion of the Columbia & Western road was let to Mann, Foley Bros. & Larson in June, 1898, and on July 1st work was practically commenced. The rail

distance from the starting point on the Columbia river to Midway is 99 miles. Commencing at West Robson the road follows the Columbia for about 18 miles, gaining in altitude all the while, so that where it turns more westerly it is high above the river level. Running in a generally westerly direction it follows up Brooklyn river and about 4,000 feet above sea level, this being the highest altitude attained along the line. From Summit to Cascade, at the foot of Christina lake, the distance is 24 miles and the general direction southerly. On this long descent into the valley of the Kettle river the line passes through the Burnt basin, in McRae pass,

KETTLE RIVER BRIDGE AT CASCADE, B. C.

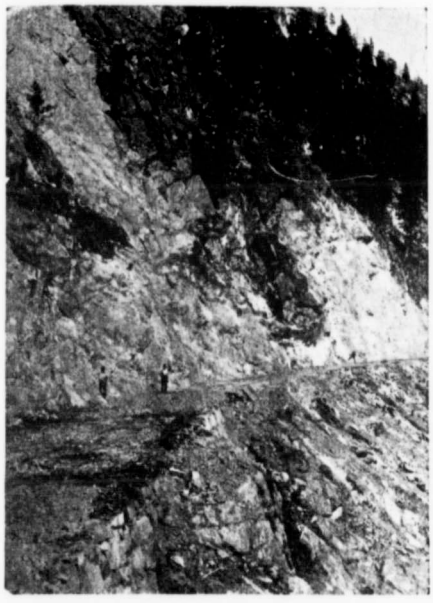
creek to the divide between the head of this creek and Dog creek on the other side. Here there is a big tunnel, known as the Bull Dog tunnel, 3,000 feet long, 16 feet wide and 23 feet high. Some 40,000 cubic yards of rock were taken out of it, and the work of driving it through the mountain took nearly 18 months. This tunnel reduces the elevation 500 feet, the summit of the mountain over which the road would otherwise have had to go being that much higher than the tunnel level.

From Tunnel the line runs up Dog creek eight miles to Summit, which is 2,575 feet above the Columbia and the small town of Gladstone, down McRae creek to Christina lake, and thence along the eastern side of the lake to Cascade. From Cascade, about 13 miles to the adjoining towns of Grand Forks and Columbia, the road runs along the valley of the Kettle river. Then a turn northward is made up the north fork of Kettle river, ascending once again, and after passing Niagara—a deserted construction town—a westerly direction is maintained up Brown's creek until Eholt is reached at about 14 miles from Grand Forks. Leaving Eholt, where the Phœnix branch joins the main line,



SHAY ENGINE AND ORE CARS, EHOLT, B. C.

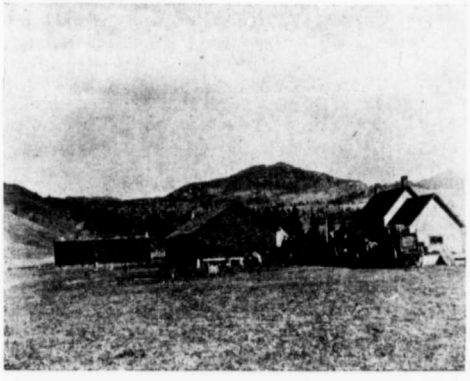
and continuing westwards, Eholt creek is followed for seven miles to its confluence with Boundary creek, and thence south two miles to Greenwood, where is the junction with the Deadwood branch. From Greenwood it goes nine miles down Boundary creek to its present



Rock Cut near Niagara, Columbia & Western Railway.

terminus at Midway, passing Anaconda at one mile and Boundary Falls at five miles from Greenwood.

The work of construction was particularly heavy in parts. Altogether about 1,500,000 yards of rock were



Western Terminus Columbia & Western Railway.

moved, the rock work, outside of the big tunnel, having been heaviest along the North Fork. Besides the Bull Dog tunnel there were six other tunnels, three along Arrow lake, on the Columbia, one on McRae creek, near Gladstone, and two along the North Fork, these tunnels aggregating about 2,200 feet in length. The longest bridge and trestle is the one approaching and crossing the Kettle river at Grand Forks; the highest bridge is that over Porcupine creek, between Summit and the big tunnel, this being 190 feet high; but the bridge requiring in its building the greatest amount of labour and material is the one over Kettle river as Cascade approached from the east. This last bridge is 1,500 feet long and 90 feet above river level, and in its construction some 1,500,000 feet (board measure) of lumber were used. There are as well numerous small bridges along the line. The rails used are steel, running 73 lbs. to the yard on all heavy grades, and lighter weights, chiefly 60 lbs., on levels or where grades are easy. The road is very substantially built, has excellent passenger and freight building accommodation at

Boundary Falls.

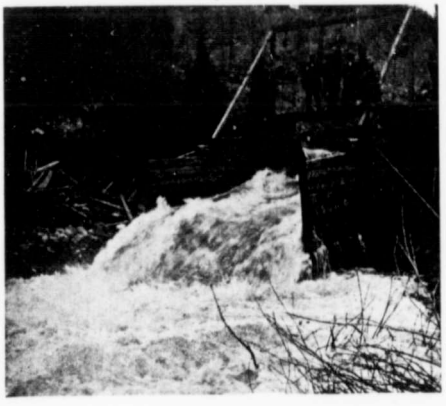
all stations, and is well equipped with rolling stock.

The chief engineer of construction was Mr. W. F. Tye, C. E., who made the exploratory surveys during the time of Mr. Heinze's connection with the Columbia & Western. His principal assistant throughout was Mr. J. G. Sullivan, C.E. The divisional engineers were Messrs. F. M. Young, G. Farr, Oscar Englund, L. M. Rice and A. Dennis. Mr. J. W. Stewart, C. E., superintended construction on behalf of the contractors. The average cost of construction was about $40,000 a mile, making the total cost about $4,000,000. This is exclusive of about 25 miles of branch lines afterwards made to Deadwood, Summit, Phœnix and Wellington camps.

CAMP McKINNEY AND ROCK CREEK.

THE Year Book of British Columbia thus describes Camp McKinney: The discovery of Camp McKinney was made in 1884 by two placer miners, who uncovered free gold-bearing quartz. The camp, however, takes its name from Al. McKinney, who located the first mineral claim, staking out the now well known Cariboo mine. Camp McKinney has ever since been a more or less active field for prospectors and miners. It is situated at an altitude of 4,600 feet, on round-topped hills, almost midway between Penticton and Greenwood, about 50 miles from the former and 40 miles from the latter. It is bounded on two sides by the forks of Rock creek, while Rice creek flows through the centre. The government wagon road affords communication between the points named. Rock Creek, a short distance in the direction of Greenwood, was in the sixties a very active placer mining camp, and gold to the value of several million dollars is said to have been taken therefrom. Of later years the deposits have been only worked at intervals.

The formation is in a northerly and southerly direction, and consists mainly of highly altered schistose, diabases banded with quartzites, crystalline limestones



ROCK CREEK PLACER.

and gneisses. West of the camp there is a large tract of granite, gneiss and porphyry. The veins for the most part are fissures, cutting across the formation in an easterly and westerly direction, in which they are frequently encountered. The ores in the central portion of the camp are carried in quartz or quartzites, and are free-milling or concentrating. About two miles away, however, there have been found dykes carrying good values in pyrrhotite, pyrites and chalcopyrite.

At one time there was considerable activity in Camp McKinney (the result to some extent of speculation) and a number of properties were worked, but at the present time operations are confined to a few leading properties. In many respects it is a promising camp, with, however, the vicissitudes incident to a free-milling industry.

To the foregoing may be added the following: The Cariboo-McKinney Mining & Milling Co., Ltd. (formerly the Cariboo Mining, Milling & Smelting Co.) authorized capital $1,250,000 in $1.00 shares, was incorporated in 1898. The directors are Messrs. Robert Jaffray, president; H. M. Pellat, vice-president; Geo. B. McAulay, managing director; S. W. McMichael, treasurer; A. Ansley, Thos. Long and G. B. Smith. The head office is in Toronto, Ontario. Mr. J. P. Keane is mine superintendent. The mining properties owned by the company are the following adjoining claims: Okanagan, Sawtooth fraction, Amelia, Cariboo, Alice, Emma and Maple Leaf. The deepest workings in the mine are down to nearly 600 feet depth. Much cross-cutting and drifting has been done on various levels and a large quantity of ore has been mined and milled during the years the Cariboo has been worked. During 1901 there were mined and milled 16,862 tons of ore, which yielded 9,439 ounces of gold bullion and 428 tons of concentrates. At the present time there are reserves of ore in sight sufficient to keep the stamp mill going for about two years. The plant includes two boilers, a 60-h. p. hoisting engine and a 10-drill Rand compressor in the shaft house, and four batteries of five stamps each (giving 20 stamps in all), a 60-h. p. Corliss engine, two Johnstone vanners, a Wilfley table, Blake crusher, Gates crusher and other appliances in the stamp and concentrating mill. The mill crushes on an average about 1,400 tons of ore per month, which results in a monthly clean-up of about $15,000 besides the value contained in the concentrates, which are hauled to Midway and sent thence by rail to the Hall Mining & Smelting Co.'s smelter at Nelson, B. C. The mine and mill employ between 50 and 60 men, but it is probable that operations will ere long be on a larger scale. The Cariboo paid dividends aggregating $478,087 up to October, 1900, but ceased paying from then up to March of the current year, when the aggregate was increased to $496,837.

The most prominent among numerous other claims in the camp are the Waterloo and Fontenoy, located as extensions of the Cariboo vein, and the Sailor and Minnehaha near by. Of these the only one now doing any work is the Waterloo, operating on a small scale.

APPROXIMATE DISTANCES OF BOUNDARY POINTS.

THE railway distances from West Robson, on the Columbia river, westwards to Boundary towns are, approximately:—To Cascade, 55 miles; Grand Forks, 68 miles; Eholt, 82 miles; Phœnix (via branch line) 02 miles; Greenwood, 90 miles; Midway, 99 miles.

The distances by waggon road eastwards from Penticton, at the foot of Okanagan lake, are, approximately:—To Camp McKinney, 52 miles; Rock Creek, 70 miles; Midway, 82 miles; Greenwood, 90 miles; Phœnix, 95 miles; Grand Forks, 110 miles; Cascade, 123 miles; and Bossburg (in Washington, on the Spokane Falls & Northern railway), 150 miles.

ALTITUDES OF BOUNDARY POINTS.

MR. L. M. RICE, C.E., who had charge of the surveys, and was the resident official supervising construction of the Boundary portion of the Columbia & Western railway, published a map of the district upon which appeared the following elevations:—

	Feet.
Phoenix (on Old Ironsides and Banner mines)	4,625
Winnipeg mine	4,425
Hartford Junction	4,300
City of Lincoln mine—White's camp	4,150
B. C. mine—Summit camp	3,800
Long Lake	3,700
Mother Lode mine—Deadwood camp	3,450
Oro Denoro mine—Summit camp	3,400
Eholt	3,080
Greenwood	2,400
Midway	1,900
Grand Forks	1,710

PHŒNIX CAMP MINES.

THE GRANBY CONSOLIDATED MINING, SMELTING AND POWER CO., LTD.

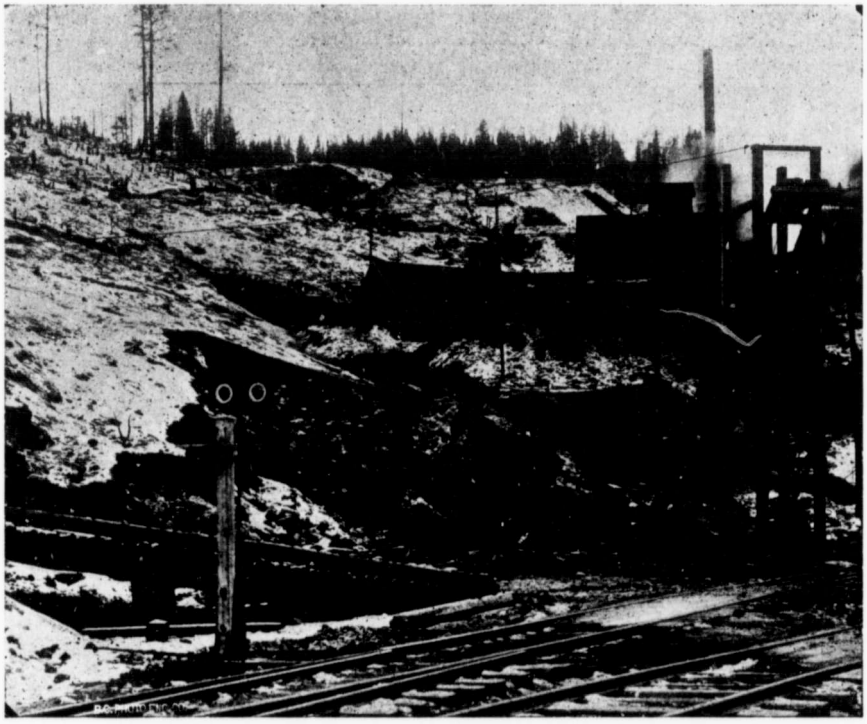
THIS company was incorporated on May 11, 1901, with an authorised capital of $15,000,000 in 1,500,000 shares at $10 each. Of these shares 1,210,633 were issued to shareholders in the four companies of which this company is a consolidation, and the remainder placed in the treasury for future use in the interests of the company. The directors are S. H. C. Miner, Granby, Quebec, president; Jay P. Graves, Spokane, Washington, U.S.A., vice-president and general manager; A. C. Flumerfelt, Victoria, B. C., asst. general manager; A. L. White, Montreal, Quebec, secretary; Fayette Brown, Montreal, Quebec, and J. H. McKechnie and W. A. Robinson, both of Granby, Quebec. The officials resident in the district are Geo. W. Wooster, treasurer; H. N. Galer, assistant to managers and purchasing agent; W Yolen Williams, superintendent of mines, and A. B. W. Hodges, superintendent of smelter. The company's head office and smelter are at Grand Forks, B. C., and its mines are at Phœnix, B. C. The four companies included in the consolidation were the Old Ironsides Mining Co., Knob Hill Gold Mining Co., Granby Consolidated Mining and Smelting Co., and Grey Eagle Mining Co. The mineral claims acquired from these several companies were the Old Ironsides, Knob Hill, Victoria, Fourth of July, Phœnix, Ætna, Grey Eagle, Banner, Tip-Top and Triangle fraction, all adjoining claims in or adjacent to the town of Phœnix. The Old Ironsides and Knob Hill were both located on July 25, 1891, and are the oldest locations in what is officially known as Greenwood camp, but now generally called Phœnix camp. The Old Ironsides Company was registered in British Columbia in December, 1895, and the Knob Hill in January, 1897. But a limited quantity of underground work was done on the Old Ironsides prior to 1897, in which year a steam hoist was put in and development commenced in earnest. The Knob Hill at this time had one of the biggest surface showings to be seen in the Boundary, a deep open cut about 90 feet in length exposing a mass of ore. Big as this showing was though, it gave no idea of the magnitude of the ore body opened up by later development, but the driving of a tunnel and crosscuts, and the blocking out of what was literally an acre of ore, followed afterwards by more extensive workings, disclosed the occurrence here of ore in such enormous quantities that even to-day most people are incredulous as to the immense proportions of the ore body until after they have seen it for themselves. Similarly, it is literally true that "acres of ore" were blocked out in the Old Ironsides and Victoria, as the writer can testify from personal observation, for when taken underground in these mines two years ago he walked around three blocks of ore each not less than an acre.

GRANBY CON. M., S. & P. CO'S OLD IRONSIDES AND KNOB HILL MINES, PHŒNIX, B.C.

Space limitations prevent anything more than a brief summary of the development work done being given here. The aggregate footage of development in the company's mines to March 21 of the current year, chiefly in the Old Ironsides, Knob Hill and Victoria, is 14,771 lineal feet, or within about a thousand feet of three miles. Of this total 2,689 feet are sinking and raising, and 12,082 feet in crosscutting and drifting. These figures show the number of feet done in underground development work proper, but leave entirely out of consideration the numerous large drifts and raises in the huge ore bodies preliminary to opening out the big stopes characteristic of these mines, which are being extensively worked underground down to the 300-foot level. The shaft known as No. 2 has been sunk to a depth of 400 feet, but no station has yet been opened at that depth. These workings are connected by long crosscuts and raises with those of the Knob Hill and at the 300-foot level are 550 feet, vertical depth, below the apex or outcrop on the Knob Hill, the ore bodies being

continuous from the summit of the mountain on the Knob Hill through the Old Ironsides to other claims beyond, also owned by the Granby Company.

One of the most remarkable phases of mining to be seen in the district is that of ore quarrying at the Knob Hill mine. The two accompanying views serve to give some idea of the ore quarries, but the photographs were taken last October and these open workings have been so much enlarged during the intervening six months that the impression conveyed by the views is now a totally inadequate one. The workings have been opened on the north side of the hill, in four or five places, three of which appear in one of the views. The big quarry appearing in the other view is the highest up the hill. These openings are, along a distance of about 900 feet, of 100 feet. These serve as chutes down which the ore is thrown and is trammed thence through the tunnel to the ore bins. As the raises are also in ore there is now a workable face of ore 164 feet in depth down to the tunnel level. Arrangements are now in progress to run the railway cars into the two lower quarries and there load them by means of steam shovels. As will be seen the lowest quarry is on the ore-track level; a switchback has been put in and a track laid up to the tunnel level, on which it will be swung round the end of the building and into the centre quarry. The double track shown in the foreground of the view runs past the ore bins and thence on 400 or 500 yards, doubling back to the mouth of the tunnel, passing in front of the building shown, in which have been installed two 80 horse-power hori-



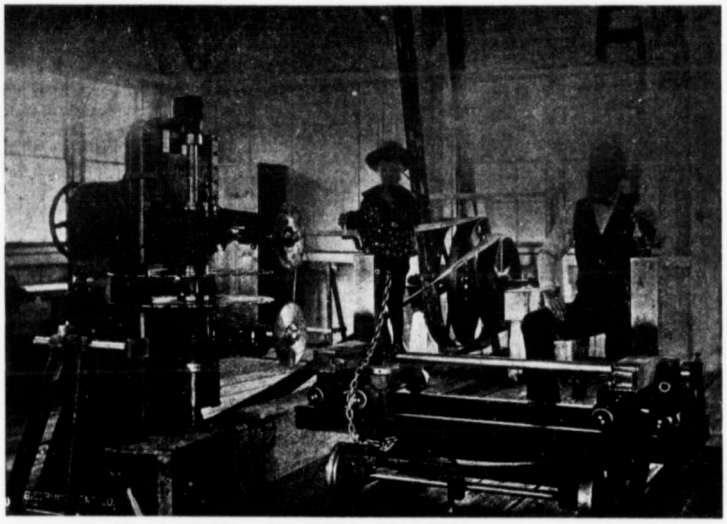
General View of Ore Quarries, Granby Con. M., S. & P. Co's Knob Hill Mine.

in ore known to extend for about 3,000 feet in length on the company's ground. Similar work has been commenced from the south end, on the southern slope of the hill, working northwards. Where stripped on the northern slope this enormous ore body has a width of from 300 to 400 feet, but it has not yet been worked to more than about a third of that distance, the top quarry being about 100 feet in width. As now opened the deepest face of ore is about 80 feet, but a big cut — the lowest shown in the view—is being run into the hill at a level that will eventually give an open face of more than 200 feet in maximum depth. The Knob Hill main tunnel, which is on the same level as the middle quarry as the three shown in the view, its portal being hidden by the buildings, is 84 feet in vertical depth below the floor of the top quarry shown. Six large raises have been made from the tunnel to the quarry at intervals

zontal return tubular boilers, a 10-drill duplex cross-compound condensing Rand air compressor, two air receivers and other plant, power for working the machine drills in the quarries and underground workings of the Knob Hill being supplied from here.

A similar plant is being installed at the Old Ironsides where there is more boiler power in addition, together with hoisting engines at shafts Nos. 1 and 2, and electric light engine and dynamo, steam pumps and other appliances, and a single ended timber-framing machine, driven by a 45 horse-power Meyers cut-off engine made by the Jenckes Machine Co. A small hoist has been placed at the mouth of a new shaft sunk on the southern boundary of the Victoria. This shaft is centrally situated in regard to all claims owned by this company, and it is connected with the 300 level of the Victoria. It is intended to make this the main working five-

compartment shaft. The company recently ordered from the Jenckes Machine Co. a 12 x 18 double cylinder single drum reversible engine, similar to that supplied by the same manufacturers to the Sunset mine. It is intended to put in a large air compressor, the ore output having been so largely increased as to make more drilling power a necessity. The buildings erected for the accommodation of employees in connection with these mines are commodious, substantial and comfortable. Besides the larger buildings the company has

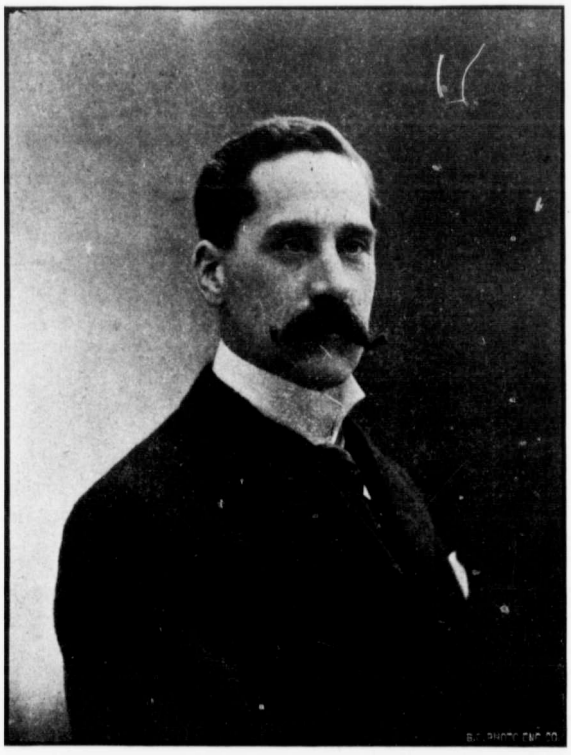


TIMBER FRAMING MACHINE, GRANBY CO'S MINES.

PART OF ORE QUARRY AT THE GRANBY CON. M., S. & P. CO'S KNOB HILL MINE.

provided a number of residence houses for married employees.

A few words in conclusion in connection with the ore shipments. These commenced in July of 1900, and during that month 2,791 tons were shipped to the company's smelter at Grand Forks. There was a rapid increase in the quantity sent out during the remainder of the year, the output for December having been 19,513 tons, the total to the end of 1900 having been 64,531 tons. During 1901 monthly shipments ranged from 17,360 tons in February to 21,596 tons in December, the aggregate for the year having been 131,762 tons. This year's figures for three months to March 31 are:—January, 17,571 tons; February, 20,206 tons, and March, 30,589 tons; total, 68,366 tons. The aggregate of all shipments from July, 1900, to March, 1902, inclusive, is 364,659 tons. As the output for April will show a substantial increase over that of March, the grand total tonnage will have exceeded 400,000 tons by the time this shall be published. And yet the limit of increase is by no means reached, for Supt. Williams, under whose competent direction these big mines have been steadily developed from their prospect days up to their present magnitude, is preparing for an anticipated daily output ere this year closes of not less than 2,000 tons per diem.



Snowshoe Mine—Mr. J. W. Astley, C.E., Resident Superintendent.

SNOWSHOE GOLD AND COPPER MINES, LTD.

