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THE BRITISH COLUMBIAN

MINING INDUSTRY IN 1902.

IN 1887 for the first time, official record was made of the production in British Columbia, of the metals silver and lead—this, however, to a very inconsiderable aggregate quantity and value. No gold was obtained from quartz mining undertakings until 1893, and copper production was not commenced until a twelvemonth later. 1894 may, therefore, be taken as the year from which the establishment of quartz mining in the Province dates. The industry as such is consequently about to enter its ninth year of existence. These facts should not be forgotten when the present position of mining in the Province is taken under consideration. Compared with any of the great mining states of the Union, quartz mining in British Columbia is a young industry, and yet a comparative history of the first eight years of quartz mining development in California, in Colorado or in Montana does not afford any more than, and in cases not as satisfactory, evidence of substantial industrial

progress and growth as is afforded by the history of our British Columbian industry. That such a comparison can be made at all is in itself creditable. In the United States mining is and has been carried on under the most favourable possible conditions. A protective tariff, an excellent home market, adequate transportation facilities with low haulage costs, an unlimited supply of skilled labour, ample capital to develop the mines. These are but a few of the advantages which have contributed of recent years to the phenomenal developments of metalliferous mining in the United States. Canada, on the other hand, with her relatively small population, has been obliged to export, at a great cost, her mine products in crude state and meet competition in the world's markets. She has imported the bulk of the machinery required in mining and on this the miner has been compelled to pay a heavy duty. Skilled mine labour has been scarce and expensive. In the West where our most important mineral interests lie, means of transport have been lacking until quite recently, or where railways have been built the systems have been generally owned as monopolies, with the consequent imposition of excessive freight rates. In addition to these economic drawbacks, the mine owner and manager in British Columbia has been called upon to face engineering and metalliferous problems of an exceptionally difficult nature. In some sections of the country the geological disturbances render mining an extremely hazardous and costly operation. In other districts the ore bodies though easily followed and of great size, carry such small average values that they can only be mined profitably by the introduction of special methods and by the exercise of the utmost skill and economy in working and management. Again a further disadvantage has been the lack and the difficulty of obtaining capital in sufficient amounts to carry through undertakings, on which large initial outlays were required, while legitimate mining in the country has also suffered much at the hands of unscrupulous wild-cat promoters and market manipulators, the collapse of whose flotations and schemes having naturally enough served to discredit the British Columbian mining industry in the minds of a large section of the investing public. That in spite of these manifold discouragements and drawbacks the industry has in eight years been placed on a footing

so important and substantial as that it now occupies, is a matter for which we have every reason to feel proud, and it is far from our intention that these prefatory remarks should be construed as intended to excuse an unsatisfactory state of affairs, but rather that they should serve to emphasize the fact of the industry's material development and growth.

In reviewing the operations of the past year, it is gratifying to note an increase over the 1901 production of probably twenty per cent. in the output of the copper-gold producing mines. This large increase is attributable to greater activity in the Boundary Creek District, and to the continuous operation during the year of the more important British-owned mines in the Rossland District. In the Boundary the capacity

none of the Boundary mining companies have yet commenced to pay dividends, we can authoritatively state that profits are being made, and these very properly, re-invested in necessary improvements and mine development. Among other important work accomplished here during the year, may be mentioned the completion of the installation at Cascade Falls, for the transmission of electric power to the mines, the effect of which will be to further cheapen mine-operating costs.

The outlook at Rossland last spring was far from promising. Intentionally or otherwise, gross misrepresentations, it was discovered, had been made in respect to the position of the Le Roi mine. Production was suspended at the War Eagle and Centre Star,



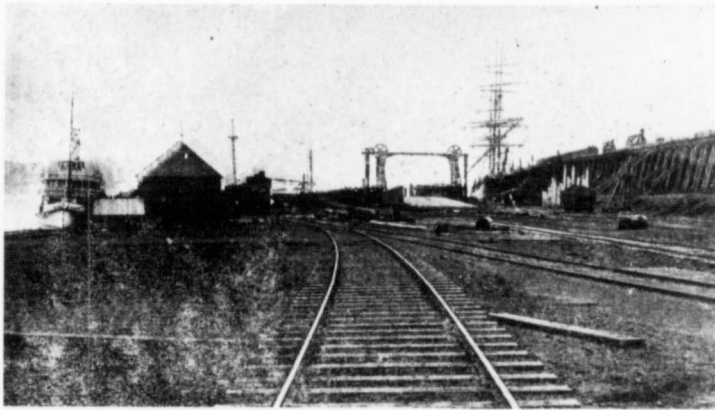
The Kettle River at Midway.

of both the Granby and Greenwood works has been doubled, and such alterations and additions made to the smelter at Boundary Falls as to admit of the treatment there of a large tonnage. The mines themselves have been extensively developed and costs, both of mining and smelting, have been further reduced. As we have previously noted, a significant point in connection with mining in this district this year is that, notwithstanding the decline in the price of copper, representing a difference of nearly twenty-five per cent. in the value of the copper contents of the ore, it was not found necessary or expedient to suspend operations at any of the mines on that account, but on the contrary, production has increased. Although

and all three mines were known to be heavily encumbered with debt. It is pleasing, therefore, to note that in the interim the situation has vastly changed for the better. Since May last the Le Roi is reported to have earned net profits approximating seventy-five thousand dollars a month, new bodies of high-grade ore have been developed, while in consequence of the satisfactory arrangements effected with the railway company over whose system the ore is carried to Northport, and with the Crow's Nest Coal Company, both the costs of haulage and fuel have been so appreciably lessened as to make a considerable difference in the profit-earning capabilities of the property. The mine now, too, being under most capable local man-

agement, is certainly a more valuable property, and its shares are better worth having than at any time since it passed under British control. The position of the Le Roi No. 2 is likewise moderately encouraging, and there is little likelihood that the mine, at which shipments were recently suspended, will be long allowed to remain unproductive. The resumption of active operations at the Centre Star and War Eagle mines during the late summer was a matter of very considerable congratulation, and at their present rate of output it can be but a question of a short time ere both companies are in a position to fully discharge their liabilities, while the former mine should very shortly be placed on a dividend-earning footing. At the Velvet, important new discoveries are reported to have

including the Mainland coast, the islands of the Gulf of Georgia and Vancouver Island. Activity has been confined chiefly during the year to the east coast of Vancouver Island, where two large mines in the Mount Sicker District have been extensively developed with, we understand, the best possible results. The Tyee mine, in particular, has proved to be a very valuable property, in fact the mineral belt in this area promises exceptionally well. The difficulties in which the Lenora mine has become involved are, however, a regrettable incident, although it is believed that these will shortly be settled. In addition to the two mines mentioned, a new and promising property known as the Copper Canyon is being opened up, and work has also been in progress on several other claims in the



Wharves at Union, B. C.

been made and it is hoped that with the change of management this property will also be successfully worked. During the year, the problem of profitably treating the lower-grade products of the mines, has engaged the attention of the mining engineers of Rossland, and experiments to that end have been systematically conducted, with, it has been officially affirmed, very promising results. The technical representative of the Elmore process of concentrating by oil is also now, as he tells us, preparing to make extensive tests locally, for the purpose of ascertaining whether the ores of the district are amenable to treatment by this process. When the problem is finally solved—and sooner or later it assuredly will be—both the mineral output from this district and the earning capacity of the mines will necessarily be increased at least three to four-fold.

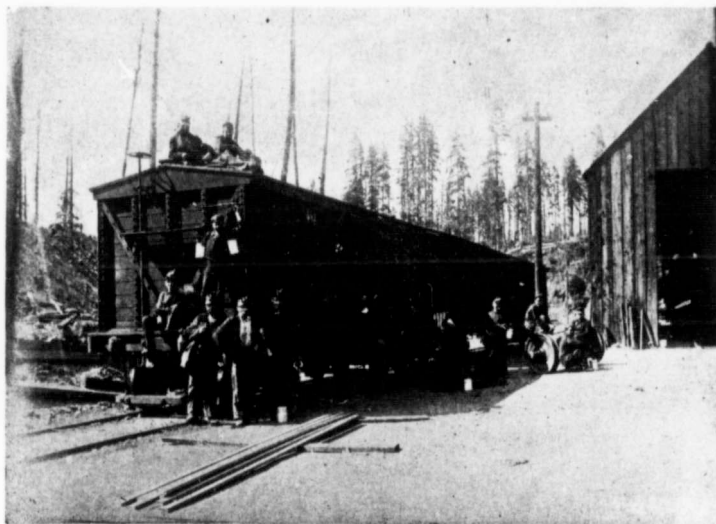
Next in importance as a copper-gold producing section of the Province is the Coast and Island Districts,

locality. The year has also witnessed the completion of the large smelting works,—and consequently the inauguration of this industry on Vancouver Island—at Osborne Bay and at Ladysmith. At Sooke a promising find of copper ore is reported to have been made. On the west coast of the Island little has been accomplished, beyond prospecting work at San Juan. The Monitor mine was closed down early in the spring and operations at the Hayes mine were suspended for a greater part of the year. At Quatsino Sound, to the extreme north, the Vreka Copper Company has, however, exposed a very large showing of ore of excellent grade. Progress on Texada Island has not been entirely satisfactory, the Van Anda properties after being acquired under bond by an American syndicate were badly “guttled,” and then abandoned; but the mines have since passed into more responsible hands. The Marble Bay mine has produced a fair tonnage of ore, and development work has been in pro-

gress at one or two other mines besides. In addition to the development of copper-gold properties the iron mines on Texada have been extensively worked, while the deposits on Barclay Sound have also been further developed. Production from the Coast this year is probably less than during 1901, and is therefore not indicative of the real progress that has taken place, shipments from the Mount Sicker mines having been held back pending the completion of the local smelting works. The Britannia mines at Howe Sound have not been operated during the year.

A small tonnage of high-grade copper ore has been shipped from the Copper King and Iron Mask mines at Kamloops, but operations in this district have been mainly of an exploratory character. It is meanwhile

in a very large number of the mines of the Slocan District, the ore bodies carry considerable percentages of this metal, which heretofore was not only unmarketable but an actual disadvantage in complicating the operation of silver-lead recovery, some return of industrial prosperity is looked for. There are also grounds for belief that the Federal Government may be induced to take such action, either by the institution of tariff reform or by offering a bounty on production, as may stimulate and encourage activity in the lead mining districts of the Province. The Slocan District has been this year the most important productive area, and some fifty mines have shipped ore in larger or smaller quantities. This list is headed by the Rambler-Cariboo at McGuigan, which has paid regu-



Railway to the Comox Collieries.