The Snowshoe Gold and Copper Mines, Ltd., was formed in London, England, in June of last year to acquire and work the Snowshoe group, consisting of the Snowshoe mine and the Pheasant, Alma fraction and Fairplay fraction mineral claims, containing in all about 120 acres. The claims adjoin and are situate in the Grand Forks Mining Division, about half a mile from the town of Phœnix. The Snowshoe company has a capital of £250,000 ($1,250,000) divided into 250,000 shares of £1 ($5.00) each, of which 150,000 were issued to the British Columbia (Rossland and Slocan) Syndicate, Ltd., vendor and promoter (which spent more than £25,000 on buildings, machinery and development work on the Snowshoe), as the purchase price of the property sold to the larger company. Of the 100,000 shares of treasury stock nearly half were subscribed for when the the company was organised. The directors of the company are the Earl of Chesterfield, chairman; Mr. Geo. S. Waterlow, (of Waterlow & Sons, Ltd., London), deputy chairman; Mr. C. G. Pym, Dr. H. Lewis Jones and Mr. Anthony J. McMillan, managing director.

The Snowshoe is the principal claim in the group, nearly all the development work done to date having been done on it. This claim was located by W. A. McDonald on April 18, 1893. Later it passed into the possession of Messrs. Robt. Denzler, W. W. Gibbs and Thos. McDonnell. Before the property was acquired by the British Columbia (Rossland & Slocan) Syndicate, Mr. Gibbs disposed of his interest to Mr. Robt. Wood, of Greenwood. Prior to the syndicate obtaining possession of it the Snowshoe had in 1897 and 1898 been under bond, the former year to "Patsy" Clark, of Spokane, Wash., and in the latter to a company represented by Mr. Rienzi W. Macfarlane, C.E. Mr. Clark did not do sufficient work to demonstrate the value of the Snowshoe, and Mr. Macfarlane's principals were unable to proceed with the development and purchase of the property by reason of a shortage of money. Following the receipt of favourable reports from Mr. Macfarlane and Mr. J. W. Astley, M.E., the latter being consulting engineer to the syndicate, an option was obtained on the Snowshoe by Mr. A. J. McMillan for the British Columbia (Rossland & Slocan) Syndicate, which eventually purchased the claim, acquiring later the other claims in the group.

At date the number of lineal feet of work done in underground development of the Snowshoe is 6,300, of which about 1,650 feet are sinking and raising and 4,650 feet crosscutting and drifting. The first work done below ground was the sinking of an incline shaft, now down 200 feet, from which levels were run at 100 and 200 feet. On these levels about 1,500 feet of crosscutting and drifting have been done, and two raises have been made to the surface. Much of this work, which is in the eastern part of the claim about midway between the north and south boundary lines, is in ore, a considerable quantity of which was taken out in the course of this development. The company's property extends easterly, and the ore bodies dip in the same direction. The total tonnage of Snowshoe ore shipped from the Snowshoe to date is 2,785 tons.

The mouth of the above-mentioned shaft is higher than the level of the C. P. R. railway, which crosses the property. Below the railway and in the southern part of the claim a tunnel has more recently been run westward into the hill which rises rapidly to the western

boundary of the property. The workings here are comparatively extensive and in a big ore body apparently parallel to that in which the shaft is sunk. This ore

Snowshoe Mine, Near Phenix.

body was cut by the railway grade, so the tunnel afterwards driven into it is known as the "railroad" tunnel. For about 300 feet, excepting where a 25-foot dike of waste crossed it, the tunnel was continuously

trusion of waste. A winze sunk 100 feet below the tunnel to No. 2 level, was in ore for 40 feet when the ore dipped out, but a crosscut from the bottom of the winze ran into the ore at 88 feet and continued in it for 170 feet, when the wall was encountered. A deal of crosscutting and drifting has been done on No. 2 level, which has also been connected with No. 1 level by

Miners to Machine Drill, Snowshoe Mine.

in ore. The tunnel was extended for a long distance beyond, with the object of cutting ore bodies should any lie ahead. A raise on the incline 150 feet to the surface was also in ore, except where it passed through one in-

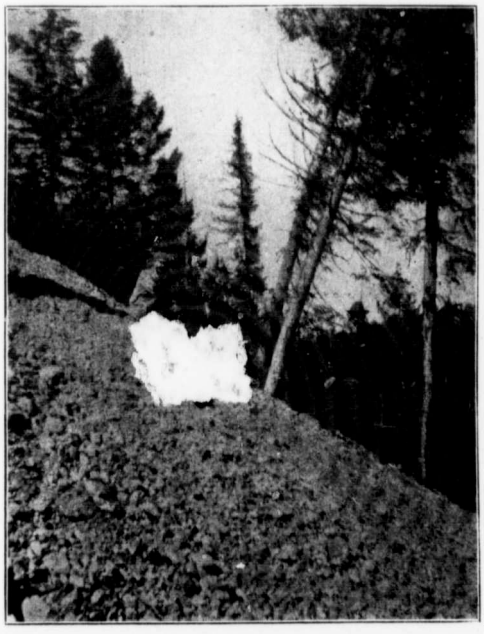
means of a raise. A winze from No. 2 was sunk until water came in, when the diamond drill was used to prospect to greater depth. Following the obtainment of much information from these prospecting operations,

which warranted more extensive and permanent work being entered upon, a large main working shaft is now being sunk on this part of the property. Work is in progress from the surface and at both levels simultaneously, so that much expedition is resulting, and the

Supt. Astley's Residence, Snowshoe Mine.

shaft will consequently be soon available for the enlarged operations the management of the mine has in view.

Preparations have also been made on the Snowshoe to quarry ore on a large scale. The surface debris has been removed from the greater portion of one area ex-

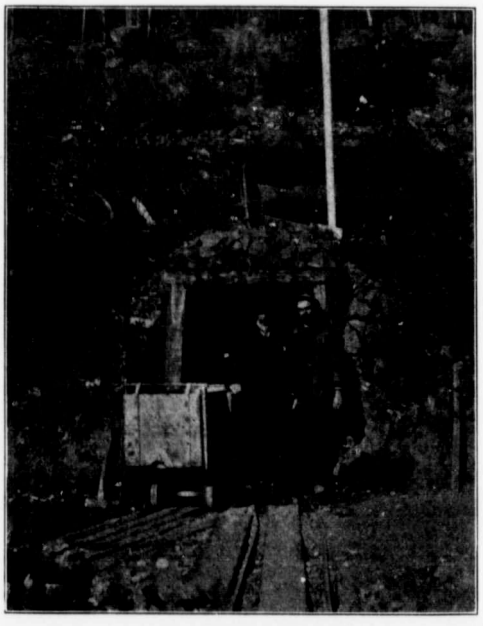


Dump of Ore at the Snowshoe.

tending about 500 feet north and south and 120 feet east and west, and from a small area across a small gulch to the southward. Overlying the solid rock there is a large quantity of decomposed ore which will be sent to the smelter, this having been found to contain values more than sufficient to pay for thus disposing of it.

Body of Ore Exposed on Snowshoe Railway Cut.

Quarrying operations have already been put in hand, and a railway spur and ore bins constructed at a level that admits of the ore being trammed from the quarry



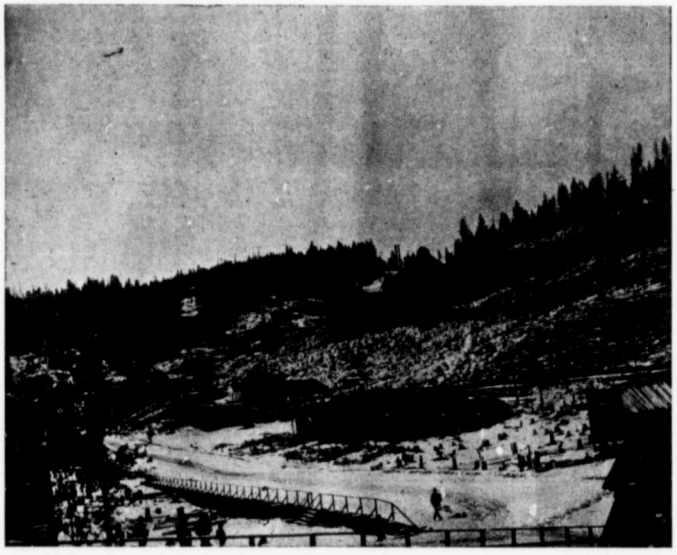
Mouth of the Railroad Tunnel.

to the ore bins and being loaded on to railway cars at small cost.

The Snowshoe ores vary in character, the gangue being sometimes silicious, sometimes calcareous, whilst

again it is a magnetite or specular hematite. All carry gold and copper. The copper either sprinkled freely throughout or more generally disseminated in very fine particles. In parts of the mine the several varieties occur in quite distinct bodies and in others they are mixed together.

The power plant on the mine includes two steam boilers, two air compressors together rated at about 12 drills, machine drills, hoisting engine at the shaft and an auxiliary hoist in the tunnel, steam pumps, etc. The first half of a Rand-Corliss 30-drill air compressor, to have a working pressure of 125 lbs., a combined machine to be driven by either steam or electricity, and two 80 horse-power horizontal return tubular boilers, with a working pressure of 150 lbs. (those boilers being the first of this class to be brought into the district) have been ordered from the Jenckes Machine Co. and are now on the way to the mine. As the Cascade Water & Power Co's transmission lines cross the Snowshoe ground



Brooklyn Mine, Dominion Copper Company.

it will be easy to obtain electric power whenever needed. The accompanying general view shows the mine buildings, most of which are quite new. They are commodious and comfortably fitted, so the mine employees are well housed.

Mr. J. W. Astley, M.E., the resident superintendent, had fifteen years' experience as a mining engineer in the states of Montana and Idaho, U. S. A., before coming to British Columbia in 1896. At the Drumlomond mine, Marysville, Montana, he was associated with others in solving the problem of how to deal profitably with low-grade ores, an experience that is serving him in good stead in the Boundary. At Rossland, B. C., he had the direction of the mining affairs of Mr. F. Aug. Heinze. Later he became consulting engineer to the British Columbia (Rossland & Slocan) Syndicate, Ltd., and in this capacity supervised the development of the Snowshoe, and when the company now under notice was formed he was appointed snperintendent and took up his residence at the mine.

DOMINION COPPER CO., LTD.

The Dominion Copper Co., Ltd., has its head office in Toronto, Ontario. Its authorised capital is $5,000,000, in shares of $1 each. The directors are: Hon. G. A. Cox, president; and Messrs. Wm. MacKenzie, D. D. Mann, E. R. Wood and Hugh Sutherland, managing director.

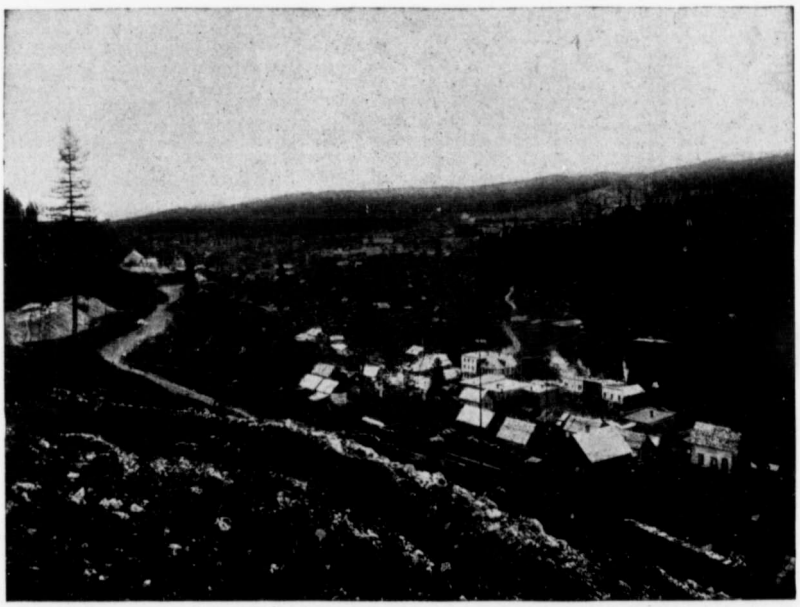
The company's mining properties are the Brooklyn, Stemwinder, Montezuma, Standard and Rawhide mineral claims, all situate at or near the town of Phœnix. No work is being done on any of the claims at the present time, but the company employed about a hundred men during the greater part of last year doing development work, principally on the Brooklyn, the work done on the Idaho and Rawhide having been much less extensive.

There is not much reliable information available regarding these properties. It is known though that development work approximating between 3,000 and 4,000 lineal feet has been done on the Brooklyn, which has a shaft 268 feet in depth from which levels have been run at 150 and 250 feet depth, respectively. Much ore, averaging $5 to $6 per ton, which seems to be somewhere about the prevailing value of the larger bodies of copper ore occurring in the district, has been opened up. It is stated on what is believed to be good authority, that one chute of ore in the Brooklyn mine has been proved to be at least 1,000 feet in length and 20 feet in width at the 250-foot level.

The adjoining Stemwinder has a shaft 344 feet in depth, but only a comparatively small footage of drifting and crosscutting has as yet been done in this mine. The Idaho, which adjoins the Brooklyn on the south, has had a shaft sunk on it and some crosscutting has been done from this towards the workings of the Brooklyn. A shaft has been sunk 184 feet on the Rawhide, connecting at that depth with a crosscut tunnel driven about 600 feet into the hill. Some nice ore was met with in sinking this shaft, but very little work was

done towards determining the size of the ore chute.

The power plant in use at the Brooklyn and Stemwinder mines, when they were working, includes three boilers, two 5-drill air compressors, two hoisting engines, steam pumps, etc. A larger air compressor was obtained last year, but this has not yet been installed. It is the first half of a cross compound Corliss engine of the Ingersoll-Sergeant type, and has a capacity of 15 drills. This machine is so arranged that should the company at any time determine to double the air capacity the other half can be added. The Brooklyn mine is equipped throughout with Ingersoll-Sergeant drills, the whole plant having been supplied by the Jas. Cooper Manufacturing Co., Ltd., of Montreal, Quebec.



THE "CITY" OF PHŒNIX EIGHTEEN MONTHS AGO.
The town has since grown.

THE TOWN OF PHŒNIX.

PHŒNIX is the centre and leading mining camp of the Boundary, at least so claims the Phœnix *Pioneer*, which merits its reputation of being the newsiest and best all-round newspaper published in the district, albeit at times disposed to take credit for its own town to a somewhat greater extent than appears fair to others who have no interest in any particular town or part of the district. But the claim that Phœnix is the leading mining camp is well grounded, for with such mining properties as the Granby Co's mines, the Dominion Copper Co's Brooklyn and Stemwinder group, the Snowshoe and the Gold Drop, either within the city limits or in the immediate vicinity of the town, no exception can fairly be taken to such an assertion. Notwithstanding that neither at the Dominion Copper Co's mines, nor at the Gold Drop is any work being done just now, there must be between 400 and 500 men on the pay rolls of the mines that are in operation, and since both the Granby mines and the Snowshoe are preparing for a largely increased output, the prospects are favourable for the addition during the current year of from 100 to 200 men to the number now regularly employed in these mines, leaving out of consideration the fact that the Dominion Copper Co. may at any time resume work and give employment to from 100 to 200 men in its mines. And since the policy of the Granby Co. is in a degree to encourage its miners and other employees to make their homes in the town, the outlook for Phœnix appears to be favourable.

Phœnix was incorporated last year, Mr. George W. Rumberger, who virtually started the town, is its mayor, and its aldermen are Messrs. John Bradley, J. H. Graham, Jas. Marshall, John McRae, D. G. Munroe and W. W. Rogers. Mr. D. McMillan, its city clerk, recently resigned, and at the time of writing his successor has not been appointed. Phœnix has also an active Board of Trade, Mr. Rumberger being president and Mr. W. B. Willcox, editor of the *Pioneer*, secretary. The Eastern Townships Bank has a branch here, and several of the mercantile establishments carry large stocks and occupy substantial buildings that are a credit to the town. A brewery and a well-stocked lumber yard are other local business concerns. Railway, telegraph and telephone connection afford means of ready communication, whilst waggon roads to surrounding mining camps give these places convenient access to the town. A stage line between Phœnix and Greenwood facilitates travel between the two towns. The local miners' union is strong numerically, and there are besides a carpenters' union, a white cooks and waiters union and a socialistic club. Incidentally, it may be mentioned that Phœnix will not permit Chinese to remain in the town, in which respect it stands alone among the larger towns of the Boundary. Phœnix has its own Water and Light Co. Last, though not least, the medical and legal professions are well represented in Phœnix.

The public school building in Phœnix is fairly adequate to present requirements, but as the population of the town which the Dominion census last year placed at 866, increases more accommodation will be required.

THE ORE DEPOSITS OF THE BOUNDARY DISTRICT, B. C.†

By R. W. Brock, Ottawa.

THE district treated of in this paper is that lying along the International boundary line, in the neighbourhood of and between the valleys of the North Fork of the Kettle river and Boundary creek, B. C. Following upon the construction of the Columbia & Western railway, a little over two years ago, and the installation of smelters at Greenwood and Grand Forks, a year and a half ago, the district at once took a foremost place in British Columbia lode mining, and it now ranks as one of the most important factors in the production of copper in Canada.

While the mountains are not rugged, and the western and southern slopes are often open, prospecting has not been easy, on account of the covering of drift which conceals the rocks over a considerable portion of the surface, and on account of the complex geological structure of the district. Eruptive rocks, including granites, greenstones, lavas (and associated tuffs) and various intrusive dikes, have the widest distribution. More or less altered sedimentary rocks (limestones, argilites, quartzites), together with more highly altered metamorphosed rocks, including serpentine, are met with in all parts of the district; but do not, as a rule, have large dimensions in any one place, being usually nothing more than inclusions of older formations, caught up in the intrusive rocks.

The oldest rocks recognized in the district are the sedimentary and crystalline rocks. In the southeastern part of the district, just west of Grand Forks, some crystalline mica and hornblende schists and crystalline limestone occur, which resemble, lithogically, the rocks of the Shuswap series (Archean), but they may possibly merely represent, in a more highly metamorphosed form the argillites and limestones found elsewhere in the district.

The argillites are normally dark or red, occasionally highly carbonaceous, but are often altered to grey knotted schist, or hornfels, or they may be largely silicified. The limestones are usually white and crystalline, but occasionally show an original black colour. In places the lime is replaced by silica forming cherty or quartzite-like jasperoid rocks. True quartzite is only sparingly found. Closely associated with these is a serpentine, probably derived from a basic eruptive rock. It is frequently altered to a siliceous dolomite or magnesite. These rocks form a series closely resembling and probably the same age as the Cache creek series described by Dr. Dawson, and ascribed by him to the carboniferous formation.

Somewhat younger than the sedimentary rocks is the greenstone, which has the greatest areal distribution of all the rocks of the district. Often it is altered but where its structure is preserved, it appears to be an augite-porphyrite, sometimes agglomeratic, similar to that rock found in many parts of West Kootenay, notably around Rossland. It cuts and holds inclusions of the older rocks; indeed, in most of their occurrences the latter appear simply as islands in the greenstone, varying in size from small fragments, closely packed and almost filling the greenstone matrix, to bands hundreds of meters long. Under pressure it becomes schistose and difficult to detect from some of the included argillites. Occurring with it are banes of a tuff-like rock, filled with fragments of the older rocks, and interbanded with fine-grained ash-like bands.

† Read before the Canadian Mining Institute by permission of the Acting Director of the Geological Survey.

Younger than, and cutting the greenstone, is a gray hornblende-biotite granite, which is exposed near Greenwood in Wellington Camp, and on Hardy mountain. Gray granite porphyry dikes from it cut the older formations a long way from the parent masses. The white altered porphyry on McCarren creek and at the City of Paris mine may belong to this series of dikes. This granite will probably prove to be the same rock as the Nelson granite, of West Kootenay, and about Jurassic in age. Near Central Camp, and northwest of it, are bosses and dikes of a gray granite rock, which closely resembles the Rossland monzonite, but until it has been carefully studied it is still uncertain that it is the same rock. Younger granites occur just outside the area described.

Beds of volcanic rock are found at several points overlying the rocks already referred to. These are remnants of a sheet of volcanics which once covered the entire country, but which, in this district, have been largely removed by erosion. The series consist of coarse and fine tuffs, ash beds and shales (in which coal is sometimes found), with sheets of andesites, basalts, and other volcanic rocks. These latter are sometimes locally termed "bird's-eye porphyry." This series is probably of Tertiary age.

Dikes of a reddish or yellowish syenite-porphyry, having a fine-grained ground mass, with conspicuous rosette-like phenocrysts of feldspar and some biotite, are common in the mineralized portions of the district, though wanting in the unmineralized. On the Carbonates claim, this reddish porphyry is seen as a contact facies of a coarse syenite porphyry similar to those observed east of the North Fork and in the Rossland district, where such dikes are known to be from the Rossland granite. They would appear to have the same relationship here, but it is yet to be proved that they have no genetic connection with the volcanic flows as well. Dark lamprophyric dikes and some of a brownish basalt-like rock also occur.

The ore bodies may for convenience be roughly divided into three classes: (1) The large low-grade copper-bearing sulphide deposits; (2) The oxidized copper veins, and (3) The small gold and silver-bearing quartz veins.

Undoubtedly the most striking characteristic of the deposits of the first class is their enormous size. In structure these deposits belong to composite-vein type, formed by mineralizing solutions traversing the country rock, principally along fissures or zones of fissures in which they deposit the economic minerals, and from which they replace with their mineral contents, particle by particle, sometimes only partially, sometimes completely, the original material of the country rock. On the outskirts of an ore body this substitution may be seen in all stages of development, the individual constituents of the country rock being one by one replaced. Sometimes as on the Emma claim, the replacement of the country rock has gone on so evenly that a completely banded ore has resulted. A banded structure cannot therefore be taken as a proof of open filling.

According to the most prominent mineral content, this class of deposits may be subdivided into a pyritic type, in which pyrrhotite, chalcopyrite, with some pyrite, are the chief minerals. Excepting that the pyrrhotite of the one is represented by magnetite in the other, these two types appear to be identical. Both the magnetite and the pyrrhotite replace the constituents of the country rock in the same way, both seemed to have been formed on the whole, a little prior to the other vein minerals, holding them in little veins, or as points scattered through, yet sometimes interbanded with them; they are both accompanied by the same acces-

sory and gangue minerals, and the country rocks show the same alterations in both cases. Rarely do both the pyrrhotite and magnetite occur in the same deposit.

Besides the metallic minerals already mentioned, some marcasite appears to occasionally be present, and sometimes arsenopyrite, galena, zinc-blende and molybdenite; but these are in all cases subordinate in quantity. Tetrahedrite has been found on the City of Paris. Specular iron is found somewhat sparingly, and bismuthinite occurs on one claim.

Calcite is a common gangue mineral, sometimes well crystallized, forming large masses, and also in the form of little seams through the ore and country rock. Seldom is it found in large quantities in those parts of a vein in which magnetite is heavily concentrated. Quartz is also an abundant gangue stone, occurring in the same way as the calcite, though I have not observed it well crystallized. Silification of the country rock to a cherty or quartzite-like (jasperoid) mass, is a common, though not invariable, phenomenon in the neighborhood of a vein. Red and green, garnet (probably grossularite and almondine) epidote are very abundant in and near the veins, both well crystallized and massive, often interbanded with the ores, and forming a very large percentage of the vein material. The progress of this formation may be observed at many points in all stages not only when limestone, but also when greenstone and granite form the country rock. In the Mother Lode, where limestone seems to be the country rock, while these minerals are developed, the chief mass of the altered rock is made up of a felt-like aggregate of short green fibres apparently of actinolite. A beautiful white radial tremolite occurs in the limestone at the Morrison mine. Kaolin, chlorite and serpentine are probably among the alteration products, but until the microscopic examination of the rocks has been made, an accurate account of the secondary minerals and their relative importance cannot be given.