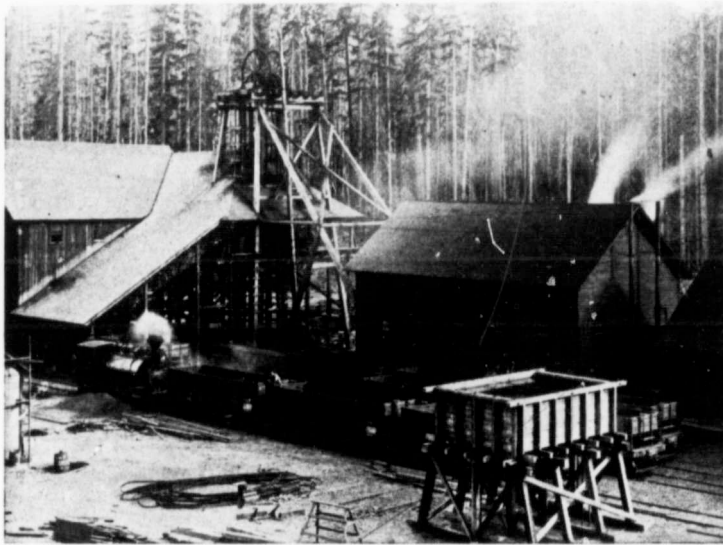
expected that local smelting works will ere long be erected. Iron ore from the Glen Iron Mines has been sent to the Kootenay smelters for fluxing purposes, the year's output having been over three thousand tons.

The season of 1902 has not been favourable to silver-lead mining effort, and a falling off in production is reported. The causes of this depression have been already, on more than one occasion, explained in these columns, and a reiteration is therefore not necessary. It may, however, be stated that the outlook notwithstanding the continued decline in the price of silver, has of late become decidedly brighter in consequence of a demand which has arisen in the United States for zinc ores and concentrates, and as

lar quarterly dividends of two and a half cents per share to its shareholders. The Sunset has also distributed profits. In the 'dry ore' belt of the Slocan City Division, the production is rather below last year's returns. The Arlington mine, however, has produced heavily, and experiments are being conducted at the property to determine the best means of profitably concentrating the lower grade products. Little has been accomplished in the Ainsworth Division, but in consequence of the completion of the branch line of railway from the Arrow Lakes into the Trout Lake District, and also on account of the high-grade character of the ore in this section, production has been on the increase. The showing made by East Kootenay is far from satisfactory. In the spring op-

erations were entirely suspended at the St. Eugene mine—the largest silver-lead deposit in Canada—an l production of any consequence has been confined to operations at one property only—the North Star. Shipments from this mine during the last six months have covered expenses of development, but the known ore bodies have been nearly exhausted. As the company has, however, an efficient plant and sufficient funds, thorough exploratory work has been determined upon. The company paid in dividends out of reserve capital, this year, \$58,500. At Marysville smelter construction work was commenced in the spring, but the enterprise was so disgracefully managed that beyond the expenditure of a large sum of

dollars. At Fairview the Stewwinder mill has been enlarged and a cyanide plant installed, a fair amount of gold having been recovered from crushing operations since last spring. Development work has also been prosecuted at the Dominion Consolidated Company's properties. New mills have been erected in the Nelson Division, at the Second Relief and other mines. The fact, meanwhile, that adequate values have not been found in the lower levels of the Ymir property, necessitating the raising of additional capital by a reconstruction of the company, and the suspension of dividends has proved a great disappointment, another blow to the district being the abandonment of active work by the Hall Mining and Smelting



Headworks at Comox Collieries.

money little was accomplished. In the Windermere and Golden Districts a good deal of prospecting and development work has been in progress, and small shipments have been made from the Paradise and one or two other mines.

The discoveries and developments in the Fish Creek District have added more than one promising mine to the number of free-milling quartz properties in operation in the country, and from present indications there can be no doubt that this camp has before it an important productive future. The Cariboo mine, in Camp McKinney, has been steadily operative, and the earnings have been sufficient to justify the distribution during the year of two dividends equal to four cents per share on a capital of a million and a quarter

Company at the Silver King. Arrangements were reported to have been effected for the consolidation of the Athabasca and Venus mines, and for the resumption of operations at these properties, but actual mining work has not yet re-commenced.

Returns from the placer mining fields will, we anticipate, remain at about the same figure, or a little below, those of last year. The decrease would have been considerable but for increased activity in the Atlin District, the value of the yield therefrom being largely in excess of the 1901 output. Production is stated, semi-officially, to represent in the neighbourhood of six hundred thousand dollars, but bank officials and others in a position to acquaint themselves with the facts, estimate that not less than a million

dollars worth of gold was produced this year, much of this being, however, not reported to the Government officials and smuggled out in order to avoid the royalty tax. In the other districts of the Cassiar country practically no mining was carried on, with the exception of the hydraulic operations of the Thibert Creek Mining Company. Here probably not more than five or six thousand dollars worth of gold was recovered, a land slide occurring in August, thereby limiting the working season to a few weeks only. The Omineca gold yield was also insignificant. The largest operators, the Arctic Slope Company, after starting the season well enough, ran out of supplies and only worked a portion of the season, barely paying expenses. In Cariboo, production from the

River at Lytton, and on the Quesnel River, in Cariboo, are said to have proved moderately successful, but the Thompson River enterprise has so far proved disappointing.

The coal mining situation has shown little change. Output has been fairly well maintained at the level of the 1901 production from the Vancouver Island collieries, and large shipments continue to be made to the California market, notwithstanding the competition occasioned by the utilization there of mineral oil as fuel for industrial purposes. An important discovery of a bed of anthracite coal is reported to have been lately made near Comox. The Crow's Nest Coal Company have added to the number of their coke ovens, increased the output and performed a great



View in Quatsino Narrows, Looking South.

largest mines was seriously curtailed by a shortage of water supply, attributable to another unusually dry season, the output from the Consolidated Cariboo Hydraulic being considerably less than for some years past. On smaller properties some very rich ground was discovered, and important exploitation work was carried on at Slough Creek, where efforts are being made to recover the gold from the ancient river channel systems at depth. From Wild Horse Creek, in East Kootenay a yield of approximately twenty thousand dollars in value is reported, and placer mining operations on a small scale have also been conducted in the Similkameen, Big Bend, Nelson and other districts. Gold dredging undertakings on the Fraser

deal of development work during the year. Operations have been, however, somewhat hindered, by labour disputes, while the regrettable disaster of last May, besides causing a large loss of life, occasioned much damage to the property. The branch line of the Great Northern Railway is now nearing completion, and this will provide further facilities for the marketing of the product, although at the present time the company experiences some difficulty in keeping pace with the local demand. During the summer exploration parties and individual prospectors have been engaged in exploring the East Kootenay field, with the result that many new discoveries of coal seams are reported. Preliminary development work is also be-

ing prosecuted on the Blairmore coal fields in the same area. Much attention has meanwhile been directed to occurrences of coal in the Similkameen and Nicola Districts, and in some localities coal seams of very good quality have been opened up.

In brief, the condition of the mining industry at the close of 1902 is better than it was at the close of 1901, and we can wish our readers a happy and prosperous New Year with every hope and assurance of its fulfillment. The low-grade mines of the Boundary have shown, thanks to the skilled and able engineers and metallurgists of the district, what they are capable of



Cyanide Building at the Ymir Mine.

doing even with the price of copper lower than it is likely to be again for some time to come. The Rossland mines are now on a business basis. The demand for zinc, and the likelihood of the accordance of Government aid of some form to the lead miner, is removing the depression which has overshadowed the industry in the Slocan and East Kootenay. The rich mines of Camp Hedley in the Similkameen are about to become productive, and railway advantages can not much longer be denied to the Nicola and Similkameen. Production from the Lardeau and Trout Lake districts is increasing and a number of new properties are undergoing development. An important smelting industry has been established on Vancouver Island and practically, for the first time, mining has been conducted on systematic and scientific lines. The outlook in Atlin and Cariboo has improved and great developments in coal mining are promised. Looking at the other side of the picture it is regrettable to note that the aggregate amount paid this year in dividends has been disappointingly small, and that prospecting has been less in evidence. The low price of metals partly explains the one; further, in many cases profits have been re-invested in improvements. As regards the other, the first excitement when the speculation fever was at its height, and any

piece of ground with four stakes stuck on it, and a fir tree, was saleable, has passed. Not only that, but a re-action has set in, and it is difficult at the present to dispose of even a promising claim or prospect. Prospecting is in itself a speculation, and speculation is not now the fashion. British Columbia, as we have so repeatedly mentioned, has suffered much in the past at the hands of the "wild-catter." She has now reached the convalescent stage, but until our mines commence and maintain the regular distribution of dividends, complete confidence will not be restored, and no considerable investment of capital can be expected.

Official returns for the year are not yet available, but several estimates of production, some widely over and some, we should judge, below the actual figures, have been published in the local press. There can be no doubt, however, that, in point of tonnage output an increase has been made this year of between 15 and 20 per cent. while in values a decrease will be shown to have taken place of perhaps 5 to 10 per cent., basing calculations on New York metal market quotations. In the following tables an attempt to roughly approximate the year's mineral production is made:

	Value.
Gold (placer)	\$1,000,000
Gold (lode)	5,000,000
Silver	2,000,000
Lead	500,000
Copper	4,000,000
Coal and coke	6,000,000
Other materials	500,000
Total	\$19,000,000



Quarrying at the Snowshoe Mine, Boundary District. The Explosion of a Blast.

TONNAGE, METALLIFEROUS MINES.

Grand Forks, Kettle River and	
Oscyoos Division	520,000
Rossland	340,000
Nelson	75,000
Slocan and Ainsworth	29,000
Coast	25,000
East Kootenay	10,000
Other districts	25,000
Total tons	1,014,000

THE CARIBOO SEASON OF 1902

(By Thos. Drummond, B.A.Sc. (McGill) M.C.S.C.E., Etc.)

THE following is a summary of mining operations in Cariboo District during the season of 1902. The season as a whole has not been a favourable one owing to the great scarcity of water for mining purposes.

In a placer mining country like Cariboo the gold is obtained almost altogether from the immense alluvial deposits of the district as found in the ancient channel systems, the more modern benches and terraces and in the beds of the present rivers, creeks and gulches. To say that these deposits are immense is no exaggeration. The writer knows of many instances in which the gravel banks are over 400 feet in height and several cases in which they are from 600 to 800 feet.

The gold is separated from the gravel by washing with water through flumes, sluices, etc., and a plentiful supply of water is an absolute necessity. As an instance of this it may be stated that the daily water supply of a town of, say, 40,000 inhabitants would be from 100 to 125 miner's inches of water. Such a supply of water would be sufficient to irrigate a good sized ranch or for supplying a drift mine or small open gravel mine, while a large hydraulic mine would take from ten to fifty times as much. When this water supply fails, the output is proportionately decreased, and such was the case in Cariboo last season.

The main source of the water supply is from the annual snowfall, which was unusually light last winter, and this with the long continued warm, dry weather of last summer, causing an unusual amount of evaporation, and the lack of rain to replenish the supply resulted in a record year for drought. This more especially affected the country along the Quesnel River, where it practically stopped active mining operations. Barkerville and vicinity being at a higher elevation, did not suffer so severely.

In Barkerville District the majority of the mines

operate with a supply of water lasting about three months, and with this partial supply of water they have an annual output of from \$4,000 to \$20,000 or more for each in the case of hydraulic and much higher results in the case of drift mines working upon the rich old channel deposits of the country.