The ores occur in all rocks except the most recent, the latter being the youngest granites, the porphyry and basic dikes and the Tertiary volcanics. In age, then, these deposits are probably early Tertiary. So far as yet found, mineralization is confined to districts which show evidence of recent disturbance, more particularly where the older rocks are cut by the recent intrusives. Limestone in such a district seems favourable for the deposition of ores. In some cases the ore occurs in the limestone itself, but more frequently it is found in a rock along its contact with limestone. Thus, in a greenstone, where it holds inclusions of limestone, the ore often occurs in the greenstone along its contact with the limestone, while the latter may show little or no mineralization. The lack of mineralization in the limestone in such cases may be due to the fact that the limestone often flows and forms compact lenticular masses, instead of fracturing under pressure, and thus furnishes no channels for the mineralizing solutions. If attacked and replaced by them, it must have been along the contacts, and this must have taken place comparatively evenly, leaving a clean cut unmineralized wall. While this may have been the case in some of the larger deposits, in many of the smaller veins occurring along such contacts, the mineralization shows a distinct preference for the greenstone, the limestone remaining unmineralized. That the contacts between lime and other rocks should be favonrable may have been due in part to the chemical influence of the lime in precipitating the mineral contents of the solutions, but it was also due to the lack of firm cementing between the limestone and the contact rock, which left free channels that the solutions used as highways and bases for their operations; but while such contacts are favourable, mineralization is by no means confined to them. While most of the deposits are in greenstone, limestone or contacts between these, they also occur in the serpentine argillites and gray granite.

Porphyry dikes are usually to be found in close proximity to the ores; the ore lies parallel to a dike along its contact or in the immediate neighborhood. The dikes while containing traces of metallic minerals, show no signs of mineralization. In age they are about the same or a little younger than the ore deposits, showing the deposits to have been formed during or before the close of the cooling of the eruptive magmas.

While the deposition of the mineral contents of the veins is evidently largely hydrothermal, many of the minerals formed are characteristic of contact zones, and there seems to be strong reasons for supposing the deposits to be connected with eruptive after-actions. The reasons for this belief cannot be discussed at length in the limits of a short paper. The magnetite appears to have been formed in the same way and under the same conditions as the pyrrhotite. It appears to be a primary constituent of the ore. Its formation seems to have depended upon a deficiency in sulphur, the available sulphur being seized upon by the copper and going to form chalcopyrite. On account of the variety of rocks in which the ores are found, it is evident that the source of the material veins cannot have been local. From the fact that the mineralized districts are much cut up by eruptive dikes, that areas of recent eruptions are close at hand, and vents from which the volcanic series were ejected were probably near by, and that magnetite so far seldom or never been found to have resulted from the deposition of ordinary mineral-bearing underground solutions, while common in contact metamorphism and as the result of solfataric action, it seems fair to conclude that the deposits have a connection with the recent eruptive rocks, and that at least some of the material was derived from the magma of the eruptives brought up by the after-actions characteristic of vulcanism. This view is supported by the independence of the deposits with regard to the country rocks, the resemblance of some of their materials to that of nickel-pyrrhotite and other deposits considered to be the products of magmatic secretion, and others to the products of volcanic after-action; at the same time it is not claimed that deep-seated underground circulating waters have had no share in the mineralization. Indeed the mingling of solutions from the two sources may have had a marked influence in the precipitation of their mineral contents.

There have been considerable movements since the ore was deposited; numerous slips, some with gouge and secondary filling, traverse the ore bodies. This broken nature of the ground, coupled with the original irregularity in the form of the ore body, makes the exploitation of the smaller deposits sometimes difficult and precarious. The slips so far encountered have not been sufficiently large to have seriously affected the larger deposits. The serpentine is particularly full ot slips, some prior, but many subsequent to the formation of the ores, which make it probably the least satisfactory country rock in the district.

The values in the ores are principally in copper and gold, sometimes with accessory silver. Further study is required to formulate the laws governing the distribution of gold values. Generally magnetite and pyrrhotite, when occurring alone, are almost barren, yet this is not always the case. Away from the chief centres of mineralization, while magnetite and pyrite are still sometimes found, the copper and gold are sparingly present.

A striking feature in the deposits is the lack of surface oxidation or alteration. At most, a few feet below the surface of the ground, the ore exhibits the same characters as are found in depth. The soil overlaying a deposit is often quite unstained, offering no indication of the underlying ore, and consequently adding to the difficulties of prospecting. Sometimes the surface of the ore even retains the glacial polishing. The explanation of this feature is probably to be found in the heavy glaciation to which this region has been subjected.

In Copper Camp oxidized copper-bearing veins occur, forming at first sight a totally different type of deposit. One deposit is found at a contact between a dike of porphyry and crystalline limestone. Wedge-shaped tongues of the porphyry extend from the main dike into the limestone. Both the limestone and the dike are much fractured and traversed by little slips. These fractures cut the limestone into small blocks. In the limestone, and to a less extent in the fractures in the porphyry, along the contact, are deposited various oxidation minerals of iron and copper, including native copper. These embrace red, massive and earthy hematite and yellow limonite, crystallized and massive malachite and azurite, a black amorphous substance, a mixture containing copper oxide (melaconite, lampadite and chalcocite), cuprite, often in transparent crystals, native copper, chrysocolla and probably copper pitchblende. The edges of the small limestone blocks have often been dissolved, and the copper ores then occur as encrustations surrounding a core of lime. The main fissures are filled with the iron and copper minerals, the smaller principally with the copper. In the porphyry it is only the fractures near the contact which contain a thin film of copper ore, the rock itself remaining fresh and unaltered. So that this type of deposit is probably an oxidized and secondarily enriched form of a sulphide deposit similar to the first type of Boundary deposits, and produced by the action of surface waters. The iron of the sulphides has been removed or re-deposited as hematite and limonite, the copper has been more or less concentrated in the form of various oxidized minerals. At greater depth the unaltered iron and copper sulphides will presumably be found, although between the oxidized minerals and the unaltered sulphides it is quite possible that a zone of enriched sulphides will be found.

The quartz veins constituting the third type of deposit are found in the neighborhood of the first type, but seem more abundant on the outskirts of areas of chief mineralization. They are sometimes parallel to the large sulphide bodies, but do not as a rule show the same regularity in their strike. In form they are more regular and they are usually enclosed between well-defined walls. Chalcopyrite, pyrite, arsenopyrite, galena and zinc-blende are the chief metallic minerals. Tetrahedrite and some rich silver minerals are said to have been found in some of these veins. The principal values are in silver and gold. In age and mode of formation there may have been little difference between these and the previous deposits, though in that case they would probably represent the closing stage of mineralization.

Some of the practical deductions from an examination of the ore deposits may be summarized as follows:

Ores may be found in any of the older rocks where the other conditions for mineralization were favorable.

Districts which show evidences of late disturbances, through vulcanism, manifested by intrusions of recent eruptives and heavy diking, are promising fields for prospecting.

Limestone contacts in such areas should, in particular be carefully prospected.

Since, with the exception of certain deposits in Copper Camp, there is no zone of oxidation, and secondary enrichment, in the main deposits, while the general conditions remain uuchanged, no loss of values is to be expected in depth.

On account of the irregular form which the ore bodies may possess, and the complex nature of the rock formations, a careful and detailed study of the surface of the ground in the neighborhood of the mines would be of great practical assistance in the exploitation of the ore bodies. For the same reason development work must always be kept well ahead of the actual mining. Crosscutting must frequently be resorted to, to determine the actual limits af the deposit, and to prove the existence or non-existence of parallel ore chutes. The limits of mineralization must be actually proved, and similarly that ore can be with certainty reckoned on, which has actually been blocked out. In this connection diamond drilling can be used with advantage. Careful magnetic surveys would always be of great value in locating ore bodies under the covering of drift, and also for testing for ore in the mines themselves. Especially good results should be obtainable by this method in the magnetic type of deposit, but it should also prove successful in the pyrrhotitic deposits.

Where the ore occurs at a limestone contact the limestone wall may often be used for following the ore, it being kept in mind that the ore does not always follow strictly along the contact, and that the limestone may pinch out without causing the ore to likewise give out. The dikes in some cases may be used in the same way.

The pyrrhotite and magnetite should always be assayed, as a barren-looking material may carry good values. The minerals in the ore and the conditions where pay values occur should be carefully studied with a view to ascertaining which carries the values, and what were the causes which produced the concentration of values.

The porphyry dikes, themselves, while not mineralized in the same way as the country rock, may in places prove auriferous.

In prospecting, it is to be remembered that float may have been carried a considerable distance, even across valleys by the former glacier. The general course of the latter was about S 30° E, but it was influenced by the local topography.

In a promising deposit of the oxidized copper type, one would be warranted in testing the deposit to a sufficient depth to ascertain it a zone of enriched sulphides exists between the oxidized zone and that of the unaltered sulphides.

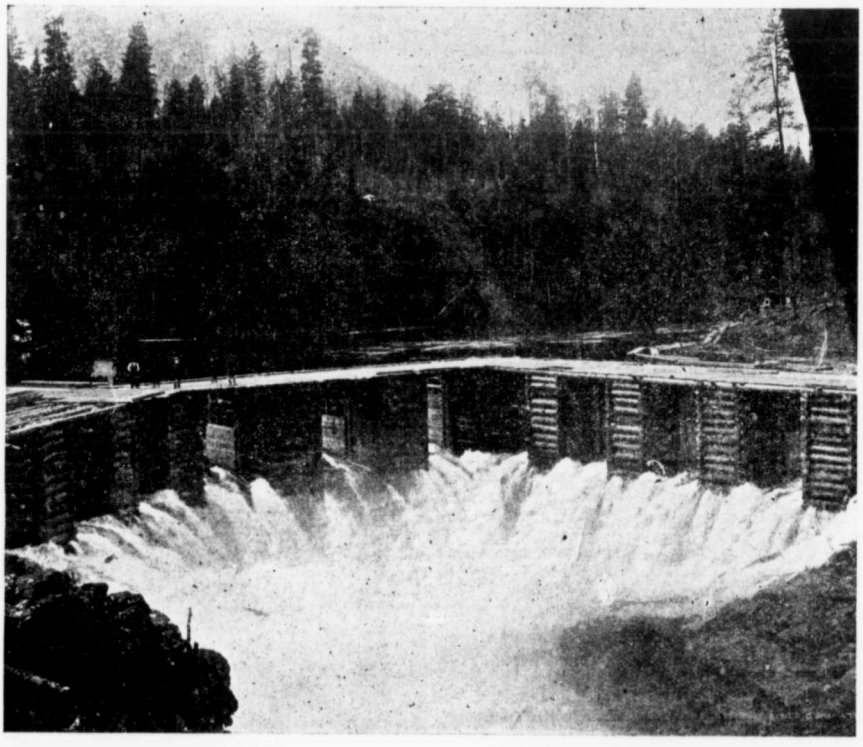
Below the limits of alteration, the deposit may or may not be rich enough to work.

CASCADE WATER POWER AND LIGHT COMPANY, LTD.

THE main Kettle river, flowing from the west, at Cascade City rushes through a narrow, rocky gorge in a series of rapids and falls for a distance of about half a mile, in which distance it has a natural fall of 121 feet. It is estimated that there is a power equal to 6,000 to 7,000 horse-power available here at low water. For its development the Cascade Water Power & Light Company, Ltd., the stock of which is held by an English company represented in British Columbia by Mr. S. S. Fowler, M.E., of Nelson, has constructed a big dam, excavated a waterway, built a pipe line and power-house, ordered the requisite plant and machinery for generating the power, and erected a transmission line from Cascade to Phœnix where are situated the largest and most productive copper mines in the Boundary district.

The dam has been constructed at the head of the gorge at Cascade. It is of timber cribwork filled with rock and is 40 feet wide at its base and slopes back until at the top it is 24 feet in width. Its total length is 400 feet, and its height from base to top is 50 feet in the deepest part, tapering off to 25 feet at the sides. The cribwork is filled with 10,000 cubic yards of rock. The site is a solid rock bed throughout, and the foundation timbers of the dam are firmly bolted to the rock. The stability of the dam has been amply demonstrated by an unexpected test of its strength, for at a time when the water was at extreme flood the log booms of a saw-mill, situate a few hundred yards higher up the river, gave way and about one million feet of logs were thrown against the dam in a mass without in anyway damaging it. The permanent water level will be 10 feet below the top of the dam and provision has been made to control the level of the water, during periods of high water, by a series of 12 sluiceways which can be opened down to 12 feet below the normal level. These give an area of about 2,000 square feet of waterway through which to pass the flood water. The sluiceways are closed by means of 12 x 12 stop logs, dropped one on top of the other in suitable grooves. A steel rail track placed on top of the dam will admit of a travelling winch being run over the sluiceways to draw up the stop logs as the water rises when the river is in flood. This winch will be operated by hand-power or an electrical motor.

The dam raises the water to a height of 35 feet above the natural level, thus giving a working head of 156 feet at low water. The water will flow from the dam to the power-house, first in an open rock cut 225 feet in length, next through a tunnel driven 410 feet in solid rock, thence for 500 feet in another open rock cut to a concrete bulkhead. The areas of these rock cuts and tunnel, in excavating which some 35,000 yards of rock were removed, are so large that no appreciable loss of head will take place, consequently the water will enter the pipes at this bulkhead with a head equal to that of its level in the dam. From this bulkhead the water will pass through pipes for about 1,650 feet to the power-house. One circular stave pipe line, 7 feet in diameter, has been completed along its length of 1,400 feet. It is of selected clear Coast fir, the 2¾ x 7-inch staves having been cut as segments of a circle and machined to the radius of the pipe. The staves are hooped every 12 inches by ¾-inch round steel bands, each in two sections with connecting shoes for tightening. From the end of the stave pipe line 250 feet of circular steel pipe will convey the water down to the turbines. Two pipe outlets, with head gates, are being built into the bulkhead, the intention being to add later another stave pipe line, the second one to be 8 feet in diameter.



CASCADE WATER POWER & LIGHT CO'S DAM.

In a natural bay at the foot of the falls the power-house has been erected on a site cut out of the solid rock, in excavating which some 10,000 yards of rock had to be removed. This building is a substantial fire-proof structure of brick on foundation walls of stone, the foundation being 22 feet in depth on the lower side. The brick walls rise 30 feet from the floor level. The

inside dimensions of the building are : Length, 150 feet ; width, 45 feet, and height to peak of roof, 45 feet. Provision has been made for lengthening the power-house whenever such extension will be required.

The power plant is now on the way in and should shortly reach Cascade. It will include three 750 kilowat generators (each equal to 1,000 horse-power), to be driven by horizontal turbines direct connected to the generators, and all necessary switch boards, transformers and other accessories. The turbines are of the horizontal type, two wheels in each case, and the generators of the three-phase alternating type, and step-up transformers will be used to raise the current for transmission. The electrical machinery is of the most modern construction of the Westinghouse Electric & Manufacturing Co.

A right of way has been cleared and transmission lines erected from Cascade via Grand Forks to Phœnix, a distance of 21 miles. The right of way, from which

Gorge and Falls, Cascade, B. C.

all brush and timber has been cleared, is 132 feet wide. Two separate lines have been substantially constructed, with heavy cedar poles and three No. 3 gauge copper wires on each line, with provision for duplicating the wires when necessary. Every practicable precaution has been taken in clearing and constructing the lines to ensure the maintenance of a continuous current. The main distributing station, the erection of which is to be at once proceeded with, will be at Phœnix. It will be a substantial brick building, the plans for which are now being prepared.

All construction work was designed by the engineer in charge, Mr. W. Anderson, C. E., who anticipates having everything in readiness for the supply of power during the ensuing summer. The company is therefore now in a position to make contracts for delivery of power at rates which must necessarily be advantageous to those who are operating existing steam plants, or others who contemplate new undertakings.

B. C. CHARTERED CO., LTD.

THE B. C. Chartered Company, Ltd., was incorporated April 6, 1899. Its authorised capital is $1,500,000 in $1.00 shares. Its directors are Messrs. F. L. Wanklyn, president ; Chas. E. L. Porteous, vice-president and managing director ; George A. Greene, W. G. Ross, E. G. Rykert, Wm. Strachan and J. R. Wilson. Its head office is in Street Railway Chambers, Montreal, Quebec ; Mr. J. Kitto, secretary, and its head office in British Columbia is at the B. C. mine, near Eholt, Boundary district, with Mr. S. F. Parrish, M. E., as attorney and manager.

The company owns a group of properties situate in Summit camp, consisting of the following Crown-granted mineral claims : B. C., Truckee, Reveille, Hilda, Vashti, Falcon, J. W., London, Daisy fraction, B. C. fraction, and Novelty fraction, together containing an

Mr. S. F. Parrish, M.E.,
General Manager B. C. Chartered Company.

area of 268 acres. The B. C. upon which most of the development has been done, was located in the fall of 1896 and the following summer the work of opening up the mine was commenced. About 7,000 lineal feet of work have since been done in underground development of the mine, the deepest shaft in which is down 400 ft. The output of ore up to the end of 1901 was about 67,136,186 tons, having an average assay of .015 ozs. gold, 2.45 ozs. silver, and 5.8 per cent. copper wet assay. About four-tenths of this went to the Trail smelter and practically the whole of the remainder to the B. C. Copper Company's smelter.

From an article descriptive of the mine, contributed by Mr. Parrish and published in the Mining Record last July, it is learned that the country in which the B. C. ore chutes occur is limestone, which has undergone

various degrees of alteration, from a white crystalised or marbleised rock to thoroughly metamorphosed limestone. Into this mass of rock sheets of porphyry, varying in thickness from four or five feet to thirty odd feet, have intruded, the intrusions having apparently followed more or less closely the bedding of the limestone. Cutting through these rock formations are several faultings having a general northerly and southerly strike, with a slight dip to the east. There does not appear to have been any great vertical displacement, but there are indications of a more or less extensive lateral movement. It is in or near this faulting that the ore is found, extending into the country rock in a lense-shaped mass, so far as developed having an extreme width of 65 feet by about 200 feet in length. This extends from the surface of the ground to a depth of nearly 300 feet, below which it has not as yet been followed. The ore lies in close contact with each porphyritic intrusion, both above and below it, the only effect having been a possible slight throw of the ore to the east. The ore itself is chalcopyrite, pyrrhotite and some pyrite, with a small quantity of gold and silver. On the edges of the main ore body bunches of specular iron and zinc blende occasionally occur, but never in the ore mass. The specific gravity of the ore is 3.65 to 4.00. Garnet rock is the mineral most intimately associated with the ore, occurring round the edges of the ore body and occasionally in masses in the midst of it. A noticeable feature is the entire absence of oxidiation of the ore body, at the outcrop or elsewhere.

The main ore mass is made up of more or less horizontal sheets of ore varying from a few feet to several feet in thickness, possibly maintaining very much the form of the original bedding of limestone, of which it is probably a replacement. There is no cementing of these layers, consequently great care has to be exercised in breaking the ore, for if too large an excavation be made without careful timbering one sheet will fall from the one above it by its own weight. It has been found necessary to timber the stopes with square sets throughout, there being no other practicable method of supporting the ground. The sets are made of 10-inch square timbers and are placed with 5-foot centres.

A branch of the C. P. R. Co's Columbia & Western railway was completed to the mine in the autumn of 1899, this being a spur from the line from Eholt to Phœnix. The facilities for economical mining and shipping are excellent, and since local smelters commenced to operate, more favourable smelting and transportation rates have been obtainable.

The mine is equipped with a sufficient power plant to break and hoist more than 200 tons of ore a day through the present shaft. This plant includes four boilers, together about 225 horse-power ; a straight-line Rand 4-drill air compressor ; half of a Class G Ingersoll-Sergeant air compressor, rated at ten drills ; one large and two small hoisting engines ; two No 5 Cameron sinking pumps, etc. An electric light engine and dynamo have also been installed. A diamond drill was at work in the mine for several weeks last year. The mine buildings are substantial and comfortable, and as many as 115 men have been employed at the mine at different times.

The manager, Mr. S. F. Parrish, M. E., has had many years mining experience, having been engaged in mining in Colorado for about 24 years, of which 13 to 14 years were spent in Leadville in charge of various work and properties, among the more important of these having been the mines of the Chrysolite Silver Mining Company, and of the Yak Mining, Milling and Tunnel Company.

THE MINES OF CENTRAL CAMP.

THE NO. 7, CITY OF PARIS, ETC.

IN Central Camp, which is connected by waggon road with both Grand Forks and Greenwood, are several promising properties, two of which have shipped

B. C. MINE, NEAR EHOLT, B. C.

ore in quantity to the smelters. These include the City of Paris group, Majestic group, No. 7 group, Norfolk group (owned by the London & British Columbia Goldfields, Ltd.), Mabel, Oro, Cornucopia, and others, but of these only the No. 7 has been at work during the last 18 months.

The City of Paris group consists of the City of Paris, Lincoln and No. 4 mineral claims, situate half a mile north of the International boundary line in what was formerly known as White's camp, and distant about nine miles westerly from Grand Forks and seven miles from Midway. The development work done on the group comprises 720 feet of sinking and raising and 4,380 feet of crosscutting and drifting. One tunnel cuts, at about 400 feet depth, a quartz vein stated to be in places 16 feet wide with from six to eight feet of shipping ore, carrying values in gold and copper. About 2,000 tons of ore were hauled to the Granby smelter before operations were suspended pending the provision of less costly transportation facilities. The City of Paris Mining Company, Ltd., capital $200,000 in $1 shares, is a Spokane organisation of which Mr. J. P. Graves and associates were the promoters.

The Majestic group is comprised of the Lexington, City of Denver, City of Montreal and Oregon fractional claims, situate in close proximity to the City of Paris group. About 1,150 lineal feet of crosscutting and drifting have been done on the Lexington, opening up

an ore body at 150 feet depth. The authorised capital of the company is $1,500,000 in $1 shares, and its officers are Messrs. S. H. C. Miner, president; Jay P. Graves, vice-president; Geo. W. Wooster, treasurer, and A. L. White, secretary. The head office is in Montreal, Quebec.

The No. 7, owned by the No. 7 Mining Company, Ltd., of New York, capital $1,000,000 in 200,000 $5.00 shares, has a power plant consisting of a class "A" Ingersoll-Sergeant straight-line air compressor rated at five drills, six one-man machine drills, air receiver, 100 horse-power boiler, 25 horse-power hoisting engine, Cameron sinking pump, etc. This mine was opened to the 130-foot level in 1896-7. When operations were resumed in 1900 what had been only a prospect shaft was enlarged to a double-compartment working shaft, and this has since been deepened until recently the 300 level was reached. It is well timbered and has the distinction of having been sunk and timbered from the 130 down, at what is probably the lowest cost for similar work yet done in the district. Drifts have been run both east and west of the shaft at the 60 and 120-foot levels, the former about 440 feet and the latter 450 feet. A raise was also made from the 60-foot level to the surface. A crosscut at the 200 level has entered the ledge, but little drifting has yet been done at this depth. A crosscut at the 300 level lately reached the ledge at 75 feet in. The total footage of work done in underground development of the No. 7 is now nearly 2,000 lineal feet, about one-third being sinking and raising and the remainder crosscutting and drifting. The ore is quartz, mineralised with gold, silver, lead and zinc, and the vein varies in width from 18 inches to 7 feet. Several stopes have been started, and during the time the weather was favourable for hauling nearly 900 tons of ore were sent to the smelter. Whenever rain or melting snow makes the roads too soft for heavy hauling the shipping of ore is not practicable, consequently until such time as a branch railway shall reach the neighbourhood of the mine the question of transportation will be a difficult one to solve, so the advisability of putting in a concentrator is under consideration, necessary tests of the ore being meanwhile made. The number of men employed on the No. 7 has been 15 to 20 under the superintendence of Mr. S. C. Holman. The company's manager and attorney in British Columbia is Mr. Frederic Keffer, M. E., of Anaconda. Mr. C. E. Laidlaw, of New York, is president of the company, and Mr. R. H. Eggleston, secretary.

WELLINGTON CAMP MINES.

THE WINNIPEG.

THE Winnipeg Mines, Ltd., owns the Winnipeg mine, situate in Wellington Camp in the Grand Forks Mining Division, and about two miles east of the town of Phœnix. The Winnipeg was located in the summer of 1895, and in 1897 a company named the Winnipeg Mining & Smelting Company was incorporated to develop the property. After a lot of work had been done this company got into financial difficulties. Towards the close of 1900 the Winnipeg Mines, Ltd., was incorporated to acquire the assets of the old company. The new company has an authorised capital of $1,250,000 in $1.00 shares, of which about 875,000 shares have been issued, leaving a balance of about 375,000 shares still in the treasury.

WELLINGTON CAMP MINES—THE WINNIPEG.

The Winnipeg has an area of about 27 acres. The mine is connected with the C. P. R. railway system by a half-mile spur which joins the Phœnix branch at Hartford Junction. Its mining plant includes two steam boilers, two hoisting engines, a 14 x 22 Rand straight-line air compressor, air receiver, steam pumps, machine drills, etc. There are on the mine several buildings in addition to those shown in the accompanying view, including bunk and boarding houses and an assay office.

The formation met with on the Winnipeg is described

as granite, as a rule changing gradually into an altered rock as the veins are approached. Several dykes cross the property, those known as the "east" and "west" dyke, respectively, being the most important. Between these two dykes most of the development on the mine has been done on various levels down to 400 feet depth. The veins are numerous, but practically all of the 2,500 tons of ore the mine has shipped to the smelter has come from three, known respectively as the "railroad" vein (from its having been first exposed when grading for the railway spur), the "concentrating" or "station" vein, first met with at the station at the 300-foot level, and the "100-level vein. The general strike of the veins is N. 50 deg. W., and they dip sometimes north or again south. The veins pitching north do not carry gold values to any appreciable extent, whilst those dipping south do. These veins cross one another in places, the south pitching veins continuing to carry the values. A marked peculiarity of both north and south pitching veins is that they generally have twin ore chutes, both pyrrhotite and marcasite occurring in the same vein.

The ore is a sulphite of iron, being either marcasite with arsenical iron, or pyrrhotite with a little arsenical ore; also iron pyrites either separately or in masses scattered through the gangue, with copper sulphite disseminated sparingly. Speaking generally the pyrrhotite north veins carry gold values of an average of $2.00 per ton, and the marcasite of $10.00 per ton. Where the two are combined the best results appear to be obtained. Very high assay values from hand samples can be got, but the best returns in bulk were $48.00 per ton from one car load, and $27.00 per ton from 57 tons, both lots from the "railroad" vein, these being the gold returns. Silver values vary from one ounce to six ounces per ton, and copper runs about one and one-half per cent. Much of the ore shipped has averaged $13 per ton, gross.

It is considered a very promising feature in the outlook for the Winnipeg that the "railroad" vein has been cut at the 300 level, where the ore, although in a narrow vein so far as explored, is of high grade, one car having returned more than $40.00 per ton. The experience of the past tends to show that a displacement of the veins has been caused by the dikes above referred to and that consequently development work should in future be directed towards the southern portion of the property. In all some 4,500 lineal feet of work have been done in underground development, about two-thirds sinking and raising and the remainder in cross-cutting and drifting.

The directors of the Winnipeg Mines, Ld., are Messrs. E. G. Holt, president; W. W. Gibbs, vice-president; Richard Plewman, managing director and secretary-treasurer; Robt. Hodge and R. E. Plewman. The head office of the company is at Rossland, B. C.

GOLDEN CROWN MINES, LTD.

The Golden Crown Mines, Ltd., was organised last summer to acquire the mining property and other assets of the Brandon & Golden Crown Mining Co., Ltd., which, after doing nearly 2,500 feet of underground work on the Golden Crown (adjoining the Winnipeg on the west) and shipping 2,241 tons of ore of a generally good grade, had got into financial difficulties. The old company had a nominal capital of $1,500,000 in $1.00 shares. The new company was capitalised at a similar amount, but the shares were issued as paid up to 95 cents, thus leaving an assessable balance of five cents per share, to provide money for the liquidation of the liabilities of the old company and for the further development of the mine. The head office of the company was removed from Rossland, B. C., to Brandon, Man., where much of the stock is held. At a meeting held in Brandon last fall the following directorate was elected: Judge Cumberland, president; Mr. G. R. Caldwell, vice-president; Hon. Senator Kirchoffer and Messrs. Andrew Kelly, Frederick Nation and J. B. Curran, all of Brandon; Mr. Wm. L. Parrish, of Winnipeg; Mr. C. E. L. Jarvis, of St. John, New Brunswick, representing shareholders in the Maritime Provinces, and Mr. W. A. Fuller, of Spokane. Mr. John Inglis, of Brandon, is secretary.

After reorganisation was completed and an assessment levied, Mr. D. H. Duncanson was put in charge of the mine, and towards the close of the year the workings were pumped out and mining operations resumed on the 100, 150 and 300-foot levels. Since then some 500 tons of ore have been shipped to district smelters. No. 1 shaft is 324 feet in depth. A second shaft is now being sunk on what is known as the "railroad" ledge, this being an extension of the ledge similarly named on the Winnipeg, and several cars of ore have been shipped lately from this vein. There are on this property three veins upon which work has been done, viz., those known respectively as the "main," "north" and "railroad" ledges. Others cross the claim, but as yet they have not been opened up to determine their extent and value. This mine is also connected at Hartford Junction with the C. P. R. system by a spur from the Phœnix branch.

WELLINGTON CAMP MINES—THE GOLDEN CROWN.

Mr. J. L. Parker, M.E., now superintendent of the North Star mine, East Kootenay, made a careful examination and sampling of the Golden Crown three or four months ago, but his report has not been made public.

THE ATHELSTAN.

Last year's directors of the Athelstan Gold & Copper Mining Co., Ltd., were:—Messrs. Jas. Anderson, president; John Mack, vice-president; W. J. Morrison, secretary-treasurer; Lenox Buzzell, Condon, Que.; Dr. Walker and T. B. Pringle, Huntington, Que., and J. B. Walsh, Ormstown, Que. The Athelstan is situate within a mile of the Winnipeg, along the waggon road from that mine towards Grand Forks. Only about 500 feet of work have been done in development of the Athelstan, which had, however, shipped 1,750 tons of ore to the smelters before it closed down last summer.

THE HARTFORD.

The Hartford group lies between Hartford Junction and the Golden Crown, and comprises the Hartford, Hartford fraction, Golden Crown fraction, Nabob frac-

tion, Double Eagle fraction and Ranger. A shaft was put down 100 feet on the Hartford and about 120 feet of drifting and crosscutting at that depth, opening up a promising body of ore. Later the Hartford company was formed but no work worth mentioning has been on the property for two or three years.

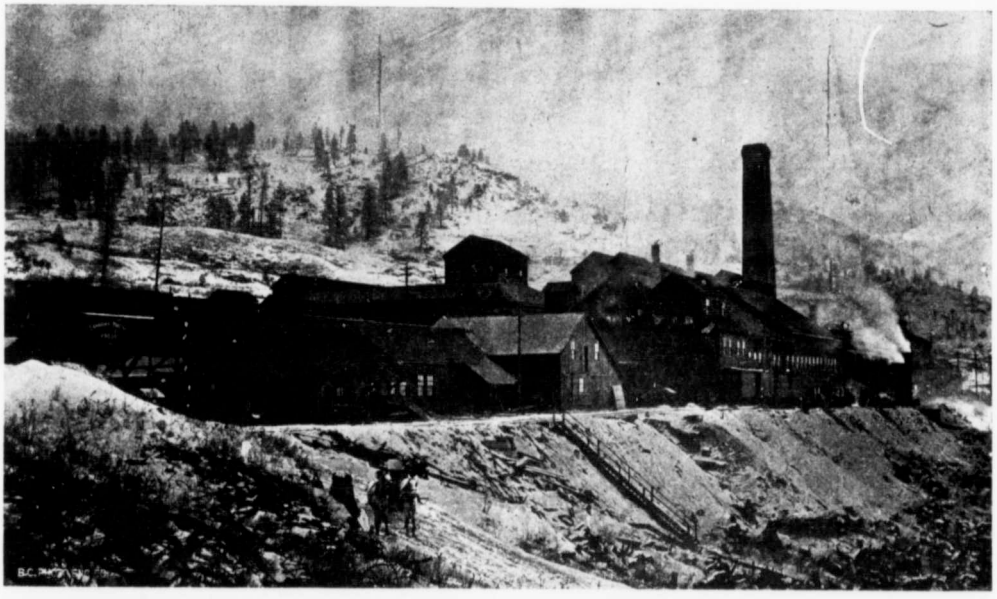
GRANBY COMPANY'S SMELTER AT GRAND FORKS.

NOTWITHSTANDING that the greater part of the following descriptive matter appeared in last month's issue of the RECORD it must be published afresh this month, otherwise this Boundary number would lack a description of the largest and most important metallurgical works in the district.

The Granby smelter commenced reducing ore in August, 1900, its first furnace having been blown in on the 21st of that month. Within eight weeks thereafter its second furnace was running. In March of the current year its third furnace was started, and on April 2nd, ultimo, it had four furnaces running at one and the same time. It is planned to add two more furnaces this year, and when this shall have been done the limit of treatment capacity had in view when these works were designed and laid out will have been reached. Any further extension of treatment capacity will involve the erection of another set of works. In the following description the plant first installed and that more recently put in are separately detailed.

The water power developed on the North Fork of Kettle river gives 1,200 h. p. at extreme low water under an actual head of 45 feet. The dam gives about 30 feet of this head, the rest being made up between the dam and the power house. The dam is 175 feet across the top, 75 feet from heel to toe on the bottom, built of 12 x 12 inch sawn timbers filled in with rock and gravel. The flume is 12 x 9 feet, and a mile long. The power house, as originally planned, was 100 feet long by 30 feet wide, all the batteries being set in line, on one long concrete foundation. It is within 1,000 feet of the smelter buildings and 100 feet below them. The power by which the blowers, sampling works, converter, etc., are driven, is created by three double 16-inch turbine water-wheels, operating under an effective head of 45 feet. These wheels are connected with the flume by steel intake pipes 4 feet 7 inches in diameter. Each is directly connected with one Westinghouse rotating arm, alernating current generator. Another wheel is belted to two pumps each with a daily capacity of 750,000 gallons. These pumps furnish water and pressure to granulate the slag as it runs continuously from the furnaces.

The smelter proper consisted of two double-decked, steel-jacketed furnaces, 160 x 44 inches at the tuyeres, made by the Gates Iron Works, of Chicago. The gases



LATEST PHOTOGRAPH OF GRANBY WORKS SHOWING RECENT ADDITIONS.

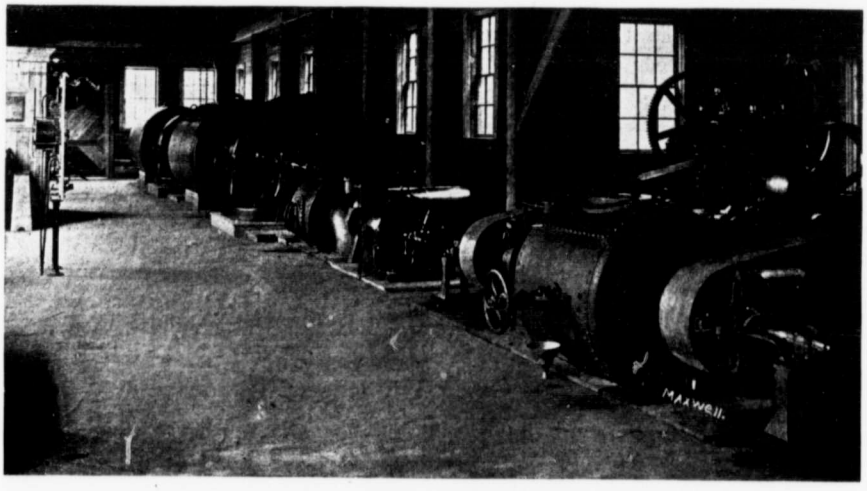
pass off from the top in a 4-feet diameter downtake pipe, which is connected with the big flue dust chamber leading to the stack, the flue chamber being 10 x 10 ft. on the inside and 300 feet in length. The stack is 11 x 11 feet inside measurement and 152½ feet high. The blower room is 50 x 58 feet, and is 42 feet ftom the furnace building. It contains three blowers, one for each furnace and one in reserve. These are connected with the furnaces by a 54-inch diameter blast pipe, all blowers being connected with the one main pipe. Each of these blowers is driven by a 75 h. p. Westinghouse induction motor, which is belted directly to the blower.

The original sampler building is 64 x 70 feet, and is surrounded on three sides by ore bins. The ore train as it comes into the smelter, is carried on a trestle to a series of receiving bins, parallel to the front of the sampling works, 23 feet above the floor of the same and 33 feet distant. The bins are filled directly from the cars, which have a bottom dump. The ore is taken from the receiving bins by small iron cars, which dump into a

No. 5 Gates gyratory crusher. This crusher has its opening a little below the floor of the sampling works and has a capacity of 1,000 tons daily. After the ore is crushed to the size of a 4-inch ring it is elevated to the top of the building by a continuous steel bucket elevator. It is next sampled by a 60-inch Snyder automatic sampler. The bulk of the ore is distributed to the bins on three sides of the sampling works by a special cast-iron revolving spout.

Behind the smelter and at an elevation of about 100 feet above the works is a 100,000-gallon tank, which is supplied with water through an 8-inch steel-riveted pipe extending from the pump to the power-house, a distance of 2,000 feet from the tank. This water is used principally for granulating the slag as it runs continuously from the settler in front of the furnaces. All the machinery is run by Westinghouse induction motors. There is a 75 h. p. motor for the sampling works, a 30 h. p. motor for matte sampler, a 25 h. p. motor for the machine shops, and a 10 h. p. motor for the elevator in the main furnace building. This embraces a brief description of the old plant.

Dam and Head of Flume, Granby Smelter.



Dynamo Room, Granby Smelter.

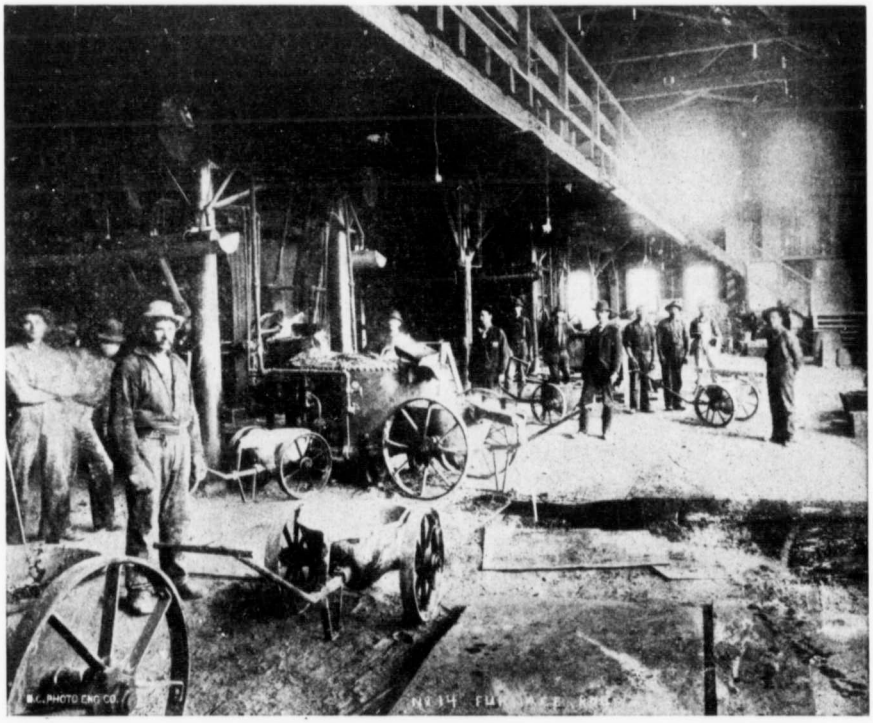
The work of enlargement was started in May last. The power plant has been increased by a 250 h. p. hori-

zontal turbine water-wheel and a 250 h. p. electric generator directly connected with the water-wheel, making a total of 250 h. p. developed for the use of the city of Grand Forks, the total water power thus developed on the Kettle river being 1,100 h. p. There have also been added two additional triplex power pumps which will each supply another 750,000 gallons af water daily for granulating the slag and for the water jackets. The new pump was furnished by the Stilwell-Bierce-Smith-Vaile Co., of Dayton, Ohio. The Dayton Globe Works furnished the 250 h. p. water-wheel.

The blower room has been increased by one No. 8 Connersville blower, making four in all or one for each furnace. Two hundred feet have also been added to the dust flue. All the contracts for the supply of the moing capacity of 5,000 tons, and with the existing bins provide a total capacity of 10,000 tons.

The briquetting plant, of 100 tons daily capacity, the function of which is to compress the flue dust into bricks which will afterwards be re-smelted.

The converter building is on the same level as the furnace house containing the four blast furnaces and 100 feet therefrom. It is a steel fire-proof structure 160 x 68 feet, its height in the main portion being 45 ft. The contract for its construction was executed by the Hamilton Bridge Co., of Hamilton, Ont. This building contains two stands of converters of the horizontal barrel type supplied by the Gates Iron Works of Chicago. The shells are 72 inches in diameter by 100 inches in length. Each stand has a capacity of from 50



THE FURNACE ROOM, GRANBY SMELTER.

tors and electrical plant were executed by the Westinghouse Electric & Manufacturing Co., of Pittsburg.

The main furnace room has been enlarged an additional 84 x 81 feet. The two new furnaces, like the old ones, were built by the Gates Iron Works, Chicago. They are set 39 feet apart, centre to centre, and room is left for two more. Their actual capacity, in consequence of the self-fluxing character of the ores treated, has been found to be about 380 tons each daily.

A new sampling and crushing plant has been built. The building is 70 x 70 feet, and at its highest part it has a height of 65 feet. An additional No. 5 Gates crusher with automatic sampler, rolls, etc., has been installed. These additions will crush and sample 1,000 tons daily, making the total daily capacity of the crushing and sampling plant 2,000 tons daily. Additional ore bins have also been built. They will have a carryto 70 tons of matte daily, and each is provided with three shells. It also contains a 40-ton electric travelling crane, 40-foot span for handling the shells and matte. In another portion of the building is a 25-ton reverberatory tilting furnace, also supplied by the Gates Iron Works.

In the same structure there is the quartz crushing plant and grinding pan for mixing the converter linings. Under each converter stand are three mould carriers operated back and forth by a hydraulic ram. The converters are also tilted by hydraulic power as well as the reverberatory furnace. Near the converter building is the engine room, in which is the blowing engine for blowing the converters ; also the hydraulic pump which furnishes the pressure to operate the various machines in the converter building.

The blowing engine is run by a belt from a 200 h. p.

alternating motor. It is of the power type, has an air cylinder 36 x 36 inches and has a special unloading device attached, so that when the pressure reaches a maximum of twelve pounds the valves are so arranged that they remain open and no power is consumed while the converter is not using air. This unloading device was especially built for the Granby Co., and has hitherto never been used on any low-pressure blowing engine used for converter purposes.

The converter building is connected with the furnace house by a 10-ton electric crane, 24-foot span. The matte from the furnaces is first settled in receivers, which in turn are tapped out into the matte ladles. The small electric crane takes the ladle of molten matte to the end of the converter building and there pours the hot metal into the tilting reverberatory. When the converter is ready for a charge the 40-ton crane in the converter building places a large matte ladle in front of this furnace, and by hydraulic power the furnace is slowly tilted until there is enough in the ladle for a charge. The large crane transfers this molten matte to

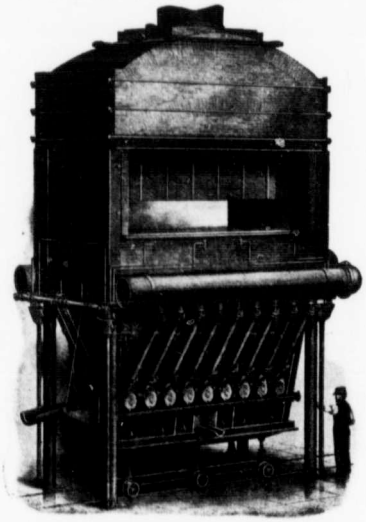
Mr. A. B. W. Hodges, Superintendent Granby Smelter.

the converter into which it is poured. The converter is then turned into an upright position and the blast turned on. The pressure blast is 10 pounds per square inch. The blast is maintained until such time as sufficient slag has formed. Then the blast is turned off and the slag skimmed into a large ladle. This ladle is then carried by a crane and the slag is poured hot into the tilting furnace. The converter is then blown for a short time when the matte is all converted into metallic or blister copper, still retaining the gold and silver values. The moulds on the carriages are now brought into position by the hydraulic ram and the copper is slowly poured out of the converter into these moulds. The copper, which is 98½ per cent. pure, is thus moulded into cakes weighing about three hundred pounds each. The converter is now ready for another charge. It takes from two to four hours to convert one charge into metallic copper. By converting the matte at the smelter, a saving of 50 per cent. in freights is effected.

The converter began operations on January 15 last. Besides converting its own product, the Granby company has closed contracts and is now treating matte from the smelters of the British Columbia Copper Co., Greenwood, and the Hall Mines, Nelson. Including the matte from these furnaces with that produced by the smelter's own four furnaces, all now in operation, it is expected that about 1,500 tons of blister copper will be shipped monthly to eastern works to there have the gold and silver values separated. This will be at the rate of 36,000,000 lbs. per annum.

The following table shows the monthly tonnage of ore treated at the Granby smelter from the date of commencement of smelting operations until March 31, last. It must be remembered that during the first eight weeks only one furnace was in operation and that three were running during the greater part of the last month appearing in the table :—

Month—1900.	Tons.	Daily Average. Tons.
August, 11 days	2,902	
September	8,753	291 2-3
October	14,215	468 1-4
November	18,050	601 2-3
December	18,467	595 2-3
Total for 1900	62,387	



Allis-Chalmers Double-Decked Steel-Jacketed Furnace at Granby Smelter.

1901.		
January	17,640	569
February	17,708	632 1-5
March	19,713	636
April	18,995	633 1-6
May	19,075	615 1-3
June	18,510	617
July	18,176	586 1-3
August	18,028	581 1-2
September	20,059	668 2-3
October	20,347	656 1-3
November	20,706	690 1-5
December	21,971	708 3-4
Total for 1901	230 928	
1902.		
January (24 days)	18 104	754 1-3
February (23½ days)	17,303	736 1-3
March (incomplete month)	30,246	975 2-3
Total for three months of 1902	65,653	

SUMMARY.