The Cariboo Gold Fields, Ltd., operating upon Williams Creek just below the town of Barkerville had a fairly successful year. The work was more or less of an experiment, practically prospecting work to test their ground, which consists of a top deposit of tailings from Williams Creek overlaid by the older and richer deposits of the creek which have

been partially worked by the drift mines of the earlier days. This mine was opened at first by a water elevating plant, which did not work satisfactorily, mainly because of the wear in machinery and the great hoister. They then installed a new plant of the bucket elevator type, which was successfully operated last season. The power is furnished by a 24-inch Pelton wheel with a head of about 460 feet. The chain of buckets is 246 feet in length and carries 82 buckets of two and a half yards capacity each, and it has a capacity of 2,000 cubic yds. in 24 hours. The gravel in the pit, by means of monitors, is washed to a central hopper over a grizzly which screens the large stones, which are hoisted separately

to the surface. The finer material is taken to the surface by the elevator, passes over grizzlies, screens, etc., and is treated on tables, etc., to recover the gold. The hoist is about 100 feet.

The Mount claim, also on Williams Creek, have this season installed an hydraulic plant which worked very satisfactorily and the claim is likely to be a good dividend payer in the future.

On Stout's Gulch, which is a tributary of Williams Creek, the Butts and Wintrip claims, both hydraulics, worked very successfully during the season and paid good dividends.

The Cariboo Consolidated, Limited, operating on Lowhee Creek, have done well this season. To insure a full supply of water for the whole season this



Elevator Pit, Omineca.

company has completed a large ditch from Jack of Clubs Creek and Lake. This company's claim on Lightning Creek (Ah Quay) is also reported to be a dividend payer.

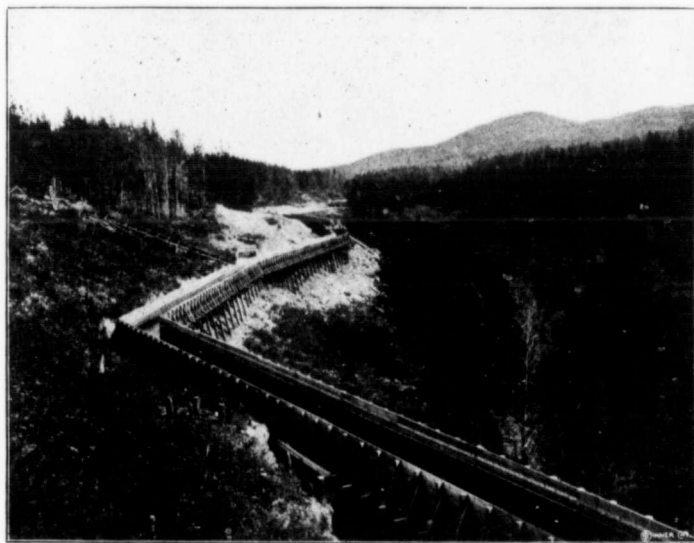
The Dragon Creek Company's claim on Dragon Creek has also paid the owners a large dividend, as usual. It is said to be one of the best claims in the Barkerville District. Heretofore they have been working through old diggings. Next year they expect to get through these old workings and still better results are anticipated.

The Cariboo Exploration Company, of Burns Creek, paid well this season and its future is said to be assured. It is an hydraulic mine. In 1901 the plant was first operated, mainly, however, in opening the mine. This year, being in readiness, more was accomplished, and the results are supposed to have been very satisfactory.

in the future as they are now getting into new gravel ahead of the old workings. This mine is well equipped, has a large bank of gravel and has persevered under great difficulties, and deserves success.

On Cumingham Creek several companies are at work fitting up in readiness for active operations next spring. The Thompson, McGregor, Ross Company have, I am informed, prospected their property by shafts, tunnels, etc. They have removed obstructions from the creek below the canyon, straightened the creek, built flumes, ditches, etc. These properties are generally supposed to be valuable ones.

The Slocan Cariboo Hydraulic Company on Canadian Creek have installed an hydraulic plant and done a lot of work in opening up and proving their mine. The bank increases both in height and value as the work progresses and everything indicates that in the near future the property will be a valuable one.



Consolidated Cariboo Hydraulic Mining Co.'s Flume.

On Mosquito Creek the Flynn Brothers operated two hydraulic mines during the summer, which yielded handsome dividends as heretofore. The water supply is limited, but the gravel is very rich.

The Thistle Company's claims at Eight-Mile Creek have proved to be rich, and they pay good dividends yearly. This company has purchased the Coffee Creek mining claims with their water rights, and this insures an abundant supply of water for the future. The results from the latter mine has also been very satisfactory.

At Wolff Creek Lasell & Co.'s claims paid well. It is an hydraulic and it is well equipped, and has a good water supply.

The Waverley Hydraulic on Grouse Creek this year paid a fairly good dividend and much is expected

They have a large area ahead to work upon.

The Slough Creek, Limited, operating upon the deep gravel on this creek by shaft and tunnel, reached the channel some time ago and remarkably good gravel is said to have been found. The shaft is $362\frac{1}{2}$ feet deep all in rock and the tunnel to the channel about 1,100 feet. A considerable amount of water was encountered and the channel was tapped in several places to draw off as much as possible, and every precaution is being taken against accident. The mine is equipped with good hoisting and pumping machinery and the gravel will be treated at the surface. The tunnel is also provided with an air lock. The deposit has been prospected with a boring machine, and depth, etc., is definitely known.

The Willow River Company, operating on the deep

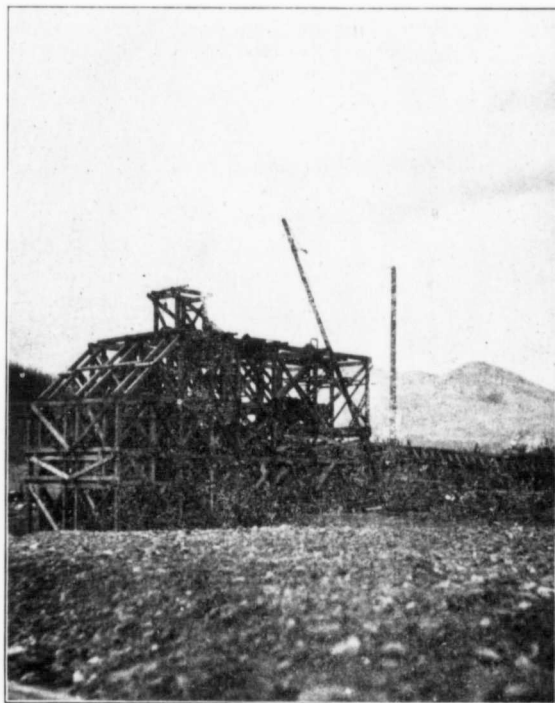
gravel of Willow River, has resumed work. They lost the old workings and now intend sinking a new shaft through the gravel. They are now erecting shaft houses, cutting ditches, etc., and will be at work during the winter. The shaft is to be a 16x12 double compartment shaft and the latest improved machinery is on its way to the ground.

On Lower Lightning Creek the Lightning Creek Gold Gravels and Drainage Company tapped the ancient channel, and it is reported that they found a good prospect. They had an unfortunate accident which will suspend operations for the winter. They

ounces of gold in six days and 85 ounces from one sett of timbers, 8-foot cap.

These two mines are working on the old channel of Lightning Creek which was very rich, and they rival the production of the earlier days.

On most of the above camps there are a number of smaller companies mining, many of which do well for the time they work. Also among the Chinese there are quite a number of good claims on Slough Creek benches and on Nelson, Burns and Cunningham Creeks. All of these claims deserve individual mention, but space will not allow it.



Chain Bucket Elevator, Cariboo.

are to resume work as soon as machinery can be obtained.

On Pleasant Valley Creek a New York company have acquired several leases and are busily engaged erecting buildings, etc., and intend working all winter.

Mr. Carny, C.E., has been working on Upper Antler Creek and also on Nugget Gulch, but the results are unknown.

The Montgomery claim on Lightning Creek (drifting) is still working on good pay and has taken out a large amount of money. It yielded 78 ounces of gold to the sett 8-foot cap.

The Point claim adjoining the Montgomery has also struck very rich gravel. They took out 162

The larger number of mines in the Barkerville District are practically unknown except to their owners and to people in the country. In the aggregate they yield a large amount of gold annually. Last year the output was \$279,600, and it is probably more this year. This is not a bad showing for a country which is popularly supposed to be worked out, and the output will steadily increase year by year as more prospects are opened up.

On Snowshoe and Keithley Creeks the same remarks apply regarding the shortage in the water supply. In spite, however, of the short season, the mines have yielded more than they did last season (1901).

The Smith and Anderson Hydraulic on Snowshoe

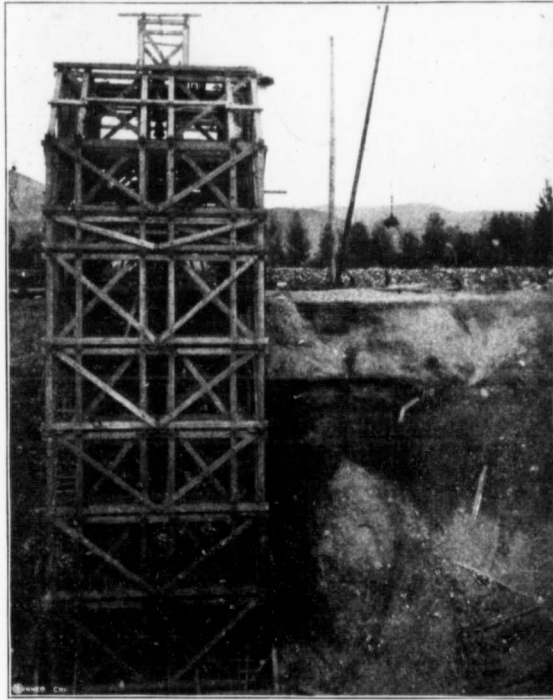
Creek has yielded a small dividend. This claim is a good dividend payer, but about three years ago, to improve the dump, the company started to bring up a new cut, and though they expected to do so earlier they are now only getting back into the good ground.

The Hayward Hydraulic on the same creek worked seven men for a season of 68 days and paid a good dividend.

The Ah Que Hydraulic has a company of five and cleaned up over \$8,000 for the season's work.

Keithley Creek, which has been mined continuously for about forty years, also holds its own. Nearly all

This hill channel is about 80 feet above the present water level of Keithley Creek and the deep channel there was 120 feet in depth. In running their tunnel the Onward Company took out quite a lot of very rich gravel which prospected remarkably well and gave an average of \$5 for twelve pans of dirt. So far as is known this is a part of the old Keithley Creek hill channel in which there were many gaps. Both it and the deep ground yielded very rich gravel, and it is not unlikely that this ground will yield 50 ounces or more to the sett. The owners are therefore to be congratulated, more especially as they have a long



Chain Bucket Elevator, Cariboo.

of the Chinese companies working the shallow ground have made money this season; indeed, six of them made sufficient to leave for China.

Pearce & Trowman, owners of the gold flat on Keithley Creek, still continue to take out pay. This ground is worked by drifting from a 52-foot shaft.