1900	62,387 tons
1901	230,928 "
1902	65,653 "
Grand total	358,968 "

The daily average (two furnaces) for last year, making no allowances for stoppages for repairs, was 633 tons. A more adequate idea of the increased effectiveness of treatment, as compared with a year ago, will probably be conveyed by the following comparison: In November and December of 1900, this smelter treated 36,517 tons of ore, giving a daily average of those two months of 598 2-3 tons. During the corresponding months of 1901 the same two furnaces reduced 42,677 tons, or a daily average of 699 2-3 tons—an increase of 101 tons a day. All the foregoing figures refer to ore alone—no coke being consumed in smelting is included, and no barren fluxes are used.

Mr. A. B. W. Hodges, superintendent of the smelter, who also designed and constructed the works, has been connected with the smelting industry since 1886. His first position was that of assistant superintendent of the Philadelphia Smelting & Refining Co., at Pueblo, Col. From there he went to Socorro, N. M., to take the management of the Rio Grande Smelting Works, belonging to the National Lead Co. Later he became superintendent of the Compania Metallurgica Mexicana at San Luis Potosi, Mexico. Subsequently he accepted the management of the St. Louis Smelting & Refining Works, at St. Louis, owned by the National Lead Co., and was later promoted to the management of the manufacturing department of the same company in New York. In addition to this experience, Mr. Hodges has done much valuable mining and metallurgical work.

The briquetting machine in use here is one made by the Henry S. Mould Co., of Pittsburgh, Penn., makers of the well-known White press. It is of the straight plunger type, similar to that in use at the Hall Mines smelter, Nelson, B. C., which is operated on a different system to the rotary machines used at Trail and Northport smelters. Owing to the presence of sufficient lime in the flue dust it cakes without lime being added, as is customary. The bricks turned out by this press are taken direct to the furnaces without further handling.

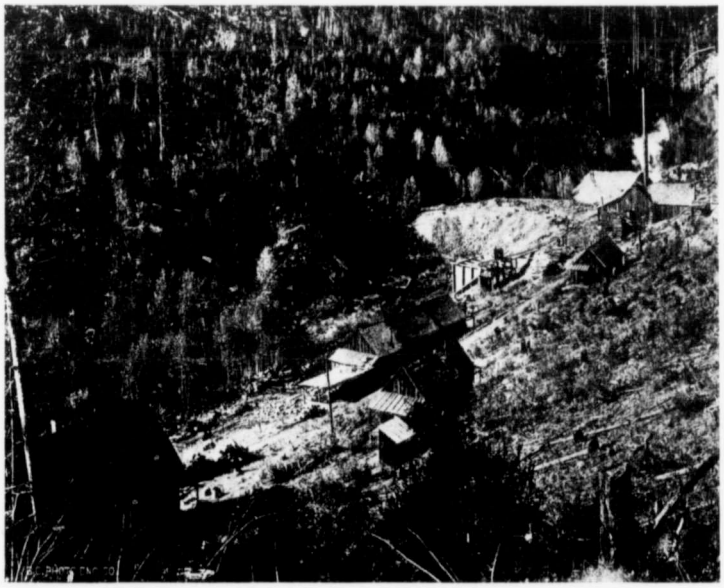
DEADWOOD CAMP MINES.

THE MORRISON MINES, LTD.

THE Morrison Mines, Ltd., is the name of the new company formed two years ago to acquire the Morrison mine and other assets of the Morrison Gold Mining Co., which latter company was organised on March 25, 1896, under the laws of the State of Washington, U.S.A., with a nominal capital of $1,000,000 in $1 shares. Of these 400,000 were treasury shares and they realised $31,232.40, which sum was spent in labour, supplies, buildings, machinery and other expenditure connected with the formation of the company and the development of the property.

On January 18, 1900, The Morrison Mines, Ltd., was organised with an authorised capital of $150,000 in 1,500,000 shares at 10 cents each, all shares being assessable to the full par value; the holders of stock in the old company taking shares in the new company share for share; the new company purchasing the mining property and all other assets of the old one, and assuming liabilities of the latter to the extent of about $1,250, in unpaid accounts for labour and supplies. Of the new company's stock 500,000 shares were placed in the treasury, and nearly 200,000 of these have since been issued. The last report published by the company included the statement that "there are 998,617 assessable shares of record on our books. The total number of shares issued and of record on our stock ledger is 1,197,688, leaving a balance now in the treasury of the company of 302,312 shares." The position now is practically unaltered in this respect. Assessments to date totals five cents per share.

The head office of the company is at Spokane, Wash. The directors are Messrs. John Hunner, president; F. H. Oliver, managing director; E. K. Erwin, J. K. Fisk and T. J. Graham and the secretary, Mr. A. F. Oliver. The registered office in British Columbia is at Green-



THE MORRISON MINE, DEADWOOD CAMP.

wood, and Messrs. Pringle & Whiteside are the company's attorneys.

The following particulars descriptive of the property are taken chiefly from a report published last year :

The Morrison claim is situate on Copper creek, in Deadwood camp, about three miles northwest of Greenwood, with which it is connected by a waggon road. A spur from the C. P. R. to the British Columbia Copper Co's Mother Lode mine passes within a mile of the Morrison, to which a survey has been made for a spur, giving about a three per cent. grade on a direct route. The surface of the property slopes up from the creek to the north, giving about 450 feet elevation above the main tunnel on the north end line. Glacial wash covers the surface to a depth of from 5 to 10 feet, so that the outcrop of the ledge cannot be easily traced. Water for steam power and domestic purposes is obtained from Copper creek. The surrounding hills furnish an abundance of wood for fuel and mine timbers.

The country, as shown by the workings of the Morrison, is considerable disturbed. The rock on the footwall side of the ore bodies is a felsite or quartz porphyry, while diorite occurs on the hanging wall. The mineral vein or zone consists largely of crystalline limestone. Along the contact of this limestone with the felsite or diorite the ore bodies are formed, though they sometimes extend irregularly out into the limestone, which has a northeast and southwest course. The ore bodies so far opened up dip to the north and west at an angle varying from 50 to 60 degrees. The contacts between the crystalline lime and the wall rocks are marked by clay and chlorite schists, seamed with red hematite, magnetite, calcite, epidote, and garnets, as well as the ore, and these rocks serve to identify the vein when there is no ore to follow. The same belt of crystalline limestone with the accompanying ledge matter has been opened up by surface cuts on the Morrison several hundred feet to the northeast of the present workings. Mica trap dikes cut across the vein in a northeasterly and southwesterly direction, and near these the ore bodies are of higher value and greater extent.

Three important ore chutes have been encountered in the main tunnel. The first begins at a point about 450 feet from portal of the tunnel and is the same chute through which the No. 2 shaft has penetrated a distance of about 100 feet. It extends easterly a distance of about 140 feet. The second chute begins about 615 feet from portal and extends for about 80 feet. The third chute begins about 715 feet from portal and extends for about 90 feet to face of drift. The ore widens from two feet at point of beginning to eight feet at centre and thence on to the face the drift is all in ore. There are two other chutes, but so far as they have been opened up they are small and of low values. The ore occurs in several varieties. At the discovery shaft it is solid pyrrhotite and chalcopyrite, similar to the Trail Creek ores. In the first above-mentioned chute it consists of calcite, iron pyrites and oxides, and quartz spotted and seamed with pyrrhotite and chalcopyrite, and occasional bunches of hematite and arsenopyrite. In the next two chutes it is pyrites, calcite and quartz, seamed with pyrrhotite and chalcopyrite.

The foregoing may be supplemented by the following particulars obtained from the management of the company : There are three veins of ore opened on the property, only one of which has been explored to any great extent. The ore bodies in the main vein upon which work has been done are from 10 to 40 feet in width. Altogether some 3,000 lineal feet of work have been done in underground development of the mine, about 450 feet being sinking and raising, and 2,550 feet crosscutting and drifting. The diamond drill has put in 1,011 feet of holes, all on the 300-foot level, and this work crosscut several large ore bodies which, though, have not yet been opened up.

The mine is equipped with two boilers — one 80 and the other 30 horse-power, a 16 x 24 straight-line Rand air compressor rated at 5 drills, machine drills, air receiver, No. 7 Cameron sinking pump, and at the station on the 200-foot level, a 7 x 9 Lidgerwood hoisting engine. The mine buildings consist of boiler and engine house, boarding and bunk houses, and all other requisite buildings. There are about 5,000 tons of ore on the dump. Shipments to date have been restricted to 443 tons, divided between the B. C. Copper Co's Granby and Trail smelters, for test purposes. With the plant and equipment now at the mine it is in a position to maintain a daily output of 100 tons of ore a day.

MONTREAL AND BOSTON COPPER CO., LTD.

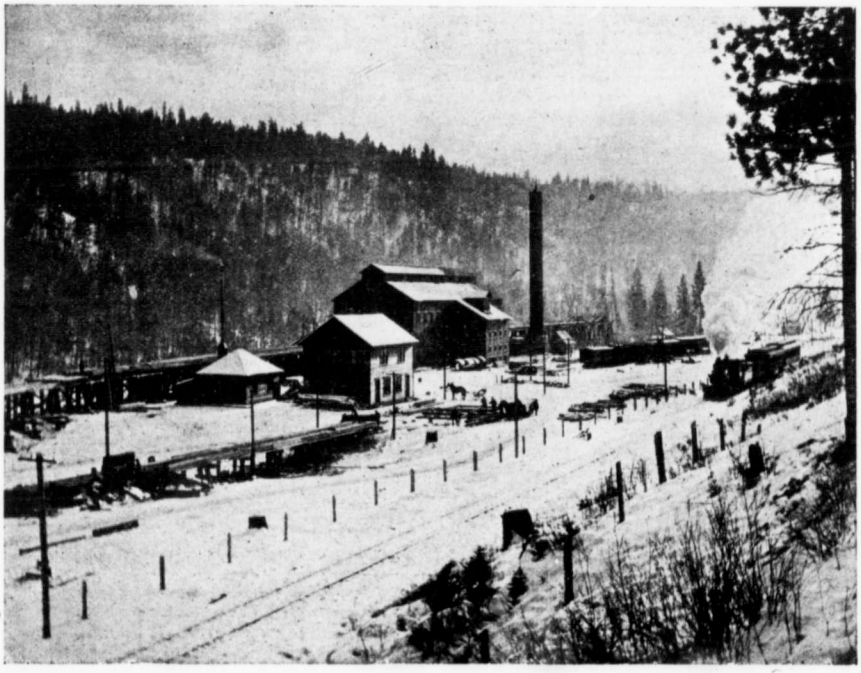
In M[illegible] 1901, there was published in the British Columbia *Gazette* notice of registration as an extra-provin-

CAPT. H. JOHNS, SUPERINTENDENT MONTREAL AND BOSTON CO.

cial company of the Montreal & Boston Copper Co., Ltd., with a nominal capital of $500,000 in 5,000 shares at $100 each. The head office of this company was at Montreal, Quebec, and the Provincial office at Greenwood, with Mr. Clive Pringle as attorney. This company had been formed to take over the mining properties and other assets of the Montreal-Boundary Creek Mining Co., Ltd., registered in 1890 with an authorized capital of $2,000,000 and having its head office at St. John, N.B. Since the registration of the existing company its authorized capital has been increased from the above-mentioned $500,000 to $3,000,000 in 600,000 shares of $5 each. The leading men in the Montreal & Boston Copper Co. are Messrs. H. H. Melville, of Boston, Mass., president ; J. N. Greenshields, K. C., of Montreal, Quebec, and T. Crockett, of Riviere du Loup, Quebec, vice-presidents ; A. A. Munroe, of Montreal,

secretary-treasurer ; G. H. Munroe, of Montreal, and Wm. Mitchell, of Drummondville, Quebec.

The mining properties owned by the company are the Sunset, Crown Silver, C. O. D. and Florence fractional mineral claims, all adjoining and situate in Deadwood camp, about three miles west of Greenwood. The Sunset was located by John East, on June 2nd, 1901. Its abrupt and prominent outcrop of copper-stained rock made the Sunset knoll a distinct landmark in the camp. The Crown Silver, which adjoins the Mother Lode on the east, was located by W. A. Ingrim on the same day as the Sunset. Both were located under the old law, consequently they were restricted in size to 600 feet in width by 1,500 feet in length. These claims were bonded 1897 by Mr. W. L. Hogg, of Montreal, who with his associates did a lot of work on them, and afterwards



Montreal and Boston Copper Co's Smelter near Boundary Falls.

organised the Montreal-Boundary Creek Mining Company to further develop them. The other two claims were acquired later than the first-named two. Much preliminary development work was done on the Sunset under the direction of Mr. J. H. Macfarlane. Since the summer of 1899 Captain Harry Johns, who had been superintendent at the Mother Lode for a year, has been in charge of the Sunset group.

Development work on the Sunset to date consists of about 983 lineal feet of sinking and raising, and 4,128 feet of crosscutting and drifting. The main shaft has been sunk to a depth of 400 feet, and has two compartments each 4 ft. 6 in. by 5 ft. in the clear. The levels at 100 feet and 200 feet, reepectively, have been run both ways from the shaft. Drifts and crosscuts are as follows : Tunnel through knoll, 225 feet ; intermediate level, 445 feet ; 100-foot level, 835 feet ; and 300-foot level 1,223 feet. The 300-foot level is a long tunnel driven about westerly with the object of connecting with the Crown Silver workings. Owing to the rise in the hill the 300-foot level of the Sunset will be at a depth of about 400 feet below the surface by the time it shall be under the Crown Silver shaft.

A tunnel driven through the Sunset knoll disclosed the presence here of a big body of ore, approximately 300 feet in length by 115 feet in width. It is estimated that there are at least 250,000 tons of ore above the 100-foot level. To facilitate the extraction of the ore, between which and parts of the 100 level as now run there is something like 20 feet of barren ground, six raises have been put up. These are about 40 feet apart and have wide, bell-shaped mouths so as to provide for the ore falling in from all around with as little handling as possible. Over each raise a "grizzly" of 10-inch timbers spaced 8 inches apart has been placed, all ore being first either "bulldozed" with powder or hammer-broken small enough to admit of its passing through the grizzly and so being of a suitable size for sending to the smelter. Each raise will serve the purpose of an ore stope, so it is calculated that with this provision it will be practicable for the mine to maintain an output of fully 400 tons per day. There is already a large quantity of ore broken down, and the mine ore bins are full, so that matters appear to be in good shape for keeping the smelter going continuously whenever it shall be started at its ore-reducing work. In addition to this big mass of low-grade ore a chute of about four feet of sulphide ore, carrying good gold values, has been found at the 200 level and has also been cut as the 300, where it has been drifted on about 90 feet and two raises put in it. At the lower level it is found to contain some copper as well as gold, which it does not at the 200. This ore

will be used to raise the grade of tht general output of the mine. The drive at the 300 level, now well into the Crown Silver ground, is getting into ledge matter, so that an early improvement is looked for. No work has yet been done from the shaft at 400 feet depth in the Sunset. The mine has produced about 1,000 tons of ore.

The Crown Silver shaft is down 262 feet, and levels have been opened at 150 feet, with 145 feet of work done, and at 250 feet depth where 607 feet of work is done. These workings have proved the occurrence here of a chute of ore 30 to 35 feet in width and carrying fair values in copper and gold. About 350 feet south from the shaft preparations have been made to open up a quarry in ore. The Sunset workings above the 100 level will eventually be opened to the surface and so constitute a big quarry.

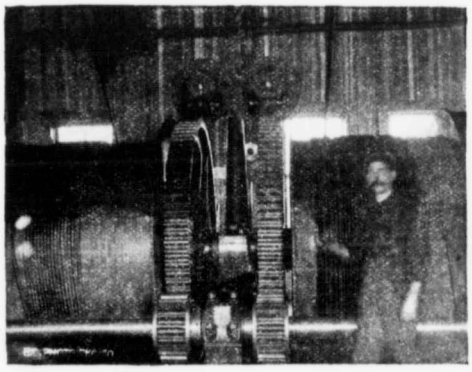
SUNSET MINE.
(Smoke from Granby Smelter in the distance).

The mining equipment at the Sunset includes two 80 h. p. boilers, half of a 20-drill duplex Ingersoll-Sergeant air compressor, two air receivers, ten Ingersoll-Sergeant 3¼ machine drills, a 100 h. p. double-cylinder, double-drum, link-motion Jenckes hoisting engine, Laurie feed-water heater, two safety platform cages, electric light plant, well-found tool and repair shop, assay plant, etc. The mine buildings consist of new two-story boarding house 50 x 30 with commodious kitchen annex; two-story bunk house 26 x 48, also new and having sleeping accommodation for 34 men; the old bunk and boarding houses, these accommodating 24 more; assay office; superintendent's villa residence; men's cottages, etc. Ore bins with a holding capacity of about 2,000 tons, and an elevated covered tramway from shaft to ore bins were lately built, and a railroad spur was put in to facilitate shipment of ore. About 50 men are on the mine pay roll and the number will be increased so soon as ore shipping shall be regularly maintained.

The company's smelter is situate near Boundary Falls between four and five miles from the mine. The smelter was built and equipped by the Standard Pyritic Smelting Company, Ltd., in 1900-1, but it furnace was "blown in," the manager, Mr. E. J. Wilson, formerly metallurgist in charge of the blast furnaces at the Great Falls smelter, Montana, having upon his arrival to take charge of the new works advised that, owing to the lack of a sufficient ore supply to keep the smelter running continuously and for other reasons, it be not started until the conditions be more favourable. Then the Standard company got into financial difficulties and Mr. Wm. Price, of Quebec, took possession of the establishment under a mortgage. Last February, after Mr. H. C. Bellinger, the well-known smelter expert, had examined and reported upon the smelter for the prospective purchasers, it was sold to the Montreal & Boston Copper Co., who immediately appointed Mr. Albert I. Goodell, of Puebla, Col., superintendent, and upon his arrival set about fitting it for continuous operation.

The large main building—the smelter proper—is 182 feet in length by 120 feet in width. Measuring from the feed floor in the centre of the building the height is 64 feet, and from the furnace floor to the roof nearly 80 feet. On the west side of the building is the sampling department, and here some extensive additions and improvements are being made. The original equipment of this department included two 36-inch and two 48-inch automatic samplers, a 7 x 10 Blake rock crusher, two sets of 12 x 20 rolls and two belt elevators. East of the sample mill were placed the bins for the

sample discard, next were located two parallel rows of ore-storage bins, eight in a row and each bin 34 x 10 feet ; south of these for storage of lime and coke, the whole group of bins occupying the central portion of the building north and south and extending beyond in the latter direction with double railroad tracks over them. The changes here are the enlargement of the sample-mill building, the addition to the machinery of a No. 5 Gates rock crusher and a Bridgman sampler



Double Drums of Jenckes Hoisting Engine at Sunset Mine.

complete, and the erection of more storage bins for ore on the west side of the building and the extension of railway trackage about the works, the whole providing the necessary further facilities for handling ore in an economical and thoroughly practical manner.

At a lower level than that of the floor of the main building the furnace floor extends east from the stone

Ingersoll-Sergeant Air Compressor at Sunset Mine.

retaining wall 60 feet, and has a length of 140 feet. From this level down to Boundary creek, which passes below the smelter and from which water is flumed from a dam a mile above the works, is the slag dump. The dust flue, of stone walls with arched brick roof, runs about 200 feet to the steel smoke stack, which is 9 feet 6 inches in diameter and 112 feet high above a 14-foot brick base. The furnace is 40 inches by 176 inches inside the tuyere line, and has a nominal capacity of 300 tons each 24 hours. It is a larger furnace than those at the Granby and B. C. Copper Co's smelters, so should have an actual treatment capacity of between 400 and 500 tons per day with the self-fluxing ores of the district. On the furnace level are also two 80 h. p. boilers, a No. 7 Connersville blower, steam hoist, 75 h. p. engine, and a 250 light Siemens-Halske dynamo run by a high-speed Atlas engine for electric lighting purposes. A 75 h. p. engine in the sample mill will run the sampling plant.

BRITISH COLUMBIA COPPER COMPANY, LTD.

The British Columbia Copper Co., Ltd., was registered as an extra-provincial company on April 28th,

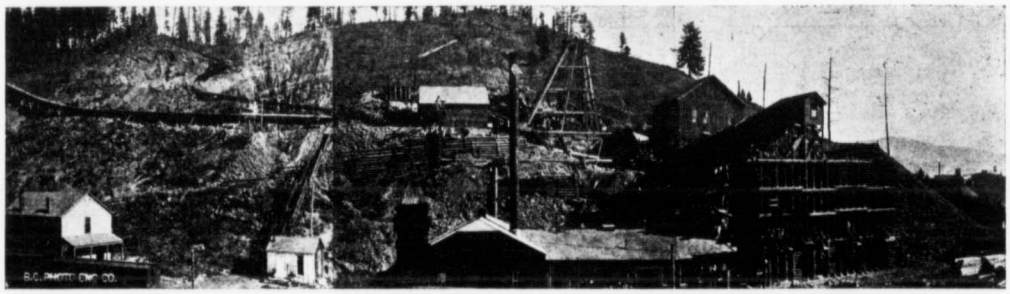
Mr. Frederic Keffer, M.E.
General Manager B. C. Copper Co.

1898, shortly after its organization in New York, U.S. It has an authorized capital of $1,000,000.00 in 200,000 shares at $5 each. Its directors are Messrs. J. F. Tichenor, president; F. L. Underwood, vice-president ; C. E. Laidlaw, treasurer; Paul Babcock and Col. H. L. Horton, all of New York. Mr. R. H. Eggleston is secretary, and the company's head office is in New York. Mr. Frederic Keffer, M.E., is attorney in British Columbia and general manager, with office at Anaconda, near Greenwood.

The company's mining properties are the following adjoining mineral claims situate in Deadwood camp, about three miles west of Anaconda :—Mother Lode, Offspring, Primrose, Sunflower, Tenbrock and Don

Julio. These together comprise a group favorably placed for convenient and advantageous working. The Mother Lode, upon which most of the mining and development work has been done, was staked on May 28th, 1891, by Wm. McCormick and the location recorded in the names of himself and three others. Having been staked under the old law, its size is 600 ft. by 1,500 ft. It was bonded in 1896 by Col. John Weir for

The lode is large, its length, traceable by continuous croppings, running some 1,100 feet north from the main shaft to where it disappears under heavy drift, while a surface exposure on the Primrose, about 700 feet from the shaft in the opposite direction, suggests the probability of its extending at least that distance southward under the intervening drift. Its surface width varies on the Mother Lode from 80 to 160 feet. The footwall, as



General View of Mother Lode Mine.

himself and other New York men, who afterwards formed the Boundary Mines Syndicate, which owned and developed the clalm until the organization of the larger company now owning it. The other claims in the group were acquired at different times since.

In some respects the Mother Lode is fairly representtative of the larger copper-gold ore deposits occurring in the Boundary Creek section of the Boundary district. The croppings are in places soft oxides of iron from decomposition of ore-bearing rock and in others unaltered magnetic iron oxides, very solid and compact,

disclosed by development work, is for the most part limestone, and the hanging wall a diabase. On the footwall side there is not as a rule a marked transition from ore-bearing to barren rock, but the ore often grades into the country rock outside of what is more or less defined as the ore body, so that it is difficult to tell within a few feet where the pay ore will run out. On the other hand the ore gives place to the barren country rock on the hanging wall side with comparative abruptness, fading away completely within a foot or two. The chemical composition of the hanging wall and of the ore

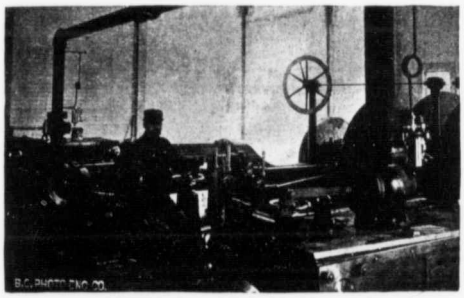
Ore Quarry, Mother Lode Mine, East Section.

Ore Quarry, Mother Lode Mine, West Section.

carrying copper pyrites and gold. In still other instances they are calcite with copper pyrites, iron pyrites, more or less quartzose material, and carrying some gold. These croppings differ from those on the Granby Co's Knob Hill mine, in which specular iron occurs, a fine-grained magnetite being more generally characteristic of the Mother Lode outcrops, the chief of which was a big copper-stained blow-out, standing out prominently and distinctly noticeable from all of the surrounding thinly timbered hills.

lying against it—leaving out the pyrites—is substantially the same. According to the best geological authorities who have examined the district the ore bodies are altered limestone. Here, as at the old Ironsides, Knob Hill and B. C., porphyry dykes intrude, and it is considered quite probable that these intrusions afforded means of ingress for the ore-carrying solutions from beneath, consequently the presence of a porphyry dyke is usually regarded in this district as a favourable indication when prospecting for ore.

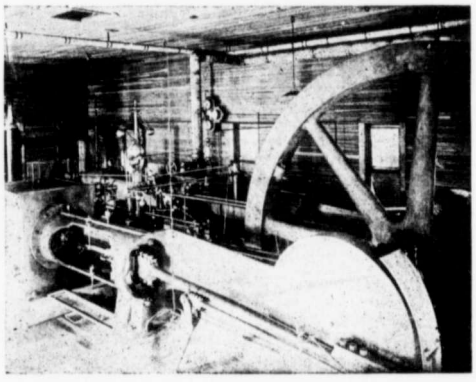
Although the croppings on the Mother Lode appear in somewhat of a crescent shape, the general trend of the lead or ore deposit is north and south. The ore bodies pitch to the east at an angle of 55 to 65 degrees. The ores themselves may be classed in three general



JENCKES HOISTING ENGINE, MOTHER LODE MINE.

groups: 1. A calcite carrying copper pyrites and iron pyrites, these sulphides sometimes being massive and sometimes scattered in small crystals throughout the rock. Some quartzite is also often present. 2. A silicate of lime, iron, magnesia and alumina, carrying both copper and iron pyrites, massive or scattered, and frequently also quartz, garnets or serpentine; often all three together. Occassionally, too, a small quantity of zinc blende occurs in this class of ore. 3. An excessively hard magnetic oxide of iron, with silica and copper pyrites; not often much iron pyrites.

All these ores carry gold, and the calcitic and silicious varieties small quantities of silver as well—about one to two ounces to the ton. There has been found near the lime wall on the 200-ft. level ore with calcitic gangue, carrying galena and zinc blende, and assaying well in silver, but not in sufficient quantities to regard it as a separate class. The several varieties of ore above described blend into one another, more or less, but this general classification holds good. The following partial



INGERSOLL-SERGEANT COMPRESSOR, MOTHER LODE MINE.

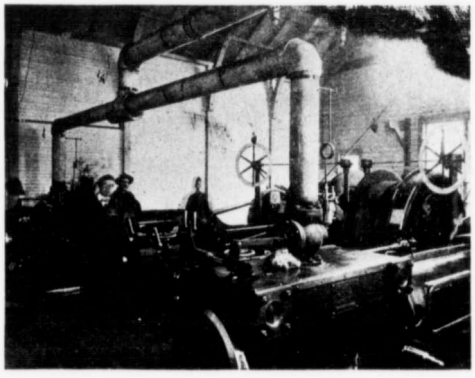
analyses further illustrates the differences between the several classes of ore:

	Calcites.	Silicates.	Magnetites.
Silica	20.10	44.23	27.33
Iron oxides	12.00	16.83	51.12
Alumina	1.31	7.46	.....
Calcium and magnesium oxides	34.00	16.03	10.26

These ores, from their composition have been found to make excellent smelting mixtures. Experience shows that they do not require preliminary roasting, their sulphur content seldom being in excess of that necessary to form the 50 per cent. copper matte that is being regularly produced on first smelting.

It may be of interest to mention that the smaller of the two ore bodies opened at the 300-ft. level of the mine is an irony ore, chiefly magnetite, but with some lime and silica, while the larger body at both this and the 200-ft. level is a calcareous ore carrying a larger proportion of silica and, of course, much more lime. These together form an ideal ore for smelting, containing constituents that make it self-fluxing. The ore being generally low grade, the profitable operation of the mine is dependent chiefly upon the great quantity of its product, the copper content of which is enriched by gold and silver, these constituting about one-third of the total values. The mine is a remarkably dry one, very little water coming in.

The work done to date in development of the Mother Lode mine is approximately 6,800 lineal ft., about 1,450



HOISTING ENGINE, MOTHER LODE MINE.

being sinking and raising and 5,350 drifting and crosscutting. The main shaft is down 325 feet, and long levels have been run at both 200 and 300 ft. depth. The ore body opened up at the 200 level varies from 80 to 100 ft. in width and crosscuts at intervals show this ore to be continuous here for at least 350 ft. to where it goes underfoot and out of the level. This big chute has also opened on the 300 level, where the north drift, crossing it diagonally, has exposed 100 ft. of ore and is not yet through it. A second ore chute has been encountered on this lower level and proved by crosscuts to be 18 to 20 feet in width and at least 200 feet in length. The "pillar and stope" system, fully described in the MINING RECORD last month, was adopted in the mine last year, and a large surface opening known as No. 1 quarry was made in ore, well up the side of the Mother Lode hill. A tunnel—No. 2 quarry—was driven 170 feet at a lower level and connection was made between this and No. 1 by means of a raise, and still lower down workings, known as No. 3 quarry, were carried 200 ft. into the hill and from them a raise made to No. 2, the vertical depth from No. 1 to No. 3 being 110 feet. No. 3 workings are now being extended farther into the hill. Ore quarrying is here becoming a more and more important feature in the working of the mine. The aggregate output of ore to date has exceeded 150,000 tons, of which between 5,000 and 6,000 tons were shipped in

1900, nearly 100,000 in 1901, and about 45,000 during the current year.

The power plant in use at the Mother Lode is the largest at any Boundary mine. The first plant installed in 1898 included two 60 h. p. boilers ; an 18 x 24 Ingersoll-Sergeant straight-line air compressor, rated for 10 drills ; five machine drills ; air receiver ; 7¼ x 10 hoisting engine, and two auxiliary hoists ; an electric light plant, etc. Last year larger equipment was added, including the largest air compressor the Jas. Cooper Manufacturing Co., Ltd., has yet made for use in British Columbia, and a large hoist made by the Jenckes Machine Co. The compressor is a cross-compound condensing Corliss-valve Ingersoll-Sergeant engine, with compound air and intercooler, high and low pressure steam cylinders, 22-inch and 40-inch, respectively, air cylinders of the piston-inlet type, high and low pressure 19¼ inch and 32¼ inch, respectively, and 48 inch stroke, the machine having a capacity of 30 to 40 drills and weighing 167,000 lbs. Steam is supplied to this engine by two horizontal return tubular boilers, each 100 h. p. for 125 lbs. working pressure. There are now fourteen Ingersoll-Sergeant and two Rand machine drills on the mine. The hoisting engine is a double-cylinder Corliss-valve, first-motion hoist, cylinders 22 x 42 inch, diameter of drums 6 feet. Two 80 h. p. boilers supply it with power. Two platform cages with safety clutches and shield roof have also been installed. A Robins ore-sorting and conveying plant comprises a 36-inch picking belt 111 feet long with return conveyor 41 feet long ; a 12-inch fine-ore conveyor 110 feet long, and a 16-inch waste conveyor 556 feet in length. A No. 5 Gates rock crusher with a capacity of 40 tons per hour, and a 70 h. p. Nagle engine complete this sorting plant. To handle the rock from the quarries the largest crusher yet brought into the Province has just been installed. It was made by the Jenckes Machine Co., and is a 24 x 36 14B Farrel improved crusher, fitted with manganese steel jaw plates, steel swing jaw and pitman. Its capacity is from 65 to 80 tons an hour crushing to a size not exceeding five inches. It is driven by a 16 x 20-in. right-hand plain slide-valve engine, fitted with Meyers' adjustable cut-off, and with fly-wheel 90-inch diameter and 18-inch face. An elevating machine made by the Jeffrey Manufacturing Co., with a chain of 20 x 9 x 12 buckets, lifts the ore from the crusher pit to ore bins alongside the railroad track. Additional electric light plant is a 250-light Westinghouse dynamo with a full complement of arc and incandescent lights, and a 25 h. p. Armington & Sims engine to run the dynamo.

The ore bins here have a total holding capacity of about 3,000 tons. Railway facilities at the mine are sufficient for handling large quantities of ore. Mine buildings are commodious and comfortable, with accommodation for more than 100 men, besides cottages for married employees. During construction periods up to 150 men have been employed, but the mine does not at present require more than half that number for development and ore production. The output of ore is now being increased to between 800 and 900 tons a day.

B. C. Copper Co's Smelter, near Greenwood, B. C.

THE SMELTER.

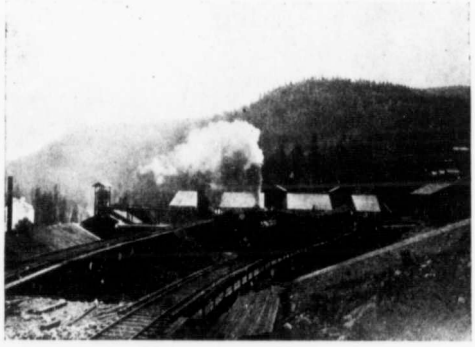
When Mr. Paul Johnson, E. M., who designed and constructed the B. C. Copper Co's smelter, and who has directed its operation up to the present time, chose the location for the works at the junction of Copper creek with Boundary creek, at Anaconda, he had due regard to the important requisites of proximity to the mines, water supply and railway facilities, and to the conformation to the site in its relation to the ordinary requirements of a gravity system. The gradual extension and enlargement of the works exhibit in an increasing degree, as progress is made, the foresight that grasped the especial suitability of the site chosen. The smelter is about 2½ miles in a direct line from the Mother Lode

mine and at about 850 feet lower elevation. It is centrally situated, too, for obtaining custom ores from surrounding mines. The Columbia & Western railway from Greenwood to Midway passes just below the works whilst the Deadwood branch runs immediately above them, giving convenient access from the latter to the smelter on two levels.

The works may be briefly described as follows :—

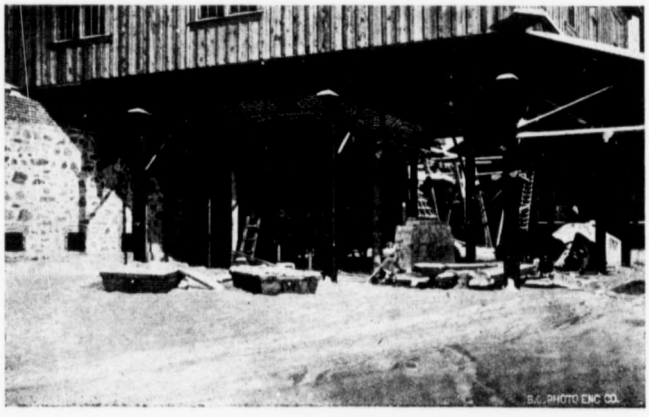
Starting from the top the upper ore bins come first.

Mr. Paul Johnson, E. M.
Gen. Mgr. B. C. Copper Co's Smelter, Greenwood, B. C.



B. C. Copper Co's Smelter.
Showing Smelter Yard, Trestles, Lower Ore Bins, Coke Dump, etc.

There are six of these, each of 500 tons capacity, built in two parallel rows and having over them a double railway track. An elevated tramway connects these with the sample-mill building, which is a three-story frame structure 79 x 65 and 58 feet high to the eaves. Its full capacity when supplied with the requisite ore bulk of the ore from the Mother Lode, already crushed at the mine and consequently not having to be passed through the smelter sample mill, comes to be dumped direct into the lower bins, and coke, etc., for delivery in the smelter "yard" below the trestles carrying these tracks to the bins.



Furnace in Course of Construction, B. C. Co's Smelter.

bins, etc., will be about 3,000 tons, but present arrangements only include provision for a smaller quantity. The building is large enough to accommodate three sets of plant, but only one set has as yet been put in. This comprises three Gates rock crushers of different sizes, one pair Cornish rolls, one coffee mill or sample grinder, three Johnson's automatic samplers, and a 16 x 18 in. Erie City engine rated at 100 h. p. at 100 lbs. steam pressure. The sample mill has been constructed on the automatic principle with samplers designed to avoid elevating the material before crushing. Under these arrangements only two or four per cent., as desired, has to be elevated, the great bulk going direct to the discard bins. The lowest floor of the sample-mill building is two feet higher than the top of the lower or smelter mixture ore bins. There are two sets of these, each 12 in number in four parallel rows, the whole giving a storage capacity of about 10,000 tons. They are crossed by three parallel railway tracks over which the

The dust chamber runs below the lower bins at a right angle to them for nearly 300 feet, thence diagonally for about 105 feet and thence up the hillside 215 feet to the base of the smoke stack. This chamber or flue is 12 feet wide by 14 feet high and has thick masonry walls, brick-lined in part and arched over with brick. A steel-plate smoke stack, 78 inches in diameter, rises 90 feet above a brick base supporting it, and gives an

effective draught height of about 190 feet above the furnace floor.

There are two furnaces, one of which has been running since February of last year and the other just completed and now ready to be blown in. They are stack furnaces 42 in. wide by 150 in. long, inside dimensions at tuyeres of which there are ten on each side, of 3½ in. diameter. They were built by the Edward P. Allis Co. (now Allis-Chamers Co.) of Milwaukee, Wisconsin. The engine and blower-house, 60x45, contains two No. 7½ Connersville blowers, the high-pressure cylinder of a compound condensing Reynolds-Corliss engine 16x35 inches rated at 150 h. p. with 100 lbs. steam pressure (the other half to be put in later), and an electric light dynamo with direct connected engine. There are in the adjoining boiler room three horizontal return tubular boilers 66 inches by 16 feet, each of 100 h.p. and equal to a steam pressure of 130 lbs. Space is left for several more boilers.

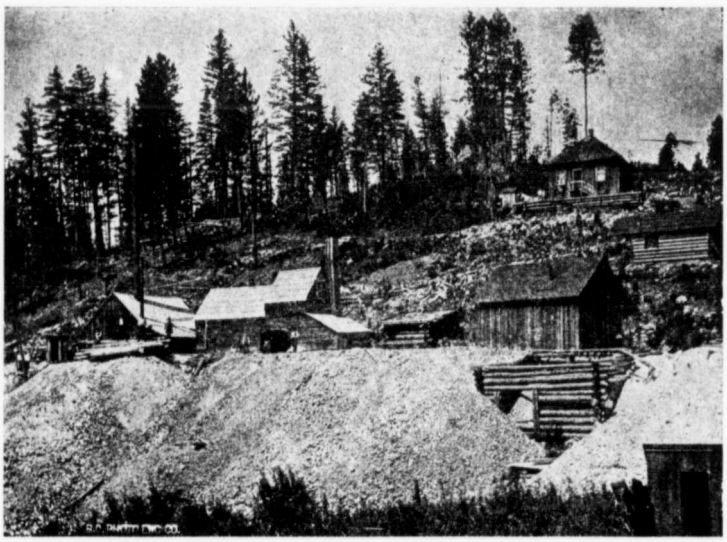
The total tonnage of ore smelted at this smelter from the time it commenced operations on February 17, 1901, up to April 16th, 1902, was 161,354 tons, with one furnace running. The average daily tonnage for 309 days of last year was 380½ tons. During recent months, the daily average has steadily increased, having been 394 tons for September, 408 tons for October, 409 tons for November, and 422½ tons for December. On one day last January this smelter made its record day's run, having during 24 hours, ended 6 o'clock a.m., of the 11th, treated 460 tons of ore. The tonnage for that month was 13,287 tons, giving a daily average of 428⅜ tons. Moreover, all the foregoing figures refer to ore alone—no coke being consumed in smelting is included, and no barren fluxes are used. The latter results appear to be fittingly designated "phenomenal," and as stated in the press of the Province, they "constitute eloquent testimony to two important facts—First, the particularly favorable nature of the self-fluxing ores of the Boundary; next the skill in designing, constructing and operating smelters that have produced results hitherto unknown in the history of copper smelting."

LONG LAKE CAMP MINES.

JEWEL GOLD MINES, LTD.

THE Jewel group, consisting of the Jewel, Denero Grande, Gold Drop and Massachusetts mineral claims and the Imperial and Exposition fractional claims is owned by the Jewel Gold Mines, Ltd., a company organized in London, England, with a capital of £90,000 in shares of £1 each. Of these shares 60,000 were issued as fully paid up, in payment for the mining properties acquired, 20,000 were subscribed for at par, and 10,000 remained in the treasury for the benefit of the company. The group is situate in Long Lake camp, Kettle River Mining Division, and is distant about four miles from Eholt, on the Columbia & Western Railway, a waggon road connecting the property with that town.

The Jewel and Denero Grande were the first claims in Long Lake camp to have development work of importance done on them. They were bonded in 1896 by Mr. Leslie Hill, C.E., for the Prospecting Syndicate of British Columbia. A small steam hoisting plant, the first brought into the Boundary district, was taken in to the Jewel over a snow road in January, 1897, and that year's developments were so promising that the Jewel Development Syndicate was formed. This syndicate spent about $20,000 in further development and acquired additional claims. Then the present larger company was organized and the claims and all other assets were transferred to it. The first directors of the present compauy were: Mr. W. H. Tyser, London, chairman; Sir Bartle C. A. Frere, London, and Mr. W. W. Slater, Edinburgh.



JEWEL MINE—BUILDINGS AND DUMP.

For about two years the work of developing the Jewel was done under the direction of Mr. Leslie Hill, but for the three years last past Mr. Gilbert Mahon has been manager. To date some 920 lineal feet of sinking and raising, and 2,360 feet of crosscutting and drifting have been done in underground development, and about 1,600 tons of ore have been shipped to smelters and other reduction works. The ore occurs in a fissure vein

running approximately north and south and varying from two feet to eight feet in width, averaging about 3 feet 6 in. The mine has been examined and reported on by several well-known mining engineers, one of whom described the vein filling or gangue as "quartz carrying considerable quantities of galena, zinc blende, iron pyrites, and occasionally, in smaller quantities, ruby silver, tellurium and tellurides of gold and silver, while free gold is of exceedingly rare occurrence." Bulk tests of 160 tons of ore made at the Silica Works, Rossland, showed an average value of rather less than $12 per ton.

The southern part of the Jewel claim is for about 500 feet in a syenite formation, and the remaining 1,000 feet in quartzite. At the contact the vein appears to fault by a displacement of about 300 feet. Most of the above-mentioned work has been done in the syenite, where an incline shaft has been sunk 348 feet, following the vein on its easterly dip of about 45 degrees. Three levels have been run, each north and south, at 120, 230 and 330 feet depth respectively. These have opened up a chute of ore about 250 feet in length and have made available, according to one engineer's estimate, about 20,000 tons of ore above the 330-ft. level. Underfoot

Long Lake.

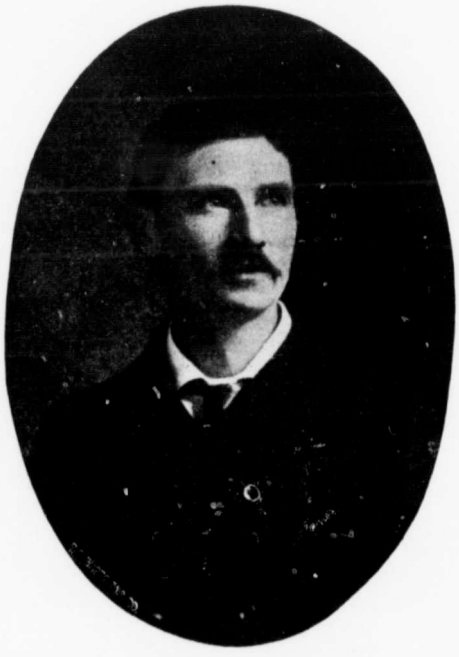
the vein is strong and has every appearance of continuing down to a much greater depth.

The faulted portion of the vein outcrops higher up the hillside and shows for about 1,000 ft. in Jewel ground and some 3,000 ft. through the Enterprise, Anchor and another claim beyond. Open cuts and three prospect shafts, two on the Jewel and one on the Enterprise, show this vein to be strong between well-defined walls and averaging about five feet in width. The Enterprise shaft is down 110 ft. Of the two on the Jewel, one is 60 ft. deep and the other, known as Rowe's shaft (Mr. W. Rowe being foreman in charge) 163 ft. From the latter a drift, now well on towards 200 feet in length, is being run northwards on the vein. The considerable difference in surface elevation encouraged the management to endeavour to cut this northeast vein (as the faulted portion is called) by means of a drive from the 230-ft. level of the main workings. This drive passed through the fault and is now in the quartzite, but it has not yet encountered the vein. Should it do so it will here give 500 ft. of backs on the vein, so rapid is the rise on the surface.

The company has its own saw-mill, also an excellent stamp-mill site, situate close to and above Long lake, and distant about 2,000 ft. from the Jewel main shaft. The grading for a mule tramway to this site, on a 6 per cent. grade, has already been done. Should the proposed stamp mill and cyanide plant be put in, it is intended to use electric power, to be supplied by the Cascade Water Power & Light Company. The mining equipment, including one 50 and one 25-h.p. boiler, 4-drill Rand straight line air compressor, air receiver, machine drills, two 5x5 Bacon hoists, station and sinking pumps, etc., is small, but is equal to present needs.

THE MINING DIVISIONS.

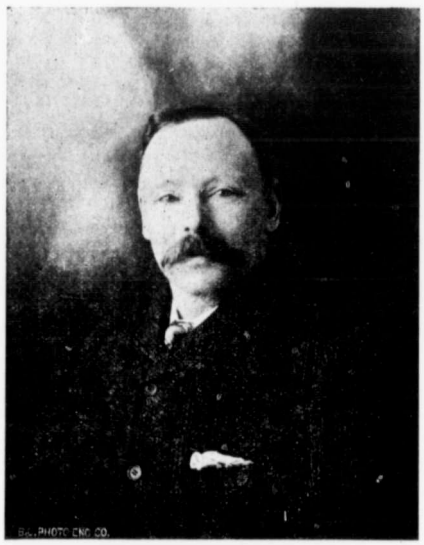
THE Boundary District, roughly speaking, takes in the southern half of the Kettle River Mining Division and the whole of Grand Forks. For some years prior to 1898, what is now the Grand Forks Min-



Mr. W. G. McMynn.
Gold Commissioner and Mining Recorder, Kettle River Mining Division.

ing Division was a part of the Kettle River Mining Division, but in that year a very necessary subdivision was made. Later a general rearrangement of boundaries of mining divisions took place, the changes dating from January 1, 1900. Under this rearrangement it was provided that the Kettle River Division should comprise that section of country within the Province forming the drainage area of the Kettle river above the point where such river is joined by Fourth of July creek, near Carson, and that Grand Forks Division should comprise that section of country within the Province forming the drainage areas of North Fork of Kettle river, of Fourth July creek and of the main Kettle river below the junction of such creek. This rearrangement removed the western boundary of the Kettle River Division westward from Rock creek to the neighbourhood of Camp McKinney, and gave it, too, the West Fork and other mining camps on creeks coming in to the main Kettle river from the west.