The new discovery of the hill channel of Keithley Creek at the Onward claim has created quite an excitement. Messrs. Veith & Borland, who are the owners, have for many years been prospecting for this channel, and have spent a lot of money in doing so, and they have now been rewarded for their perseverance. The channel was tapped about 500 feet back from the present creek by running a tunnel.

piece of the channel to work upon. The flume, dump house, living houses, etc., are about completed and in a few days they will be at work taking out money.

Two other companies are at work prospecting for this channel lower down.

At Goose Creek Messrs. Helgesen and Poquette and the McRae, Hunter, Nelson Company are at work and both are on pay.

Spanish Creek is also being worked by three companies. I am unable to give results, but I understand they are on pay.

Likely Gulch has not been worked this season, I understand, but it has been purchased by Mr. Hobson, who is likely to open out next season.

The Pride of the Lake Company own two leases

above the Golden River Quesnel Company's dam and have a good supply of water. The results for the season are supposed to be good and the mine is generally believed to be rich.

Roses Gulch was worked this season and as usual with good results considering the limited supply of water. A permanent supply can be obtained from Spanish Lake.

The Consolidated Cariboo Hydraulic Mining Company has, as usual, been at work all season. The supply of water has been very scant and in consequence the results are disappointing. The water has been used mainly in carrying up a bed-rock cut to work the lower gravel in the channel. Electric drills were used for this purpose and they worked successfully. The power is furnished by a dynamo operated either by steam or water power. The same power operates searchlights for the pit and ordinary lights for general use. The new camp, with its well appointed dwelling houses, dining hall, offices, etc., is completed and has been in use all summer. The results have been disappointing for this season, but it could not be otherwise with the great scarcity of water. The mine, however, looks remarkably well and the company has uncovered about half a mile of bottom pay gravel which will undoubtedly yield a very large amount of gold.

The National Hydraulic Mining Company on Quesnel River below the mouth of the Beaver, have been operating during the season. I understand they opened up from the river and uncovered a portion of the rim between the channel and river. The company are now running a tunnel through this rock rim through which the deep ground will be worked. They have a good supply of water and a good plant. I understand the results this season were satisfactory and when the mine is properly opened up it should be a valuable property.

Mr. Millar and others are at work upon a low bench below the above company's ground and they are doing well.

Mr. Drummond has been operating a small dipper dredge upon his dredging leases on Quesnel River which extend up stream from the mouth of the Beaver. The dredge is only useful as a prospecting dredge, but I understand that quite a large amount of ground was tested and that the results were satisfactory.

Messrs. Stephenson, Brodie and Drummond were prospecting all season in the Clearwater country, but I understand that the results were not altogether satisfactory.

A considerable amount of prospecting has been done this summer, especially upon the creeks running into Quesnel Lake and several very good prospects were obtained, but nothing absolute is known yet.

Ward's Horsefly Hydraulic Mining Company has been working all season. In the early part of the season I believe they were not very successful, but they soon struck good ground and I am informed that the results for the whole season have been very satisfactory. This company has an abundant supply of water

under a pressure of about 350 feet and work an hydraulic elevating plant with great success. They have some very rich gravel.

In addition to its placer mines Cariboo District has numerous quartz ledges, but they have so far not received so much attention as they deserve.

On Snowshoe Mountain Mr. Howison has been prospecting the Hayward ledge and also other reefs. The Hayward ledge (gold) has given very good results and I am informed that his company will open out upon this ledge in the spring. Several other ledges are also being prospected and I am in hopes that this is the beginning of a new era in quartz mining and that more attention will be paid to this branch of mining in the future.

There is every prospect that there will be a good snowfall this winter as there is already more snow than is usual for this time of the year, and this, of course, means renewed activity in gravel mining next year and a successful season in 1903.

HYDRAULIC MINING IN CASSIAR.

OPERATIONS of any importance carried on during the year in this district have been confined to the hydraulic working of Thibert Creek by the Thibert Creek Mining Co., Ltd. This company owns on the creek seven leases of 80 acres each, consolidated, and having a total frontage of 10,500 feet. It was decided last spring to install two additional No. 4 monitors, two new 12-inch water-gates, and 600 feet of 12-inch pipe, but notwithstanding that all possible despatch was used in transporting this machinery to the mine, before the installation was made nearly a month had been lost out of the working season, and washing was not commenced until June 25th. Ground was then blocked out in the different pits by running off the top dirt, the intention being to take up the bottom later in the season. The block of ground between Nos. 1 and 2 pits gave in 1901 some considerable trouble by sliding. This slipping was caused by a modern side-gulch, which here crosses the old river channel, and thus cut away the top gravels, depositing in their place an accumulation of boulder clay and frozen mud. The management was, of course, aware of the treacherous nature of this portion of the ground, and in mining it, by side-cutting, considerable caution was exercised. Nevertheless it subsequently proved, that an insufficient quantity of the upper surface was not removed, for towards the close of August, the whole of the deposit, containing thousands of tons of boulder clay and mud, slipped down into the mine, completely filling No. 1 and No. 2 pits and covering three monitors, two gate-valves and about 400 feet of pipe, besides taking out the three lower sluice boxes in No. 2 pit. This certainly happened in the most unfortunate time of the season, for, had the slide come earlier, there would still have been time to clean it out and perhaps for a good run on the bottom gravels; or, if later, a big portion of the bottom could have been cleaned up,

instead of as now having to leave this over for another season.

As the first work to be done was to remove this debris, extricate machinery and pipe, re-set boxes, etc., only a limited number of men could be thus employed most of the men were paid off, a sufficient number only being retained for this work and to make preparations for next spring's operations. It was fortunately found that none of the machinery had been destroyed by the slide, and the actual damage was therefore small. But the loss of the season's work was a great disappointment. The slide, however, was a benefit to this extent, that the top deposit, which slipped, would sooner or later have had to be removed and this therefore disposes effectually for a number of

After two years' trial, the under-currents have been taken out, as they show only 1 per cent. of the recovery from the sluices, and this will not pay for their making or keeping them in running order. It is safe to say that the first two boxes (24 feet) give 85 per cent to 90 per cent. of the total gold recovered in the sluices, and this is caused by an exceptionally good and heavy quality of gold, making it so easy to save. Although this in hydraulic mining is a very great advantage, this characteristic on the other hand has a tendency to "rob the sluices," so that a very large percentage settles in the rock cuts and in all the crevices on bed-rock, and is not recovered until the latter is picked up and cleaned. The flume, which caused so much trouble last year by settling and con-



The Latest Method of Walking in the Atlin District.

years of the most difficult portion of the ground to be mined, as nowhere else do the same conditions of boulder clay and mud exist, nor have many places along the whole of the 10,500 feet of channel such a large overlie of debris as the company has had here to contend with. Where the top is gravel, as in pits 3 and 4, and also now after the removal of the debris from pits 1 and 2, the banks are all that could be desired with a view to economical mining, as they stand up at an almost perpendicular angle.

Two new pits, with rock cuts and necessary sluice boxes, have been opened up this year, and two monitors are now placed so that a fifth can easily be opened thus making five different openings from which to wash gravel.

sequent leakage, has now found a solid and permanent foundation, and during all summer it has been necessary to turn off the water for only ten hours for repairs.

From the work done this season it is now known that the bottom between Nos. 1 and 2 pits is very good, and as good gravels have been found in pit No. 3 it proves that the rich paystreak found in early days in the original old pit continues all the way down the channel. In pit No. 3 a bank 130 feet high, of top gravels, discovered last year, was worked this season, and although it was impossible to keep this separate from the bottom, a very small portion of the latter was taken up. The returns from this pit show that the top here will at least pay running expenses.

leaving the gravels in the bottom as a profit. With bottom is understood the lower strata of gravels, 12 to 20 feet thick. Of course, until the bottom is taken out not much gold can be recovered—firstly, because most of the pay lies in these gravels, and secondly because the gold in the top gravels settles in the bottom ones when the former are caved and dropped on the latter. It is exceedingly difficult to judge what proportion, exactly, of the bottom was taken out when the slide came and stopped operations, but it is safe to say that only one-sixth of what was laid out for this season was washed out. There was no bed-rock or cuts cleaned up, and a great deal of gold was always visible after each day's washing—sometimes almost as much as found its way down into the sluices. Occasionally a small portion of bottom gravel was washed down, but there was no serious attempt to take this out until about the middle of August, the intention being to devote the rest of the season up to October 10th to taking up bottom and cleaning bed-rock and cuts. The company had, therefore, been working for only a very short time, say about 10 or 12 days, when it became necessary to close down. Up to this time the result of the season's run was \$5,000, without cleaning cuts or bed-rock.

By actual measurements we washed last year 3.57 cubic yards of gravel per miner's inch, which for 69,200 cubic yards returned 11 cents per yard. This year the company used and would have continued using on an average 550 miner's inches of water per day, and would have had 100 days washing. This would have made for the whole season 65,000 miner's inches used, and 3.57 cubic yards per miner's inch, 232,050 cubic yards of gravel washed. It is quite safe to say that this year's gravel is of a better quality than last year's, and that with the larger monitor the efficiency of the miner's inch is greater; so that probably more than 3.57 cubic yards per inch was handled. The season's operations have shown that gravel of a low grade, if economically washed, can here be mined at a good profit.

A glance backwards to the time three years ago, when this enterprise was first started, might here be proper, as it will give an idea how the mine through prospecting has developed in size from what was first expected it would be:—

The whole of the leaseholds, 10,500 feet along Thibert Creek, is by the nature of the ground divided into three distinct parcels: The first from the mouth of Berry Creek to Boulder Creek; the second from Boulder Creek to Five-Mile Creek, and the third from Five-Mile Creek to the end of the leases.

Roughly speaking, each one of these portions consists of about one-third of the total 10,500 feet. On the first portion a certain amount of prospecting and all the work in the line of development has been carried on. On the second only prospecting work, and on the third portion nothing has as yet been done. When work was first started the width of the old channel was calculated to be 150 feet, whereas the company has already crossed about 250 feet of it and so far have not reached the centre. The channel lies

here on a very sloping side-hill, and as a consequence this increased width has given increased height, so that in place of 60 feet as expected the bank is now 130 feet. This is rather the highest portion of the channel, and towards Boulder Creek it decreases considerably, so that it can be estimated at 100 to 120 feet high and probably 400 to 500 feet wide. The value of this deposit has already been demonstrated. We have, then, here in this block about 7,000,000 cubic yards of gravel at about 12 cents per yard. The second portion of the channel, from Boulder Creek to Five-Mile, is not a side-hill like the first portion, but almost flat and considerably lower, not exceeding, say 60 feet high and between 300 and 400 feet wide. The prospecting here gave better results than the portion where work is now in progress. The returns from 688 cubic yards were \$533, or 77½ cents per yard, this being from bed-rock and up for 20 feet, or about one-third of the bank. On the third block no prospecting has been done. The ground here is more in the nature of the first portion and contains certainly as much gravel as this latter. In earlier days drift diggings were carried on both from the Five-Mile end and from the lower end. In those days, wages were about \$6.00 per day per man, and both places then paid well. Five-Mile, where the pay was especially good, had to be abandoned because the miners were drifting down stream and could of course not get grade for drainage; and at the lower end, after working about five years without any proper appliances for ventilation, the air got foul and necessitated a suspension of work.