For years the office of the mining recorder for the Kettle River Division was at Midway, but eventually it was removed to the more populous town of Greenwood. Owing to its extensive area this division has been given several sub-recording offices, for the convenience of prospectors and others, who might otherwise have to travel long distances to reach Greenwood. These sub-offices are at Westbridge, situate at the confluence of the West Fork with the main Kettle river, at Camp McKinney, and at Vernon. The better known mining camps in this division are those of Camp McKinney, West Fork, Canyon and other creeks flowing into the upper main river, Rock creek, Graham's, part of Central, Smith's, West Copper, Copper, Deadwood, Kimberly, Long Lake, Providence, Skylark and part of Greenwood or Phœnix camps. The more prominent mines in these camps are the Cariboo, at Camp McKinney; Carmi, up the West Fork; No. 7, in Central Camp; Ruby and Republic group, in Smith's camp; King Solomon, in Copper camp; Mother Lode, Sunset and Crown Silver



MR. S. R. ALMOND.
Gold Commissioner and Mining Recorder, Grand Forks Mining Division.

group and Morrison, in Deadwood camp; Jewel, in Long Lake camp; and the Granby Co's Old Ironsides and Knob Hill group and the Brooklyn and Stemwinder, at Phœnix. Mr. Wm. Graham McMynn is gold commissioner and mining recorder for the Kettle River Mining Division.

The camps in the Grand Forks Division include part of Central (White's), Wellington, part of Greenwood, Summit, Pass Creek, Brown's, Knight's, and several other lower North Fork camps, Franklin camp, the coal country up the West Fork of the North Fork, and the camps around Grand Forks and Christina lake. The principal mines in this division are the City of Paris and Majestic properties, in White's camp; Athelstan, Winnipeg and Golden Crown, in Wellington camp; Snowshoe and Gold Drop, near Phœnix; B.C., R. Bell and Oro Donoro, in Summit camp; and the Humming Bird, Pathfinder, Volcanic and Golden Eagle, on the North Fork. Mr. Sydney R. Almond is gold commissioner and mining recorder for this division, with office at Grand Forks.

The office statistics of the respective divisions for three years, 1899-1901, show the following figures for the whole period:

GREENWOOD.

	No.	Amount.
Free miners' certificates, including companies' and special	3,829	$20,006 75
Location records (mineral)	2,363	
" " (placer)	39	
Leases, "	23	
Certificates of work issued	2,939	
" improvement issued	165	
Conveyances and agreements	1,260	
Abandonments	97	
Filings	..	
Water grants	24	
		22,093 15
		$42,099 90

GRAND FORKS.

Free miners' certificates	2,288	$12,546 80
Companies' "	24	2,025 00
Special "	14	220 00
Mineral location records	1,806	4,515 00
Certificates of work issued	2,779	9,062 00
" of improvements	170	425 00
Conveyance records	1,185	3,100 30
Filings	887	218 75
Permission to re-locate	6	35 00
Water grants issued	11	91 50
Abandonments	33	249 25
Miscellaneous	..	621 85
		$33,110 45

CASCADE CITY AND CHRISTINA LAKE.

CASCADE CITY is one of three sites, along a distance of about 25 miles in an air line, that appear to be natural locations for important towns. Cascade is at the eastern end of this line, Grand Forks in its centre, and Midway at its western end. Each is at the junction of streams and the meeting place of valleys and consequently will be of railways, each possesses advantages for smelter and other industrial purposes, each should draw trade from a considerable extent of country naturally tributary to it, each is favourably situated for carrying on an extensive lumbering industry and each is especially suitable for residence purposes. Cascade's "growing time," though, has not yet come. That it will do so eventually numbers are confident, for within a few miles, from Huckleberry mountain on the southwest around to the Burnt Basin on the northeast, lie several mining camps of much promise. The chief present difficulty in connection with most of the as yet undeveloped mining camps, or more correctly prospecting camps, of the Boundary is that there is comparatively little money available for opening up their mineral wealth. This is the case in the neighbourhood of Cascade. Similarly other resources, with the single exception of the water-power obtainable here, are awaiting the stimulus of the investment of capital to turn them to profitable account. For instance, in the hills immediately east of Cascade a large deposit of marble is known to occur, but as yet little or nothing has been done to open up a marble quarry so that this useful material might be turned to good account. Then there are at the upper end of Christina lake valuable cedar limits the timber on which will doubtless ere long be much in demand and will be floated down the lake and manufactured into lumber at or near Cascade. Still again there is in close proximity to the townsite a smelter site so eminently suitable for this industry that an area of 500 acres of land embracing this site, was some time since purchased from the townsite owners by the Canadian Pacific Railway Company with the stated object of either itself establishing here a big smelter or transferring the site and accompanying facilities for this

purpose to some other company or persons who would carry out this object.

Cascade is indeed the "gateway" town in the sense that it is here the C. P. R. Co's Columbia & Western Railway fairly enters the Boundary country after crossing the mountain range that was long regarded as an effective barrier to any railway entering this district from the Columbia river without crossing into American territory; and here, too, the railway the Great Northern Co. is constructing from Marcus, on the Spokane Falls & Northern railway along the Kettle River valley with the mining camp of Republic, on the Colville Indian Reservation, south of Grand Forks, as its present objective point, crosses the International boundary line. To Mr. Scott McRae, of Deadwood, belongs the credit of having first shown the pioneer railway engineers that there was a pass (afterwards named McRae Pass), through the mountains available for railway purposes, and once satisfied on this point it was simply a matter of determining the best route from the summit down to the low-lying level of the Kettle valley. With two railways, one with convenient connections with both the Crow's Nest and main lines of the C.P.R., on the east and north, and the other with Spokane and its diverging railroads on the south, it does not appear unreasonable to assume that ere many years have passed, Cascade will have a big hotel and a correspondingly large tourist patronage, as the beauties of Christina lake, only one mile away, become widely known. Christina lake is described as a most beautiful body of water 20 miles in length and from two to four miles in width, "the sportsman's paradise and the pleasure-seeker's resort," and this terse description only does it bare justice.

Bird's Eye View of Cascade City.

Christina Lake, B. C.

In view of the fact that Cascade may become the health and pleasure resort of the Boundary, the following, from the pen of Mr. Stanley Mayall, who wrote after an extended residence here, may be of interest :—

"The climate is dry and bracing, the air invigorating, the soil generous, the water pure and wholesome. The majesty of the hills is dignified by the presence of stately deer of many varieties; silver-tip, cinnamon, black and brown bear roam the mountain slopes and revel among the rotating crops of the ever abundant fruits and berries. The mountain lion, lynx, fisher and the cayote—the Bill Sykes of the republic of fin, fur and feather—batten and multiply upon their prolific spoil. Ptarmigan, blue and ruffled grouse, fool hen and duck of many sorts provide sport and food from the mountain summits to the very shores of the lovely and far-stretching Christina lake. Whilst every mountain stream, even above Gladstone, at an altitude of 3,000 feet, supplies the speckled trout in an abundance that is amazing. In Christina lake itself salmon and lake trout of various sizes up to sixteen pounds weight are caught. Numerous other fish abound, and in due season the bright-colored and tasty kokanee is taken in large quantities."

GRAND FORKS.

GRAND FORKS AND TRIBUTARY COUNTRY.

GRAND FORKS to-day has a more prosperous appearance than any other town in the Boundary District. The observant visitor sees more activity in connection with its industries, more business being transacted in its stores, and more stir in its streets, than are at the present time to be seen anywhere else in the district. He finds, too, more enterprise among its leading business men, more confidence in the future of the town and surroundings, more energy in fostering and encouraging whatever promises to substantially benefit the town, and more determination to advance the common interests of the community "first, last and all the time," than he will meet with in any other town in the Boundary. Some ascribe this to the fact that just now the town is enjoying the benefit of having a considerable transient population, consequent upon railway construction being in progress near by. Doubtless this is in part accountable for the larger business that is being done in the town, but aside from this temporary advantage there is much to be found that makes for permanent progress in and around what its residents claim is "the metropolis" of the Boundary. Perhaps evidences of careful progress are more noticeable in the number and style of architecture of the many villa and cottage residences, some of them pretentious and attractive to the eye, than in anything else, although the business streets, too, give unmistakable tokens of participating in the improvement that marks the town.

Whilst an increase in the valuation for assessment purposes of city property is not necessarily a thoroughly dependable evidence of enduring progress, the large advance in the total value for purposes of civic taxation is very significant, and may in this instance be taken as demonstrating in some measure the big strides the town has taken during the period now quoted. In 1898 the total value was $275,143; for 1902 the figures, as published in a local newspaper are: Improvements, $418,100; land, $619,610; total, $1,037,710. The statement of assets and liabilities lately published by the corporation, shows a total liability of $207,470.78, all but $9,000 (payable on account of school building) being liability on debentures. The opposite side of the balance statement shows that the assets are $15,707.11 less than the liabilities, but in making up this statement no account was taken of streets, bridges and other public improve-

ments, which had they appeared as assets would have placed a very different complexion on the position as exhibited in the published statement. Whilst on the subject of city finances it is interesting to note that the receipts from the city's water and light system during 1901, were $13,264.99, as against an expenditure on the same account of $8,630.61, thus leaving a net profit for the year of $4,634.38. The city council consists of: Mayor, Mr. T. W. Holland; aldermen, Messrs. Robert Harvey, John Donaldson, H. A. Sheads, Robert Gaw, Neil Matheson and Jeffrey Hammar. Mr. W. B. Bower is city clerk.

Grand Forks is advantageously situated at the confluence of the North Fork with the main Kettle river. It is the commercial centre of a wide and fertile valley having an estimated area, so it is claimed, of about 45,000 acres of land, which is suitable for agricultural and horticultural purposes, as has been effectively demonstrated by the success achieved by several ranchers who have made money out of farming and fruit-growing. One of the most promising features in the outlook for the future of Grand Forks is the probability of there being within a few years a comparatively large population settled on small holdings in this valley. There are already several successful examples in the cultivation of 10-acre lots, and efforts are now being made to find buyers for small sub-divisions of one of the best improved farm and orchard properties in the neighbourhood. A resident nurseryman states that fruit trees grow rapidly and come into bearing earlier than in the east. He advocates besides the cultivation of small fruits, which are prolific, the planting of plums, crabs, apples, pears, etc., with which he considers success practically certain, and thinks that with a growing market, a fine climate and comparative freedom from pests, fruit-growers have bright prospects in this valley. Growers of roots and garden crops also find conditions favourable for profitable production, and poultry-raisers do well.

Getting back to the town and the industries that support it, first place must be given to the Granby Co's smelter, with its pay roll of about 300 men, which has an extended notice elsewhere in this number. Then in or near the town there are a saw-mill, sash and door factory, foundry and machine shop, two breweries, steam laundry, brickyard (which turns out about the best bricks made in the district), and other industries. Two chartered banks, the Eastern Townships and the Royal Bank of Canada, have branches here, besides which the Grand Forks Investment & Trust Co., Ltd., a local company having an authorized capital of $100,000, does a general financial and trust business. Grand Forks is the customs "port" for the Boundary, the customs offices at Cascade, Carson, Greenwood and Midway having to report to it. The collector, Mr. R. R. Gilpin, was one of the early settlers in the valley, and is a well-known and popular official. The office of the gold commissioner and mining recorder for the Grand Forks Mining Division is here, these positions being filled by Mr. S. R. Almond, who is also registrar of the Supreme and County Courts and holds other government appointments. The chief license inspector for the Boundary Creek License District, Provincial Constable I. A. Dinsmore, makes Grand Forks his headquarters. The license commissioners for the district are Messrs. E. Jacobs, Greenwood, chairman; H. B. Cannon, Grand Forks; W. B. Townsend, Rossland. The town has well-stocked stores, and its big leading hotel, the Yale, is widely known. Two telegraph and one telephone (a long distance and local) systems facilitate speedy communication. Three railways add to the importance of the town — the C. P. R. Co's Columbia & Western line passes through; the Kettle Valley & Republic, or as it has been dubbed, the "hot air" line, is nearly completed, and the Great Northern, or the V. V. & E. line (the two appear to be so mixed up here that it is difficult to find out to which company the length of line from Cascade to Grand Forks and Carson belongs) is endeavouring to have injunctions and other obstructions to its progress removed so that it may complete its railroad from Marcus via the Kettle River valley to Republic. Mails are received and dispatched daily, Mr. Geo. H. Hull, being postmaster.

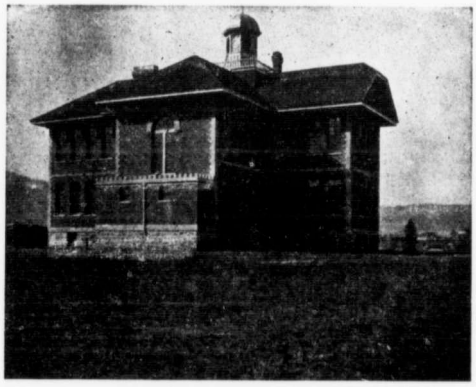
Reference has already been made to the many residences as a marked feature of Grand Forks. The local public school is the finest school building in the Boundary, a substantial and commodious brick structure, the cost of which, with fittings, is variously stated at from $15,000 to $18,000. Four churches have their own church buildings completed and paid for, viz.: The Church of England, Presbyterian, Methodist and Baptist churches, each having its own resident clergyman or minister. Secret societies are represented by lodges of the Knights of Pythias, Oddfellows and Foresters. Athletics and other outdoor sports have much attention, several clubs being in active existence, while a determined effort is being made to lead the district in horse-racing, a 27-acre level site for a half-mile race track, situate just across the river from the town, having been purchased, as this is now being suitably improved for horse-racing purposes and for outdoor sports generally.

Grand Forks has two weekly newspapers. A small daily is published in the adjoining municipality of Columbia, the fortunes of which burgh are being gradually bound up with those of its larger neighbour. The population of the two municipalities was given in the Dominion census returns last year as Grand Forks 1,012 and Columbia 350, together 1,362. A recent municipal count placed the population at 1,650. Allowing for a larger transient population during the present period of railway construction than usual, the ordinary population of the two municipalities may be fairly placed at 1,500, which makes it appear, as it certainly does, to be the most populous centre in the district.

It is customary to regard Grand Forks as not having any nearby camps to contribute to its trade, but as the fact must not be lost sight of that there are some mining properties up the North Fork that, although to a large extent neglected just now, will eventually be worked with promise, from past experience of them, of profitable results. A few miles above the town there are several well-known mineral claims, on one side of the river or the other, upon which sufficient development work has been done to show that with capital to provide the requisite plant and machinery, and to properly open up the mines, there is a reasonable prospect of their being able to regularly maintain an output of ore that in the aggregate would aid materially to the total value of the district's production. Those properties that have already shipped ore are the Humming Bird and Golden Eagle, which together have sent out nearly 1,000 tons, with the Strawberry and Little Bertha credited with a test car load each. Other claims are the Seattle on the west side of the river, and the Earthquake, Volcanic and Pathfinder on the east side. There are numbers beside these, but as a rule there has not yet been much work done on them. It is stated that there are on the Pathfinder three main bodies of ore, of a somewhat irregular character, partially developed by two shafts 125 and 135 feet in depth, respectively, and about 700 feet of crosscutting and drifting. These ore bodies are large masses of low grade pyrrhotite, carrying values in gold, silver and copper. The power plant on the Pathfinder consists of a 50 horse-power boiler,

6x8 hoisting engine, pumps, etc. There is, besides, a small steam plant on the Golden Eagle. The ores of several of the claims named are quartz, with gold and silver, bulk shipments having returned from $10 to $21 per ton gross.

Up the East Fork of the North Fork there is a very promising country known as Franklin camp, which for size of ore bodies, so far shown by the very limited amount of work done, and specimen assay values compares favorably with what was known of the older camps at a similar stage. A waggon road has been made from Grand Forks well up the North Fork, and a trail cut out thence to Franklin camp, but the extension of the road through to the camp is an urgent necessity, so that the present almost prohibitive cost of getting in supplies may be considerably reduced and machinery be taken in to facilitate development, otherwise the mineral resources of Franklin camp must remain undeveloped. It is understood that the Provincial Government will carry the road through during the ensuing summer, Mineral locations have been numerous in Franklin camp. the Banner, McKinley, Gloster and Polard being about the best known claims.



Grand Forks, B. C., Public School.

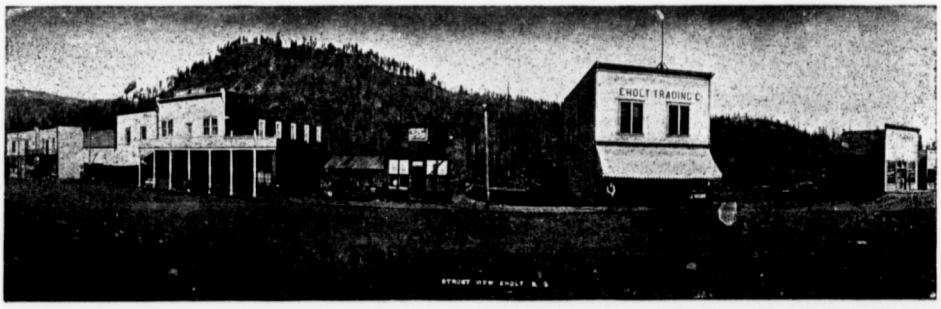
The West Fork of the North Fork has attracted much attention during recent months by reason of a reported discovery of coal up there. The country for many miles has been staked for the stated purpose of prospecting for coal, but the only legitimate effort now appearing to be made is that of an organization named the B.C. Coal Co., Ltd., of Nelson, B.C., having an authorized capital of $1,500,000 in $1 shares, but which has not yet sold much of its stock. This company has secured about 25 of these coal prospecting claims, and it now has half a dozen men at work on some of them. Several seams of coal, ranging from 6 in. to 3 ft. 6 in. have been found along a distance of about two miles of the stream, and it is stated that tests of coal from these seams shows that the coal has good coking properties. Arrangements have been made to send in a diamond drill, so that something definite should be ascertained this season regarding the extent and value of the coal, at any rate where seams have already been found.

No mention is made above of mining properties in the hills near Grand Forks, nor of the mining country west and south of the town and naturally tributary to it. There are, though, numerous indications of the presence of minerals in the surrounding hills, but more development is necessary to determine whether or not these prospects possess any substantial value. The general position in relation to the town may be summed up by stating that the site of the town, with three valleys converging here, is a most favorable one ; there is ample room for a large producing population all about the city ; the water power derivable from the rivers and the electric power obtainable from the Cascade Power Co's lines which pass through the town, supplemented by whatever steam power it shall be found necessary to put in, together favour the establishment of additional important industries here and the large areas of timber country along the North Fork constitute another valuable resource. Location and climate, varied resources, industrial development already in large measure assured —these combined with the enterprise and energy of the citizens are full of promise that Grand Forks will eventually attain to the position to which it aspires, viz , that of being the largest town in the Boundary District.

EHOLT.

THE town of Eholt is situate on the summit of the divide over which the Columbia & Western railway has to pass in crossing from the valley of the North Fork at Grand Forks to that of Boundary creek near Greenwood. It came into existence with the railway and depends to some extent upon the railway for its trade. It has five or six hotels and several stores, the largest of which is that of the Eholt Trading Company, which does a considerable amount of business with neighbouring mining camps.

Eholt is in a measure the railway divisional point of the Boundary, being the home station of most of the trains and train crews employed in hauling ore and doing other train work on the local branch lines. Ore and freight trains are made up here and sent thence to



Street View, Eholt, B. C.

their various destinations. Passenger trains in and out cross here, and trains to and from Phœnix arrive and depart at about the same time, giving the railway station and yards a comparatively busy appearance when these several trains meet. The railway company keeps here its main coal supply for district use and, too, does such repair work as it is not necessary to send out to larger repair shops.

Mines and camps for several miles around make this their postal town. The B. C. mine is distant less than two miles to southward, and within another mile are the R. Bell, Oro Denoro, Emma, Blue Bell, Mountain View, and numerons other mineral claims. In another direction lies the Rathmullen group, and further north the Rambler, a promising property upon which are big surface showings and below ground much ore has been passed through by the diamond drill. Northwest are the Jewel group and many more Long Lake camp properties, including the North Star, Lakeview and Ethiopia, the last-named having had done on it some 300 feet of underground crosscutting and drifting which has opened up a vein of gold-bearing quartz of which more may yet be heard.

Besides daily mail facilities, Eholt has telegraph and telephone communication. There is a public school here and religious services are held periodically. The resident population is not large, but when the surrounding mining properties become developed so as to join the list of producing mines, the town will grow and prosper.

Greenwood, Looking S. W.

GREENWOOD CITY.

IN the fall of 1895 Mr. Robert Wood, well known in the Province as an enterprising pioneer, journeyed from Armstrong, in the Okanagan district, down to the Boundary country then coming into notice. Sitting one day by a cabin at the junction of several trails near where Twin creek flows into Boundary creek, the idea occurred to him that here was a suitable site for a town. Having come to this conclusion he at once set about securing rights to the land, which had already been taken up either by pre-emption or as mineral claims. (It may not be out of place to mention here, by the way, that as early as 1892 Messrs. C. A. R. Lambly, then stationed at Camp McKinney, and Wm. G. McMynn, staked the sites that are now Anaconda and Deadwood, respectively, the intention being that they should be reserved as Provincial government townsites, which, however, was not done). Before the winter closed in Mr. Wood had erected a store building wherein was established the mercantile business that has since developed into the important trading concern of Rendell & Co., in which the enterprising founder still retains an interest. In those days of tardy transportation and slow communication progress was not rapid, but the new town grew. Mr. Wood during the years immediately following threw into the work of making it accessible to the several surrounding embryo mining camps, much energy and expending money freely, in both of which he was heartily supported by the pioneer residents of the town and neighbourhood. Trails were cut and waggon roads made, these connecting Copper, Deadwood, Greenwood (now Phœnix), Summit, Long Lake and Kimberley camps with Greenwood, which thereafter became the business centre of the surrounding country.

On July 12, 1897, Greenwood was incorporated as a municipality and later Mr. Wood was, by acclamation, elected its first mayor. Having power to levy rates the money was raised wherewith to make public improvements, and during 1898 quite a transformation was made in the appearance of the growing metropolis by the grading of streets, making sidewalks, etc. Fire, police and health departments were established, and a water system was put in. The first valuation roll for assessment purposes showed a total value of property within the city limits of $211,035. The valuation roll for 1902 shows a total of $1,256,795, a considerable increase, as will be seen, during a period of about four years. The present mayor is Mr. Geo. R. Naden, manager of the Bealey Investment & Trust Co., Ltd., and the aldermen are Messrs. D. A. Bannerman, J. J. Caulfield, W. J. Kirkwood, Duncan Ross, R. Smailes and D. J. Sullivan. Mr. G. B. Taylor is city clerk, and Mr. I. H. Hallett, police magistrate. The city some time since purchased 320 acres of land situate north of the town, for park and cemetery purposes. The population

as given in the Dominion census returns was 1,359 but there are numbers of residents just without the city limits, so that the actual population of Greenwood and its immediate vicinity is larger than these figures show.