NOTES FROM THE ATLIN

DISTRICT, BRITISH COLUMBIA.*

(By W. M. Brook.)

I LEFT Atlin, British Columbia, October 3; navigation closed this year on the lakes and on the Upper Yukon about November 3. The Atlin District produced this past (mining) season over \$500,000 in coarse gold. There have not been more than 800 miners employed.

The official statement will be ready for publication possibly by another month. The increased (gold) production this year was due to the hydraulic mines on Boulder, Pine and McKee Creeks. Last year companies operating on these streams were installing their improvements and opening up their mines.

The statement given below from Count E. Janne De Lamare, of Paris, general manager of the Societe Miniere de la Colombie Britannique, De Lamare Syndicate, on Boulder Creek, Atlin, B.C., was furnished me one year ago, when I visited this valuable property and saw their immense pay streak exposed.

"The bed-rock had been struck September 25 last on the hydraulic property of the De Lamare Syndicate, at a depth of 45 feet. The season was too late and the water supply too low to realize on the excel-

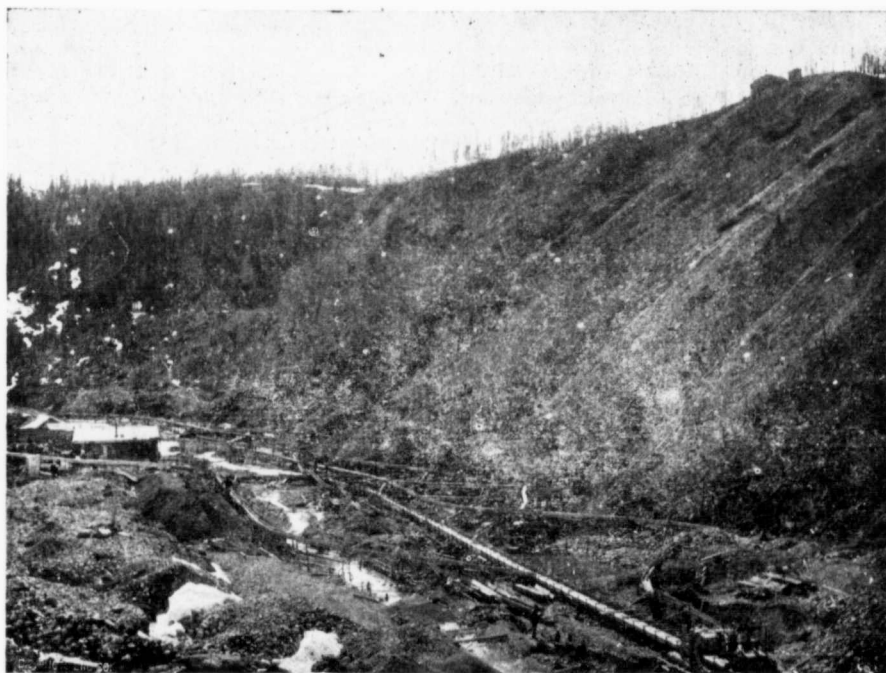
From the Engineering and Mining Journal.

lent prospects. But there is satisfaction in knowing exactly upon what the company will begin operations next spring.

"The pay on bed-rock from panning goes as high as \$5 to the pan, and the gold is very coarse. The bed-rock layer of the pay gravel taken from a shaft of 18 feet deep sunk in a tunnel of 50 feet west of the flume, and in the supposed centre of the creek channel gave from \$40 to \$50 to the cubic yard. The 12-foot thickness of pay gravel is therefore estimated to yield not less than \$15 to the cubic yard, a figure that promises to place this proposition among the first rank once the point is reached, from which the whole pay streak can be piped into the sluice boxes.

I was in Atlin, Mr. Melwin, the superintendent of the above-named mine, delivered in Atlin, from his weekly clean-up, gold dust which gave the mine an average of over \$1,000 per day. This demonstrated the accuracy of De Lamare's estimates furnished one year ago. Superintendent Melwin tells me that their operations have been greatly retarded by the tailings from individual miners above them. About 150 miners have been engaged in hand-slucing on Upper Boulder Creek.

The Pine Creek Power Company, under the management of F. T. Blunck, of Davenport, Iowa, has made a very good showing this year from their hydraulic mines on Pine. From 30 to 50 men were



Hydraulic Mining in Atlin.

Photo by Muirhead Bros.

"The intention of the company is to sink to bed-rock in the channel some 500 feet lower down stream than the face of the present workings.

"From this point of commencement drift will be run to work out the intervening pay, the grade at its disposal not permitting this initial portion of the ground to be otherwise worked.

"These operations will commence now and go on all winter.

"The season work of this property has been largely of a preparatory nature, the results from which have proved highly satisfactory the successful development of the proposition along the lines adopted this year being assured."

During the month of September, this season, while

employed by this company all season. They are using 3,000 miners' inches of water under 140 to 60 feet of fall for pressure.

There are very few individual miners left on Pine Creek. On Willow and Gold Run, both parallel channels, forming part of the Pine pay streak, there are a number of miners engaged in hand slucing. On the latter channel it is from 30 to 35 feet to bed-rock. The miners have experienced considerable difficulty in working this ground, because of water leaking into their shafts.

Steam hoists and centrifugal pumps are being used successfully, and several more will be shipped in next year.

J. F. Deeks, of Toronto, has a large tract of rich

placer ground on Pine just above the extensive properties under control of the Pine Creek Power Company. Mr. Deeks has made some big clean-ups this year. In September he had a large force of men at work constructing a ditch conveying about 1,500 miners' inches of water from Surprise Lake, the source of Pine, along the benches of the stream, which is for the purpose of supplying the Gold Run miners and his own claims. The ditch will be about four miles long.

R. D. Featherstonehaugh, general manager of the Nimrod Syndicate, of London, England, in which company Lord Ernest Hamilton is heavily interested, has hydraulic mines on McKee Creek. Mr. Brewer has given the *Journal* a very good description of this mine in a former article. This season's work has yielded the company over \$40,000, giving them very good profits, especially when it is to be considered that the mine was just started last year.

Messrs. Christopher & Hawkins have a large area of rich placer ground on McKee Creek, just below and on both sides, joining the property of the Nimrod Syndicate, which will be worked next year.

Some hand sluicing was done on McKee above and near discovery claim. The miners have made very good wages. A half ounce to two ounces per day to the man was not an uncommon thing.

In speaking of McKee, I find from investigation that the main pay streak where the heaviest gold is found, runs through and under the bench claims, this being shown by prospects in a tunnel running in 100 feet under the bench from the creek; and when those benches running parallel with the creek are fully developed and worked an output of gold far in excess of anything produced in the present workings of the creek will be realized. This property for over three miles is owned by Christopher & Hawkins, who have a plant now on the ground ready to be installed early in the spring, soon enough to catch the first early water, they having already graded their supply flume, which will enable them to make quick work for spring. This will add another valuable producing mine to our district.

The most extensive area of rich placer ground in the Atlin District may be found on Spruce Creek. There has been great deal of development work done on this stream during the past season, covering a distance of 12 miles, with very satisfactory results.

The Columbia Hydraulic Mining Company is operating on Spruce above Discovery claim. Their improvements have cost \$75,000. This is a Chicago company. Senator Mason is president and A. A. Johnson general manager. They have completed the installation of a modern hydraulic plant, and the manager reports that the mine is now on a paying basis. Their main pipe line from pressure box is 30-inch heavy steel, with 40-inch intake and 200 feet of fall for pressure.

On this part of the creek referred to where the company began to operate there was a large mass of huge boulders. In order to get a good dump and start the bed-rock flume on sufficient grade the boulders

had to be removed. The Columbia Company has had in operation all season one of the largest derricks in the North. It is manufactured by Handee, of San Francisco. Capacity, 10 tons. The derrick has given perfect satisfaction; it is operated by a 3-foot hurdy-gurdy waterwheel, using 40 miners' inches of water under pressure. When in use boulders weighing from one to eight tons were moved with a 66-foot boom every three minutes.

Below Discovery claim on Spruce the Consolidated Spruce Creek Placers, Ltd., Seattle, Wash., has control of four miles of the creek, where most of the gold from the stream has that far been taken. Charles L. Denny, of Seattle, is president of this corporation, and W. M. Brook is the general manager. This company has been acquiring more rights on the creek this year, and preparations are being made for the construction of a modern hydraulic plant giving the mine a capacity of 3,000 to 4,000 cubic yards per day. The average length of the mining season is 140 days.

Mr. J. H. Brownlee has incorporated a company with \$100,000 capital to work Otter Creek ground. Some \$10,000 worth of mining machinery has been secured, and it is being moved on the property. Next season this new company will have a hydraulic plant in operation, using 12-inch, 14-inch and 16-inch pipe under 200 or more feet of pressure, piping down gravel banks where several thousand in coarse gold has been washed, averaging better than \$1 per cubic yard.

Mr. Switzer, manager of the British American Dredging Company, has formed his company in Philadelphia with \$2,000,000 capital with the intention of operating machinery on their Pine Creek Placer ground. Mr. Robinson, representing the Eastern stockholders, was in Atlin this year looking over the property with the engineer. He expressed himself as being highly pleased with their prospects.

Considerable attention has been given to the development of quartz claims in our district. On Pine Creek J. M. Ruffner has had under bond this year the Rock of Ages from Dr. H. B. Runnals, of Skagway, Alaska, and associates. Thirty tons milled from a 60-foot shaft on this claim averaged over \$12 per ton.

Mr. Ruffner and partner, E. N. Banon, are doing development work on the Yellow Jacket claim just above the Rock of Ages, preparatory to the erection of a stamp mill next year.

Herbert P. Pearce, late general manager of the Pilbarra Goldfields, Limited, Western Australia, is manager of the Imperial Mines in Atlin on Munro Mountain. I was in their 600 feet of tunnel and cross-cuts, and saw veins of free-milling quartz exposed. Mr. Pearce has a five-stamp mill located nearby to prospect the mine. He states that the quartz averages about \$10 per ton. He seems to be well satisfied that they have a sufficient body of pay quartz to justify the erection of a ten-stamp mill. He will want this machinery next year.

On Engineer group of mines, 20 miles distant from Atlin southwest of Taku Arm, a ten-stamp mill is being put up. W. B. King, assistant auditor White

Pass Railroad, is president; Mr. Gard, secretary. There is a big vein of ore exposed by the tunnels and cross-cuts. I have seen the assay receipts from several tons of ore treated, and from these returns I am satisfied that this is the most valuable quartz property being worked in Atlin. A majority of the stock in this mine has been held by citizens of Skagway, Alaska.

Mr. J. A. Fraser, the new Gold Commissioner, is proving himself to be well qualified to fill the position. In order to promote the general welfare of the miners and encourage legitimate mining, protecting the titles of those who have rights granted by the Government, Mr. Fraser is sparing neither time nor energy. In the long run, this policy will insure to the Provincial Government the largest revenue.

The White Pass & Yukon Railway has given the Atlin miners very good service this year. The fare to Skagway has been reduced to \$20, with an occas-

locations had been recorded, and only a few had knowledge of the discovery. It is quite possible that Juneau, Alaska, will profit by this discovery, because the Taku route can compete with the White Pass for the business of the new district.

VANCOUVER ISLAND AND COAST DISTRICTS.

THIS year very important mining developments have taken place on Vancouver Island, chief among which should be mentioned the completion of the construction of the Crofton and Ladysmith smelting works. A description of the former undertaking has already been published in the *MINING RECORD*. Actual operations were started at the Ladysmith works last month (December). The ore is brought from the Tyee mines by means of an aerial



Construction work at the Ladysmith Smelter.

ional excursion rate of \$12. The fare from Seattle to Skagway, Alaska, is \$30 first class, including board and stateroom on all the steamship lines. Freight rates on mining machinery from Seattle to Atlin, \$60 per ton by weight.

There was a scarcity of miners in Atlin this last year. Wages range from \$3 to \$5 per day and board.

Because of sharp competition between the Atlin Lake Lumber Company and Dr. Troughten's mill rough lumber was sold this season for \$20 and \$25 per thousand. This reduction has been of great service to the miners of the district.

Mr. McGee, discoverer of McKee Creek, has made a new discovery some 40 miles or more distant from Atlin eastward on a stream flowing into the Taku. This creek has been described to me by one of the party as being as large as Pine. Prospects from \$3 to \$5 to the pan have been already found. Mr. McGee had three tons of provisions moved over half-way to the new strike when I left in October. No

tramway, which dumps the ore into the bins at Statton's Crossing. There it is loaded directly into the cars on the E. & N. Railway and conveyed to the smelter at Ladysmith.

The ore bins lie some little distance north of the townsite of Ladysmith, and are situated on high ground. The roasting bins are splendidly arranged for receiving the ore from this storage bin. Five parallel tramways are elevated six feet above the level of the ground, devoted to the roasting process. These tramways are about 30 or 40 feet apart. Connecting these parallel lines is a bridge which can slide to any place throughout the length of the intervening spaces. The cars are dumped while moving across the bridge. In this way the roast heaps are deposited with a minimum of handling. The methods adopted for transferring the ore after roasting to the smelter bins are also worthy of remark. Trenches about four feet below the level of the bottom of the roast piles are excavated so that the roasted ore is easily

loaded into the cars. The smelter itself is about 300 yards nearer to the town than the roasting bins. It is a very complete plant, capable of handling about 200 tons daily, but has been so planned that the capacity can be readily increased at any time.

Mining in the Mount Sicker district has been very active, and considerable installments of machinery have been made at the principal mines. At the Tyee, large ore reserves have been opened up, and the mine is in a very promising condition. Shipments aggregating 275 tons were shipped this year for test purposes to the Tacoma smelter, the returns being 8 per cent. copper, \$5 gold and five ounces silver per ton. The Lenora mine during the year shipped to the Tacoma smelter 1,943 tons of No. 1 ore, and to the Crofton smelter 643 tons of No. 1, and 11,915 tons of No. 2 ore. The property has been further considerably developed, the principal work including the sinking of a double compartment shaft to a depth of

six ore cars were also purchased, and a large ocean dock was built at Crofton, a townsite having been plotted there, since when a promising little town with several good buildings and a population of several hundreds has sprung into existence.

The Copper Canyon group, owned by the Mounts Sicker and Brenton Mining Co., has also been developed with encouraging results, and during the year a five-drill compressor plant, 40-h. p. boiler and hoist were installed at the mines. Another important occurrence was the discovery and development of promising mineral at East Sooke, about 1,000 tons of copper-gold ore having been taken out in the course of development operations. On the West Coast of Vancouver Island conditions have been less favourable. A small shipment of 150 tons of ore was made from the Monitor mine, on the Alberni Canal, in the spring, but since then operations have been suspended. The Hayes mines in the same locality,



Tyee Ore Bins, Ladysmith, capacity 1,600 tons.

180 feet, from the floor of the No. 2 level to a point about a hundred feet below No. 3 level. At this point the formation showed no change, but a large amount of mineralized rock was passed through, and the showing was such as to warrant the belief that the top of another ore chute has been reached. At the present time there are two chutes of ore that have not been stoped, one of high grade ore between tunnels Nos 2 and 3, and the other between the same levels, a body of ore of the grade usually found in the Lenora mine. The machinery installed during the year include a five-drill compressor, 16-inch cylinders, manufactured by Holman Bros., of Camborne, Cornwall, and a rubber-belt sorting table, with crusher and elevators. The company also completed five and a half miles of railway and sidings and built a trestle 800 feet long, being part of the system over which ore is carried from the mine to the smelter at Crofton. Another 20-ton locomotive and

after shipping 2,000 tons early in the year, were closed down in consequence of differences of opinion among the owners, but recently work has been resumed. The exploratory work on the Golden Eagle has been steadily continued, and important developments are reported to have been made in the Kennedy Lake Camp, where fissure veins of gold bearing quartz to the value of about \$30 per ton, were first discovered in 1898. Operations on the Rose Marie were, however, suspended, no further attention being paid to the district until this year, when new discoveries were made, and test shipments of ore sent to the Crofton smelter. Work has also been resumed this year at the New York mine, on Bear River, at the head of Bedwell Sound. The iron occurrences at Gordon River and at Serita and Copper Island on Barelay Sound have attracted further attention and the exploratory work that has been in progress has resulted in the exposure of very considerable ore



Clyde's Cut, Comstock Mountain—Showing method of quarrying out ore on Yreka property. Part of the dump is seen. All to the left is ore.

bodies. In the north of the Island, at Quatsino Sound, exceptionally promising deposits of copper ore have been opened up on the Comstock and other groups. An aerial tramway has been installed from the Comstock mine to the beach, and the property has been extensively developed. During the summer two shipments of ore were made, one to Tacoma and one to the Ladysmith smelter and the returns from the ore taken from open cuts were eminently satisfactory. The owners have contracted to supply the smelters with a large tonnage for the coming year.

On Texada Island, the Van Anda mines have passed under the control of an English syndicate. The Cornell mine has been thoroughly exploited, the shaft has been continued down to the 360-foot level, and a drift run to the 160-foot level in the old quarry hole, an extensive body of ore having been thus opened up. On the 360-foot level the same ore bodies

The iron mines on Texada Island have been in continuous operation during the year, and the ore shipped to the Irondale furnace near Port Townsend, Washington. The pig iron here produced has found a ready market in San Francisco and other manufacturing centre on the Pacific Coast.

THE KAMLOOPS MINING DISTRICT.

(By Chris. Outhett, A R.C.Sc. (London).)

THE Kamloops camp is situated to the southwest of the city. Its principal mines lie in a belt of basic granitic rocks commencing three miles south of Kamloops and crossing the country in a northwesterly direction. The granitic belt is about six miles in length and at its widest part, nearly three miles wide. The granitic rocks are in contact with the Nicola for-



Shaft House—Tyee Mine

have been encountered as those developed by the former management at the 260-foot level. The present policy is to thoroughly develop the mines and block out ore reserves before production is resumed. The Marble Bay mine here has been in steady operation during the year, having been acquired by the Tacoma Steel Co. A gravity tramway has been built from the mine to the wharf, and the ore which has been accumulating on the dumps since the mine was first opened has been shipped. Development work has been continued on the Golden Slipper claim—a gold-bearing quartz ore, and work has also been in progress on the Volunteer group. There is a likelihood of a resumption of operations on the Surprise and Silver Tip next spring. On these properties shafts have been sunk to a depth of between two and three hundred feet and test shipments made therefrom some years ago.

mation to the south and overlaid by a belt of Tertiary age on the north. The elevation of the area is between 2,000 and 3,500 feet above sea level. The area is for the most part covered with glacial drift with the exception of two bold escarpments. The outcrops of the igneous rocks are scattered over the area, rendering considerable surface work necessary in following up mineral exposures.

Several dykes cut the granitic rocks, one on the east end of the camp starting on the Python group, passing through the Hecla and Kimberley eastwards for over two miles. This dyke is kaolinised and of a reddish colour due to decomposed iron pyrites. In the west end of the camp in the vicinity and northwest of Sugar Loaf Hill, a number of magnetite deposits occur. Some have a width of over twenty-five feet, but little work has been done on them. Eventually it may be found that the veins bear some

relation to these dykes, as most of the veins are in the vicinity of one or other of them.

In this district the ore is primarily chalcopyrite, on some properties associated with magnetite, on others with pyrites; more or less calcite occurring in all the veins; quartz is very sparingly distributed. On the Copper King, which is outside the main copper belt, a mile and a half from the Glen Iron mine, the ore is bornite with chalcopyrite and some bands of grey copper in a felsitic gangue. This property carries



Falls on the Kootenay River.

higher gold values than is general in the district. In a shipment of a car of ore running 20 per cent. of copper, an ounce of gold per ton was returned. Whilst the mines of the copper belt are able to make occasional shipments of high grade ore to the Kootenay smelters, they have large bodies of low-grade ores and the success of the camp depends upon local treatment facilities being provided. At least two companies have this provision under consideration.

During the year the shaft on the Iron Mask has been continued to a depth of 520 feet. In all over 2,100 feet of work has been done on the property. The mine has been opened up with levels 100 feet apart. The year's development work has been satisfactory. Early in the spring a few carloads of ore were shipped to the Granby smelter which returned 12 per cent. of copper. Shipments ceased with the fall in the price of copper. Twenty to thirty men have been employed throughout the year. Sixty to 200 gallons of water, per minute, are raised from the mine by a Northy duplex compound station pump which lifts direct from the 500-foot level. The remaining plant consists of three 50-h.p. boilers, a four-drill air compressor; a gasoline engine is used for hoisting purposes.

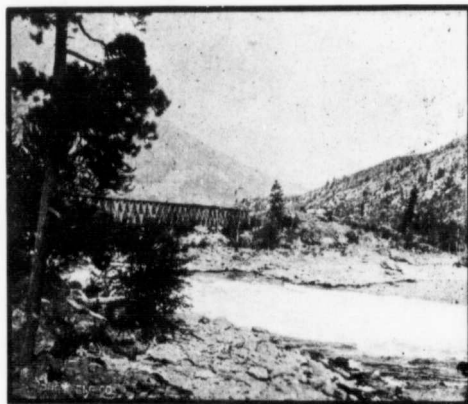
The Inland Smelting Company was incorporated during February with a capitalization of \$7,500,000 to acquire the Python group of claims and the Homestake group, Adams Lake, a total of sixteen claims. The company has purchased and made two payments upon the mission grounds of 600 acres, upon which it is proposed to build their smelter, also 160 acres one

mile south of the mission grounds, and on the border of the granitic area where sampling works and reserve ore bins will be erected. The sampling works will be connected with the smelter by a trolley tram. The Homestake group contains a very large body of low-grade lead ore with some high-grade gold and silver ores in a gangue of baryta and quartz.

The Chieftain Copper Mines, a Detroit company who last year purchased the Chieftain group at a good figure, failed to renew their free miner's certificate on the 31st day of May, in consequence of which they lost their property.