The Dominion government is represented in the town by customs and inland revenue offices, with Mr. H. McCutcheon as collector, and post office, Mr. K. C. B. Frith being postmaster. The value of goods imported and revenue collected during the financial years ending June 30, 1900 and 1901, respectively, were :—

In 1900, dutiable goods, $152,700 ; free goods, $15,048 ; total, $167,748. Revenue, customs duty, $41,-133,50 ; inland revenue collections, $18,-386.49 ; total, $59,-519.99.

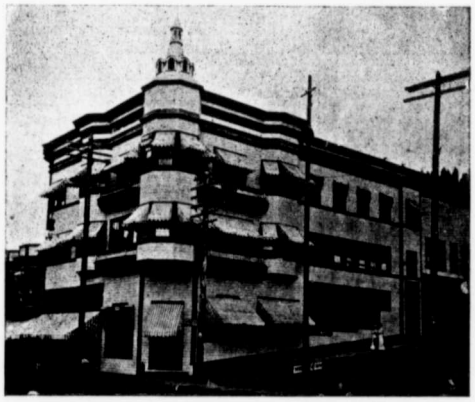
In 1901, dutiable goods, $106,289 ; free goods, $37,850 ; total, $144,139. Revenue, customs duty, $30,-756,63; inland revenue collections, $15,060.03 total, $45,846.66. The higher figures of the first-named period were in part attributable to the larger trade that was necessarily done during the railway construction days.

Early Beginnings in Greenwood, 1897.

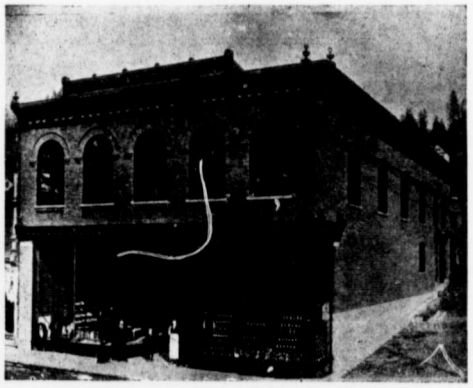
The Provincial government office here is in charge of Mr. Wm. G. McMynn, who is government agent for the Boundary district, gold commissioner and mining recorder for the Kettle River Mining Division, and holds as well several other government appointments. Greenwood is a supreme court registry, and courts of assize are held here periodically. His Honour Judge Leamy, county court judge, resides in the town and holds sittings of the county court whenever necessary. Mr. McMynn is registrar of both supreme and county courts, and, too, is chief Provincial constable for the district.

Greenwood makes a creditable showing in regard to financial, commercial and industrial matters. The Bank of Montreal, Canadian Bank of Commerce and Bank of British North America each have a branch here. The Bealey Investment & Trust Co., Ltd., is a local institution, whilst other loan, investment and insurance companies have agencies in the town. Its mercantile establishments are large and well stocked, some of them occupying premises that even a much larger town might well be proud of. Two of its hotels are among the most comfortable and best conducted in the interior, the Hotel Armstrong and the Imperial, the latter being the more popular commercial house. The *Boundary Creek Times*, the local newspaper, Mr. Duncan Ross, editor, was established in the fall of 1896 by Messrs. H. Mortimer Lamb and W. J. Harber. Both the C. P. R. and Spokane Northern Telegraph Companies have offices here, and the Vernon & Nelson Telephone Co., having disposed of its rival the Columbia Telephone Co., now has a monopoly in the district, which however has the benefit of a generally good service both long distance and local throughout. The chief industry is the B. C. Copper Co's smelter, situate just without the city limits. Other industries are saw-mill, sash and door factory, cigar factory, brewery, steam laundry, electric light works, etc. Labour unions are much in evidence here, those organised being the local unions of the miners, printers, carpenters, tailors, painters, clerks, cooks and waiters, and plumbers and iron workers. These all have delegates who constitute a local trades and labour council.

The professions—medical, legal, civil and mining engineering, surveying, etc.—are together rather numerously represented here. The Church of England, Roman Catholic, Presbyterian, Methodist and Baptist churches each have erected a church building in the town. The public school has Mr. McD. Hunter as principal. There is a public reading room provided by the local W. C. T. U. Secret societies having local



The Rendell Block, Greenwood.



The Law-Caulfield Building, Greenwood.

lodges are the A. F. and A. M., Knights of Pythias and Oddfellows. Cricket, football, baseball and tennis clubs for summer, and a skating rink for winter, provide amusement in variety. The Sisters of St. Joseph of Peace have a hospital at which good medical and surgical attendance and skilled nursing are always available in case of need. Villa residences are numerous in

COPPER STREET, GREENWOOD.

and around the town so that there is here, as the surrounding mines and the smelting industry become more extensively developed, nearly every requisite for making the town a busy commercial, industrial and residential centre.

ANACONDA.

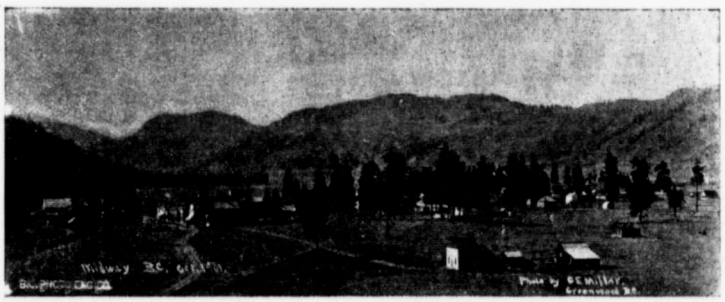
Anaconda adjoins Greenwood on the south, and it is making steady progress, being in favor as a place of residence. It has had more buildings erected within its limits during the past twelve months than any other place on Boundary creek, and new houses are still going up Many of the residences are occupied by smelter employees. The resident townsite agent is Mr. Thos. A. Garland, formerly of Portage la Prairie, Man. Anaconda has its own public school, the Provincial government having recently erected, for the accommodation of the school-going children of the town, a comfortable school house. Anaconda possesses the smallest newspaper in the Province, and probably in the Dominion, edited and printed by the son (aged 11 years) of the general manager of the B. C. Copper Co. Mr. L. A. Smith is postmaster at Anaconda.

DEADWOOD.

Deadwood is a small town situate about two miles west of Greenwood, near to the Morrison, Sunset and Mother Lode mines. It occupies a level site and has two hotels, store, post office, public school, saw-mill, etc. The school building is similar to that erected at Anaconda. Several mining properties closer to the town than those above named have had some development work done on them, but these latter are idle at present.

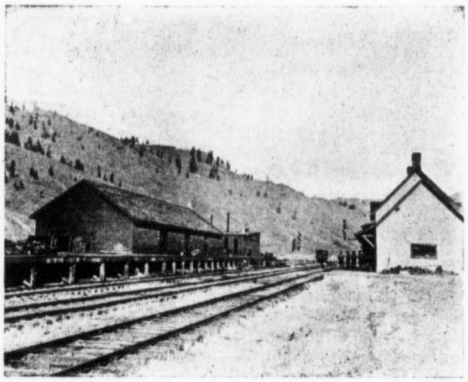
MIDWAY.

IT is difficult under present conditions, which later may prove to have been but transient, to determine whether or not the belief of many that eventually Midway will be one of the more important towns of the Boundary district is well grounded. The assertion may be made, however, without any qualification and in full confidence of its truthfulness, that Midway possesses one of the best natural sites in the district for a town. Beautifully situated at the confluence of Boundary creek and Kettle river it certainly is a most picturesque spot. Occupying a broad, level plain at the meeting place of three valleys, with the intervening mountains rising around it, it compels general admiration. But aside from its scenic advantages it would appear that it was designed as well for utilitarian purposes. Lying as it does in the only natural pass through the mountains east and west for a long distance, it appears destined to become an important point on the chief highway through the district. Here meet three main waggon roads which come in, respectively, from the Okanagan country, Camp McKinney, the upper main Kettle river and its West Fork, and the Meyers creek and American Okanagan districts across the International boundary line, all these places being situate west of Midway; from Republic and other mining camps on the Colville reservation, also across the line to the south; and from the extensive area of mineral-bearing country comprising the Boundary Creek district, lying immediately to the north. Here, too, for some time has been, and probably will be, the western terminus of the C. P. R. Co's Columbia & Western railway, which provides rail connection with the Kootenay and thence northwards to the C. P. R. main line, eastwards via the same company's Crow's Nest Pass line, and southwards by two or three different routes to the United States centres of population. And when competing railways shall come in it will be here that a road from Spokane and another from the Columbia river up the American Okanagan, via the Palmer mountain and Meyers creek mining camps and the surrounding wide extent of agricultural and pastoral country, will junction, whilst the surveys of the V. V. & E. and the Vernon & Midway railways



MIDWAY, B. C.

make this their starting point west and northwest. Then, too, it is well known that smelter men fully recognise that the physical conformation of the benches overlooking the town, the ample water supply here obtainable, the abundant room for extensive works, and the central location in regard to the numerous mining camps within a radius of 20 to 30 miles, combine to make this a superior site for reduction works on the



Railway Station and Sheds, Midway, B. C.

large scale that sooner or later must be adopted to admit of the best results being obtained from the mines of the district. It is by no means improbable that two or three paying mines will eventually be opened up on the hills immediately west of the town, for here are some very promising surface showings of copper-gold ore upon which, though, very little money has as yet been spent in development. There are, as well, indications

Kettle River, Midway, B. C.

of the occurrence of coal measures, regarding which Mr. S. Fowler, M. E., wrote several years ago, "For some distance along Kettle river, from four miles west of Midway, the cretaceous rocks show occasional croppings of coal. Up to the present time the best of these is near the mouth of Rock creek, 12 miles from Midway, where the seam is about four feet thick. Although prospected to a very limited extent this coal appears to be quite up to the average cretaceous coal in quality, and it has undoubtedly been brought to its present stage as a coal by the heating and distilling influence of the abundant trachyte (?) flow of this vicinity." In this connection it may be remarked that no systematic or sufficient work has yet been done to prove whether these coal measures are extensive or productive enough for the requirements of mining and smelting on a large scale.

The experience at Grand Forks has shown that it is quite practicable to grow farm and garden produce within a short distance of a smelter, so that there does not appear to be any good reason to fear that the establishment here of the smelting industry will, to any appreciable extent, injure the steadily expanding farming and gardening interests around Midway. The farm, orchard and garden, of Mr. J. R. Jackson, west of the town; the young but thriving orchard planted in 1898 by Mr. W. H. Norris, and now coming into prolific bearing, and the productive vegetable garden and berry patch on the same ranch; the large market gardens of Messrs. Davis Brothers and others, also in the vicinity of the town (there is a score of others in the neighbourhood that might be named, too), and the 5-acre lots

Tunnel, Bruce Mine, near Midway, B. C.

subdivided by the Midway Company and watered by its irrigation system, together demonstrate that there is room for a considerable population on small holdings around the town, with an increasing demand for products of farm, garden, dairy and poultry yard in the towns and mining camps within a dozen miles.

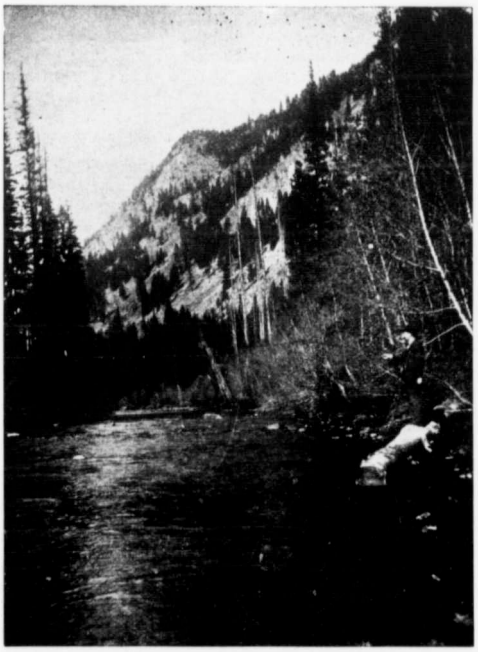
Midway enjoys the advantage of telegraph and telephone as well as railway connection with outside points. It has its own newspaper, *The Advance*, which was the first newspaper published in the Boundary, having been established here in 1894 by Messrs. W. H. Norris and A. K. Stuart. Its public school is the oldest in the Boundary Creek section of the district, as, too, is its Customs office. The first saw mill brought into the Boundary was set up in 1893, on the bank of Kettle river at Midway, and its enterprising owner is still closely identified with the town in the same line of business. It is believed by those interested in the town that this mill, with its accompanying sash and door factory, is but the pioneer of other manufacturing industries to be established here after trade and population shall have adapted themselves to more permanent conditions than now prevail in the district. Then, too, it is thought Midway will be a distributing centre for a wide area of country.

But it is as a residence town that Midway offers most attractions. No other town on Boundary creek can fairly claim to possess equal advantages from a health point of view. With a dry, bracing atmosphere, an abundant supply of pure water, favourable sanitary conditions, an absence of contagious diseases, plenty of room for outdoor sports, level roads for driving, etc., good shooting and fishing in summer, and excellent skating and sleighing in winter—these combine to make it par excellence, the best residence town in this part of the district.

Mr. C. M. Crouse is townsite agent and editor of the Midway *Advance*; Mr. E. A. Hain, postmaster; Mr. R. Gardom, deputy collector of customs, and Mr. A. A. McPhail, principal of the public school. It may be of interest to add that the site of the town, which was for years known as Eholts, was purchased in 1893 from the pre-emptor, Louis Eholt, by Capt. R. C. Adams, of Montreal, Quebec, for himself and several Montreal associates. The townsite was platted in 1893, and later the Midway company was organised to acquire this and other property of the original syndicate.

WEST FORK OF KETTLE RIVER.

IN June of 1901 the MINING RECORD published an interesting article on the West Fork of Kettle river and its tributaries, accompanied by a sketch map, by Mr. James Atwood, a pioneer in the Boundary and a man of considerable prospecting experience and general knowledge of the country. In this particulars were given of several "mineral zones" occurring along the West Fork or its tributary creeks. The first was the Boomerang mining camp, the southern boundary of which is Boomerang creek, flowing into the West Fork about six miles above the confluence of that stream with the main Kettle river. The Boomerang camp was described as "a mineral granite belt about three miles wide by nine miles long, commencing about two miles east of the West Fork and running in a westerly direction for nine miles. The principal mineral zone appears to be in the southeast corner of the belt, and about equally divided by the river. The ore is gold, silver, copper and iron, carrying some tellurium, and is partially free milling." This mineral belt is crossed by French and Kelly creeks, which run through deep, rugged canyons, the country rock of which is deeply impregnated with iron. Other creeks come in from one side or the other as the West Fork is ascended, but as yet no mineral discoveries of importance have been made up these. Higher up is Cranberry creek, which is the southern boundary of the Beaver creek mineral belt, lying on both sides of the West Fork and, so far as explored, extending for about 30 miles up the river, and having an area more or less mineralized throughout of about 150 square miles. There are two mineral zones in the Beaver creek belt. The Beaver mountain zone takes in that part of it lying east of the West Fork, and from the mouth of Cranberry creek to the head waters of Beaver creek, about 15 miles in length by about 5 in width, the area being somewhere about 75 square miles. The best known claims around Beaverdell, which is the town of this part of the district, are the Bell, Sally, Bounty, Washington and Idaho, on all of which some development work has been done that has opened up veins of ore generally running well in gold and silver. Half a dozen miles higher up the West Fork is the Carmi mine and the embryo town of Carmi, named after his native town, in Illinois, U.S.A., by Jas. Dale, who, in August, 1896, located the Carmi and the neighbouring Butcher Boy. The Carmi was sold in 1900 to the representative of some old country capitalists, and it in the winter of 1900-1 sent down to the smelter 885 tons of ore, which had to be hauled on sleighs more than 50 miles to the railway station at Midway. This ore is generally understood to have returned a gross value of from $40 to $50 per ton. In the same vicinity is the Rambler, the ore of which also runs high. The "Carmi zone" including the country about the Arlington, situate higher up the river, takes in an area of about 30 square miles. The Arlington is a re-location of the old Headlight, which was located on May 6th, 1895, by Peter Heldstab, and was the first mineral claim up here staked and recorded. Before the summit of the divide between the Kettle river and Okanagan river valleys is reached other creeks flow into the West Fork, among them Wilkinson, Hall and China creeks, and the East Fork, this last a considerable stream, about 10 miles in length. The West Fork from its head waters to its confluence with the main Kettle river, is about 45 miles in length, and drains a country that after it shall have been given transportation facilities (two railway preliminary surveys have already been made through here) will likely come into prominence as a mining section.



WEST FORK OF KETTLE RIVER.

Mr. R. W. Brock, of the geological survey of Canada, briefly describes the geological features of this district thus: One mile above Rock creek, dolomites, serpentine, argillites and greenstones, probably belonging to the Cache creek series, occur. After continuing about a mile these give place to a conglomerate, probably tertiary. The conglomerate is soon succeeded by more of the Cache creek rocks, which continue to James creek. From James creek to Westbridge, and from Westbridge up the West Fork of Kettle river to Boomerang creek the dark purplish and reddish basalts (bird's-eye porphyries of the prospector) obtain. From

Boomerang creek to Ranch creek the rock is grey granite, and thence to Beaverdell it is mostly the reddish younger granite. At Beaverdell is an important area of greenstone and some altered sedimentary rocks in granite.

North from Rock creek, along the main river and several of its tributaries, there are numerous other mineral claims, but as a rule they have had but little development work done on them. The Oro Fino and Riverside groups—the latter lately purchased and now being opened up by men from Duluth, Minnesota—on the east side of the river, and the Crown Point and Barrett's groups, up James creek, on the west side, have had some attention. Above the West Fork, Cedar, Canyon and Deer creeks are the best known of the tributaries to the main river. Numerous claims have been located in the vicinity of these creeks. On the Montana, Colorado and Fourth of July claims, on Canyon creek, good showings of copper-gold ore are said to occur, with fair assay values. Some $2,000 have been spent here in development. On the Silver Dollar, where a shaft has been sunk, and Barnato claims, situate on Horseshoe mountain, there are stated to be large bodies of quartz and arsenical iron carrying gold. Among many others are the O.K. and Fletcher's groups, Mogul and Hackla.

DEVELOPMENTS IN CAMP FAIRVIEW.

(From Our Own Correspondent.)

YOUR correspondent has just returned from an inspection of the Stemwinder mine, and was agreeably surprised to see matters in such a fine condition. A great deal of construction work has been done within the past few months and is steadily progressing.

The shaft has been sunk an additional 25 feet in order to put in a large sump and ore pocket to receive the large quantity of ore which the 3rd level will supply. Ore chutes are now in for over 300 feet on the different levels and all preparatory work well advanced in order to enable the company to extract large quantities of ore when necessary.

Twenty more stamps have been purchased and will be placed alongside of the 26 stamps which are now in operation. This work will take about three months, after which the Stemwinder will crush over 150 tons of ore a day.

For the past month work has been going on in the erection of a cyanide plant which is expected will be completed in a few weeks.

This plant is for the treatment of the concentrates, of which there is at present on hand about 200 tons.

A new bunk house has recently been erected for the accommodation of the miners.

While the changes were being made in the shaft and compressor buildings it was necessary to close down the mill, but it has been steadily working since. Five Wilfley tables have been added to the concentrating plant recently and are doing very fine work.

Mr. Charles Ostenburg, the superintendent, certainly deserves great credit for the manner in which the operations have been conducted. He says that he is positive that he can treat the ore for a total cost of less than $1.75 per ton, and as the values run between $4 and $6 in the thousands of tons now being broken down, the prospects are very bright indeed for the New Fairview Corporation.

As soon as the frost is out of the ground a pipe line is to be laid from Reed creek to the mill to supply the water for the extra stamps being installed. This will be completed by the time the mill is ready for it.

Many buildings are being erected near the mine which is assuming quite a townlike appearance.

About quarter of a mile farther up the hill the Dominion Consolidated Co. are developing their mines by a series of tunnels. This company have recently got a large amount of working capital, and we understand they intend in addition to the mining work to put in a large power plant at Okanagan Falls in order to supply power to all the mines in the district.

We hear that a newspaper is to be started in the immediate future.

RECENT MINING PROGRESS IN YMIR DISTRICT.

(From Our Own Correspondent.)

THE most important event in the mining interests of this section for many months was the striking of the Ymir vein at the 1,000 foot level. The last official information with regard to the strike is contained in a cable sent by Mr. Fowler, the engineer, to the head office of the company in London. The cable read as follows: "Deep level now in ten feet of quartz; very low grade; much better than expected." The somewhat ambiguous wording of this cable is explained by the fact that the long adit strikes the vein near the western extremity of the ore chute. The shaft which is now down about 750 feet, lies about 150 feet east of the portion of the vein which has been struck by the adit. In the shaft at its deepest part a very fine showing of high grade ore has been made, and it is a fair assumption to say that by drifting 150 feet east from the end of the adit, a similar showing will be obtained perpendicularly below the bottom of the shaft. The cyanide plant is now working at its full capacity, but so far the returns for the first month's work have not been made known. Admission to the mine and cyanide works is now refused to all visitors.

The Union Jack mine, operated by the Active Gold Mining Co., is showing up wonderfully well under development. Upon the Queer claim a chute of ore 80 feet long and 4 feet wide has been developed, which will average over $40 per ton. The ore is a fine grained galena, carrying high gold values. The Active Co., which is formed of a number of Cincinnati capitalists, is in good shape financially, and will shortly thoroughly equip the property with machinery adapted to the carrying on of development in the most economical manner possible, there being now sufficient ore in sight to amply guarantee this expenditure.

During the past month shipments of ore have been made from the New Victor mine on Wild Horse creek and the Queen mine near Salmo. From the New Victor a quantity of rich gold ore has been sent out, the returns being reported to run over $100 per ton. The Queen has sent out a number of car loads of ore running about $50 a ton, but will shortly commence putting its output through the Yellowstone mill, with which it is now being connected by means of a steel track tramway.

COAL EXPORTATIONS.

EXPORTATIONS of coal from Vancouver Island collieries during March were distributed as follows:—

	Tons.
New Vancouver Coal Co.	31,473
Comox	18,740
Ladysmith	12,041
Total	62,254

THE METAL MARKET.

THE price of silver, which has been steadily declining for several months past, has recently reached an abnormally low point, being quoted in London at 23⅜d. to 24¾d., and in New York at 50½ to 53⅝. The outlook for this metal is not encouraging, and the only possible prospect of an improvement in the market depends on industrial developments in China, occasioning large local expenditures for labour, payable in silver coin. Lead has also been dull, but with little change in prices, the ruling quotations being 3 97½ @ 4.05, St. Louis, and 4.05 to 4.10, New York. The London market, however, has been slightly firmer at £11 15s. to £11 17s. 6d. The demand for copper has been greater during the month, and the large purchases made early in the year are being consumed more rapidiy than was anticipated. Enquiry from Europe has also shown improvement. The latest quotations are: Lake copper, 12 @ 12⅛; electrolytic copper in cakes, wire bars and ingots, 11⅝ @ 11¾; in cathodes, 11⅜ @ 11½, and casting copper, 11½ @ 11⅝. Spelter is easier at 4.20 St. Louis, 4.40 New York.

MINING RETURNS AND STATISTICS.

ROSSLAND.

ORE production from the Rossland district for the four months ending April 30th, approximate 121,000 tons. Shipments to April 26th, were distributed as follows:

	Year.
Le Loi	88,965
Le Roi No. 2	20,450
Cascade	300
Bonanza	30
Velvet	250
Centre Star	3,010
Rossland G. W.	1,950
War Eagle	90
Spitzee	20
	115,125

LARDEAU.

The total tonnage of ore shipped from this district during the first three months of this year was 1,667 tons valued at $164,000.