The Pothook, Python and Kimberley Companies' properties were closed down the whole year. Representatives of the Kimberley Company have purchased the Copper King, near Cherry Creek and arrangements are well under way for opening up these properties. The local company owning the Tenderfoot on Copper Creek, have done over 200 feet of work at the 100-foot level on an ore body twenty feet wide. The ore is bornite in a porphyritic gangue and nearly ninety tons of ore on the dump awaiting local treatment facilities. The Cherry Creek Copper King Mines, Ltd., a local development company, have purchased the O. K. group which is situate midway between the Iron Mask and the Python. Operations will be commenced in early spring.

For 1902 the output of the Glen Iron Mine has been over 3,300 long tons of magnetite which was shipped to the Nelson and Trail smelters for fluxing purposes.



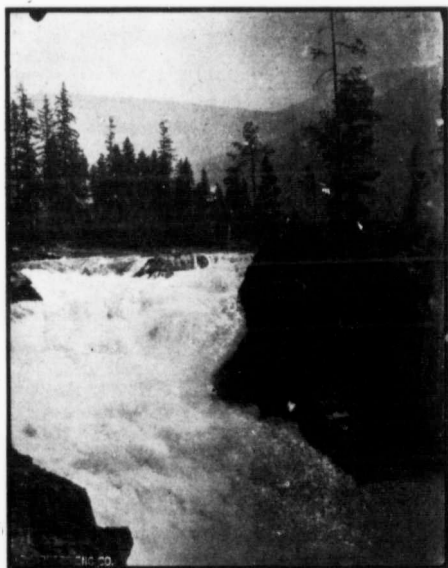
C. P. R. Bridge Near Nelson.

The ore was obtained by stoping above a 200 foot tunnel on the vein on over twenty feet of solid magnetite. The output is the largest in the history of the mine.

The property of the Hardie Cinnabar Company, a London company formed during the year, is on Hardie Mountain, four miles north of Kamloops Lake. Joseph Luce, M.E., of Salt Lake City, is in charge of operations. Over 1,000 feet of work has been done in four cross-cut tunnels. No. 1 tunnel is near the foot of the mountain and the others at intervals

of 250 feet. A nominal crew of men is at present employed. Buildings to the value of \$2,000 have been put up including a bunk-house with accommodation for twenty men. A shaft 20 feet deep has been sunk, on the Toonkwa, a promising cinnabar prospect, twelve miles south of Savonas. The average across the shaft is between two and a half and three per cent. of mercury. The ore occurs in a dyke 40 feet wide.

The bucket dredge on the North Thompson River did not prove the success anticipated, the gold where the dredge was placed being limited to the upper few inches of river sands. The dredge company then secured two dredging leases on Tranquille Creek whether the dredge was moved, a distance of over twenty-five miles by river. The creek has been well prospected by shafts and panning, the results proving



A Glimpse of the Upper Bonnington Falls.

satisfactory. The dredge has been closed down a considerable part of the season for repairs and on account of the shortage of water. Whilst running it may be said to have been successful even when working over shallow auriferous gravels towards their best ground. During one run of a fortnight, over \$1,000 in gold was recovered.

The Empire Development Company have acquired several leases on the Tertiary areas north of the copper belt, and two to six miles west of the town. The coal formation is partially cut through by a creek two miles south of Kamloops. Several years ago an attempt was made at exploration on this exposure, but little was accomplished as nearly all the work was done on the dip of the strata, at this point consisting of thin seams of coal and clay, the thickest seam of coal being not more than twelve inches. The Devel-

opment company propose to bore with a diamond drill near the Thompson River, where the Tertiary area has a greater development. Bore holes in this vicinity will determine if a workable seam of coal here exists. The coal is bituminous, of a good quality and gives a firm coke.

THE BIG BEND DISTRICT.

(From our own Correspondent.)

THE resources of this district are such as are bound before very long to make its name widely known to the mining world. The Big Bend District has not been extensively advertised owing, perhaps, to the difficulties hitherto existing in the matter of transportation.

The city of Revelstoke lies on the Columbia River at the junction of the main line of the Canadian Pacific Railway with its Arrowhead branch, and forms the gateway to the vast territory comprised in the name "The Big Bend." Revelstoke has never been subjected to the pernicious influences of a "boom," as a result of which it has certainly never been over-rated, and perhaps for this reason has not been as generally brought before the public as other much less substantial towns. During the last few years it has enjoyed prosperity, and steadily progressed until today it is one of the most thriving towns in the interior of the Province. The past summer has seen marked strides in the shape of several new residences, handsome brick buildings, and other improvements. It enjoys a considerable pay roll, owing to the C.P.R. workshops, lumber mills, and mining to a small but steadily increasing extent. Its citizens have pinned their faith on the Big Bend District, being heavily interested in it, and for some years have been steadily developing its great mineral resources.

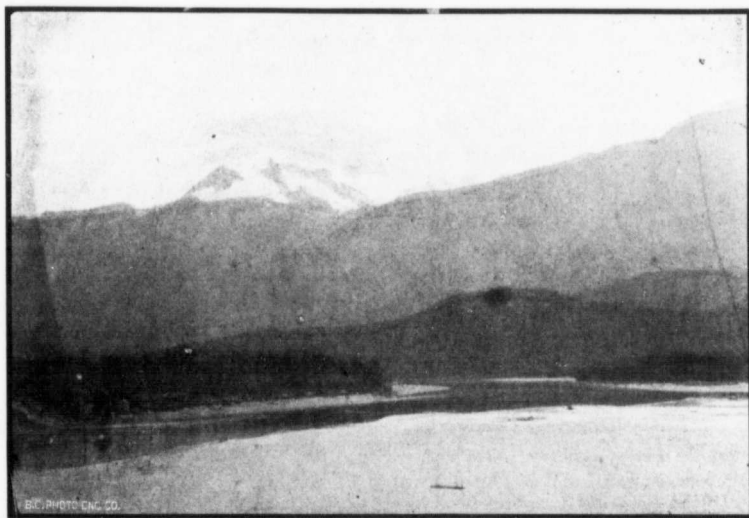
The Columbia River leaves the main line of the C. P. R. at Beaver Mouth, flowing northerly for a hundred miles or so; it then takes a complete bend to the south (hence the name Big Bend given to the district) and crosses the C. P. R. again at Revelstoke. The district is over one hundred miles in length, indeed, including the Canoe River, it is two hundred miles in length. In the past transportation has been by means of trail, but efforts made by the citizens of Revelstoke last year were rewarded in having a fine steamboat making regular trips to Laporte all summer, Laporte being some fifty miles north of Revelstoke. At this point navigation is interrupted by Death Rapids which at present are impassible, but it is hoped that this may be overcome by improvements to the river bed. The Dominion Government are working to this end and have now a crew of men employed on improving the channel. In any event the difficulties of Death Rapids can be overcome by a tramway, and from that point there is continuous navigation to the mouth of Canoe River, which flows into the Columbia River at the point where it takes bend to the south, and, besides, navigation is good for many miles up Canoe River. It is contemplated that a steamer will be plying on this upper river in the summer of

1903, thus making the country easily accessible for 150 miles north of Revelstoke.

It is unnecessary to state that the timber resources alone of such a large tract of territory are of inestimable value. The axe was first applied to these virgin forests in the summer of 1902 when there was considerable activity in this line. The advent of the steamboat rendered it possible to ship up large supplies for the winter, and was taken advantage of by the people of Revelstoke to establish here permanent lumber camps.

There are at present upwards of a hundred men employed in the Big Bend District. While the development of mining properties has necessarily been slow, it has been more or less steady, and some properties of great promise have received considerable attention. These are too numerous to describe in detail in this brief sketch and indeed only a few of the most im-

Carnes Creek Consolidated Gold Mines, of Revelstoke. This property is also in a fair stage of development, upwards of \$20,000 having been expended upon it and gives great promise. The ore is arsenical iron carrying gold, considerable bodies having been exposed. There is also a small copper vein developed to some extent. The ore has been tested and found capable of treatment by the cyanide process. Situated near the Roseberry group are the Shaw group and the J. & L. group, properties of considerable promise, but on which very little work has been done at present. South again on Laforme Creek some nineteen miles north of Revelstoke, considerable work has been done showing valuable deposits of ore. The chief of these properties are the McCallum group, the Adair group and the properties of the Double Eagle Mining Company. Downie Creek flows into the Columbia River from the East about 45 miles



The Columbia River, Revelstoke.

portant ones can be named. The most highly developed property is what is known as the Standard group, lying in the Standard basin, some six miles west of the Columbia River. On this property upwards of twelve hundred feet of work has been done, exposing large bodies of copper ore at different points. The ore has been cross-cut at several places showing in places from five to eight feet in width of copper ore. It is said that five and a half tons of this ore will make a ton of 60 per cent. copper matte. This property is owned by the Prince Mining and Development Company of Revelstoke. It is being worked all winter, a tunnel being now driven to tap the leads at a much greater depth. When this tunnel is completed the property will be in a high state of development.

Lying about five miles southeasterly of the Standard group is the Roseberry group belonging to the

north of Revelstoke. On each side of Downie Creek development has been carried on to a considerable extent. The Keystone group shows large deposits of high-grade galena, as does also the Silver Shield group. Rich gold carbonates have also been discovered on Keystone Mountain.

On the north side of Downie Creek a remarkable copper property has been located. Nature has here been generous in assisting in development, the lead over the length of four claims being cut by six slides. Three of these slides in particular show the ledge to be over twenty-five feet wide carrying beautiful ore. The slides have in places disclosed a depth of from 100 to 200 feet on the ore, and show a continuous vein for the length of four claims (6,000 feet) in places exposing valuable copper ore to a remarkable degree. The ore here is similar to that of the Standard group.

Then farther north above Goldstream, flowing into the Columbia from the east, some 60 miles north of Revelstoke, lies the Ground Hog basin. Here as yet but little work has been done, but that performed gives great promise of the existence of large bodies of free milling ore. Lying yet again north large deposits of mica have been discovered. The mica is of the best quality and very large in size, the veins being clearly defined. Considerable prospecting work has been done from time to time with good results. The lack of transportation facilities has been an almost insurmountable drawback, but with a steamer plying above Death Rapids this will be overcome. There are several other properties receiving attention by prospectors and individual miners.

For some time past placer mining has been carried on to a considerable extent. A few miners working individually the year round make good pay with poor facilities. The Duquesne Mining Company is carrying on extensive operations on Smith Creek, opposite Goldstream, and have a fully equipped plant. The company employs some twenty men. There are other placer properties on which work is being done, situate on Smith Creek, French Creek, McCullough Creek and Camp Creek, all about sixty miles from Revelstoke, coarse gold being from time to time brought into town from these properties. The Revelstoke and McCullough Creek Hydraulic Mining Company has recently been incorporated to acquire the Ophir and other adjoining placer leases on McCullough Creek. Work on the Ophir was discontinued owing to litigation for several years, but this now is happily ended. Large quantities of gold have been taken from this ground. The new company intend installing a hydraulic plant in the spring.

The lack of capital and proper transportation facilities has been the great drawback to the development of the vast resources of this district. The steamer has to a large extent solved the transportation problem and it must now be only a question of a very short time when capital on a large scale will discover and take hold of the opportunities offered by this rich district. The Big Bend will then occupy its proper place among the productive mining sections of the Province.

TROUT LAKE MINING DIVISION.

THE YEAR'S MINING OPERATIONS.

(By A. H. Holdich, R.S.M.)

THE Trout Lake Mining Division is a very irregularly shaped tract of country in the Lardeau District of British Columbia, taking its name from the Lake itself, which is, roughly speaking, some twenty miles long and from one to three miles wide, and is so called from the abundance of excellent fish found in it. This lake serves as a reservoir for all the numerous creeks that pour ceaselessly down the mountain sides into it, and in turn it discharges through the Lardeau River into the north end of Kootenay Lake.

The formation of the district is chiefly schist in all its various altered conditions, but bands of quartz are frequently met with, and running from southeast to northwest (acting practically as a boundary) is the well known big lime belt that forms the "Divide" between Trout Lake and Duncan River.

As may be expected, the general character of the country is extremely mountainous, with vast forests of hemlock, fir, and cedar (though not so much of that as one ascends) clothing the sides of the hills and giving an aspect of perpetual verdure, but rendering prospecting for minerals almost impossible. This undoubtedly accounts for the fact that so far all the best prospects which are likely to become mines have been located above or near the timber line and consequently are not very accessible, though of course if the property after development shows itself to be valuable capital can usually be interested to build tramways and erect such other machinery as may be needed.

This has occurred at the Nettie L., Silver Cup and Triune mines, all of which are building tramways to facilitate the handling of their ore; and in addition it is very gratifying to report that the Nettie L. has already put in a complete plant for mining by the aid of compressed air, and that the Silver Cup is preparing to do the same thing. This is the first installation of mining machinery in the district and will undoubtedly exercise an immense influence in opening up our wonderful ore bodies, to the ultimate benefit of the shareholders.

It is well worthy of note that the gold values in most of the properties are increasing as more work is done, and though it is apparently not in free milling condition, yet it adds considerably to the value of the ore and may easily turn a loss into a profit at that much abused (not without reason) institution, the smelter.

The small Vulcan smelter erected here last summer has unfortunately not proved a success; at least it has not been in blast since the first trial. Some doubts were expressed at the beginning as to its being adapted to treat our rich silver-lead ores though most probably it is well suited for low-grade copper ore, but that class of mineral is not known to exist in quantity in the district, and any furnace capable of handling the average Lardeau ore economically would do a good business.

The only mines that have been shipping any quantity of ore are the Nettie L., Silver Cup, and Triune; the amount of high-grade ore being about 800 tons from the Nettie L. during the last twelve months and some 300 tons from the Cup in the last four months. Returns from the Triune are not yet available. In addition small sample shipments of a few tons have been made from many of the smaller and less developed prospects that are scattered all over the district, but can hardly be called mines, though in time no doubt some of them will become so.

Reference has been made above to smelters, and it is not too much to say that the development of the country is seriously retarded by the excessive charges made for smelting and the continued cutting down

of the values. For instance, ten per cent. of the silver contents is deducted for a start, and this with other fines not infrequently brings the smelting charges up to 33 per cent. of the value of the ore.

It can easily be seen from this that it only pays the mine to send out the richest ore, leaving two or three times the quantity of lower grade to be treated by some method that is not so extravagant in its operation, but that method has yet to be found.

THE SLOCAN DISTRICT.

(From our own Correspondent.)

MINING production during the past year in the Slocan has not shown an increase, owing mainly, and I may say entirely, to the very low prices of both silver and lead, and also to the advanced prices of everything used in mining. The tonnage for the past year for the Slocan and Slocan City Mining Divisions will be approximately 26,000 tons, being about the same as last year. But when you consider that nearly one-third of this tonnage represents the output from the dry-ore mines, the silver-lead mines do not make a creditable showing. Mining in the vicinity of Sandon has been exceedingly dull and at the present time of writing there are less than 300 miners employed in this neighbourhood. We hope, however, to get some relief from the Dominion Government, who has been asked to increase the duties on the importation of lead products into Canada. Furthermore, it is believed that the situation will be improved by the demand that now arises for our zinc ores. The price of zinc has risen considerably of late, and already several small trial shipments have been sent forward to Iola, Kansas. I do not, however, think that it will help very much, as only those having high-grade zinc can afford to ship, and to bring it to a paying standard (60 per cent.), it has to be milled and roasted. The Bosun, Payne, Wakefield and Hewett are making test shipments and the Slocan Star and Ivanhoe are contemplating doing the same.

During the past year the largest productive mines have been the Arlington, 3,460 tons; American Boy, 1,092 tons; Payne, 1,802 tons; Whitewater, 2,962 tons, Enterprise, 1,960 tons; Rambler-Cariboo, 4,123 tons; Ruth, 825 tons; Bosun, 1,190 tons; Monitor, 1,136 tons.

The Ruth, Whitewater, Last Chance and Noble Five are all now practically closed and what few men are working in the camp are doing development work and getting out just enough ore to pay running expenses. The lawsuits pending between the Slocan Star and Star Milling Co. (Rabbit-Paw) and Last Chance v. Noble Five may possibly account for the fact that these properties are not being operated.

The Monitor at Three Forks, which carries about \$8.00 in gold besides high values in both silver and lead, has done remarkably well during the past year. Excellent ore has been encountered in the lowest level, and when connections are made it will be practicable to load the ore direct into C. P. R. cars. It

is doubtful, however, whether the mine will ship this winter with lead at \$1.30 and silver 47 cents. A dividend is promised from this property shortly. This group of mines is composed of: Monitor No. 2, 48.74 acres; Hustler Fraction, 28.40 acres; Portland No. 2, 41.17 acres; Friday Fraction, 18.13 acres; Keewatis, 46.63. The owners are the Monitor and Ajax Fraction, Limited, of London, England. They purchased the Monitor and Hustler Fraction in September, 1900, for the price of \$125,000. The other claims have been obtained since. When the purchase was made the original owners had already taken out from the Monitor alone 688 tons of ore which netted to them the sum of \$68,869.60. This group is situated on the Nakusp & Slocan Railway, a branch line of the Canadian Pacific Railway, which makes it probably the best located in the district for economical exploitation. So far development was directed on the Monitor and Hustler Fraction only and since commencement of operations to end of November, 1902, 1,620 tons of ore have been extracted, which produced a total of \$116,712.08, the total values in the ore being as follows:

	Value.
Gold, 504.8 ozs.	\$ 9,610 55
Silver, 177,713 ozs.	91,856 03
Lead, 1,119,903 lbs.	15,245 50
Total	<u>\$116,712 08</u>

It is a very peculiar fact that although none of the mines in the Slocan division produce any gold it will be seen that the ores extracted from these mines contain high values in gold, which occurs in the lead sulphides and in much larger proportion still, in the oxides found nearer to the surface where the ledge had been exposed and the ore decomposed by atmospheric action. These mines are developed by means of adit levels, no machinery of any kind being used, and apparently none will be required for years to come. Large ore reserves have been opened up and the ore actually blocked out amounts to several thousand tons. Three thousand two hundred and fifty-seven feet of tunnelling and raises have been driven since September, 1900. The management of these properties is in the hands of Mr. Maurice Gintzburger, with Mr. A. R. Finland as superintendent, and to these gentlemen is due to a large extent the success of the company. An interim dividend of 12½ per cent. has just been declared by the company.

In McGuigan Basin the Rambler-Cariboo is working about 40 men, having cut down its force about half. The mine is now shipping only about 80 tons per month. They have not enough water during the winter to run the mill, but will begin milling the large and valuable dump they have on hand first thing in the spring.

The Surprise, Red Fox, Antoine and Washington all have small forces at work. The Antoine has a fine body of very high-grade ore going over 200 ounces to the ton. They are shipping about 75 tons per month, and working about ten men. The Red

Fox and Washington both have forces of about twelve men and are shipping about 40 tons per month.

The Silver Glance, near Bear Lake, is another new shipper. It has a very fine showing of rich sulphurets and carbonate ore. The returns from one car went over \$3,200. This property is owned in Nelson and Kaslo. The ore is at the present time exceptionally good, as it carries very little lead and consequently the freight and treatment rates are low.

The Hope, an adjoining property to the Ruth, is working a small development force and shipping about two cars of high-grade carbonates per month. This ore is very acceptable to the smelters.

The Ivanhoe, owned by the Minnesota Silver Co., has been developing all summer with a force of about twenty men. The mill has been in operation occasionally. They have of late been making a zinc product and have on hand about 300 tons. Large bodies of concentrating ore are blocked out in the mine, but present prices hardly justify shipment.

The American Boy is shipping regularly about 100 tons monthly and employing about twenty men. The mine is looking well and the values of late have increased. The ore is being shipped over the Noble Five tramway and then it is sent out over the K. & S. Ry. The mine has in one place nearly four feet of good ore.

The Sunset, situated above Cody, has shipped about 250 tons of ore since the rawhiding season of last year. Mr. G. Hughes, the principal owner, has decided to suspend shipments and continue development work. The mine is looking very well and has large bodies of high-grade ore blocked out ready for shipment. The ore in carload lots averages in values 135 ounces in silver and about 76 per cent. lead—about two ounces of silver to the one per cent. in lead. An aerial tramway will in all probability be installed at this property in the spring. Within the last eighteen months this property has paid \$55,000 in dividends and been largely developed. In addition necessary buildings have been erected and there is also a surplus in the treasury. Mr. Hughes, who is the fortunate owner of half of this property, has just sold a quarter interest in the Idaho mines for \$75,000. The fact of such a price (cash) being paid for this interest during these times is indicative of the high value of the property. Mr. Hughes has been the manager of this property for over five years, and we sincerely hope he will not now sever his connection with the Slocan, as he will be very greatly missed. It was in a great sense due to his efforts in the pioneer days that the Slocan became the camp it is to-day.

The camp is meanwhile anxiously waiting the decision of the Dominion Government as to the steps that will be taken to place lead mining in this country on a more satisfactory footing.

THE HISTORY AND PROGRESS OF MINING IN THE BOUNDARY DISTRICT.

(By E. Jacobs.)

THE Boundary District, as the portion of British Columbia here under notice is becoming more generally designated, comprises the southeast part of what is officially known as the Yale District. It is, however, quite distinct from the main section of what is commonly referred to as Yale, as too, is it from the West Kootenay District. Mountain ranges effectually separate it from these two districts, although for political purposes it has heretofore been a part of the one or the other, first of South East Yale, and more recently of Rossland Riding of West Kootenay electoral district. It extends, approximately, from the summit of the divide between the Columbia River and Christina Lake, on the east, to that between the Okanagan and Kettle River valleys, on the west, comprising within these limits the valleys of Christina Lake, north fork of Kettle River, Boundary Creek, main Kettle River, and of all streams tributary to these waters, together with a considerable area of intervening mountainous country. East and west the district extends, in an air line, from 50 to 60 miles, whilst it covers some 40 to 50 miles of country north from the international boundary line.

HISTORY.

The early history of the Boundary country is associated with placer mining, for outside of a few scattered trappers seeking furs its population, sparse until recent years, excepting during brief periods of placer excitement, consisted chiefly of hardy seekers after the alluring placer gold. The first reports of the existence of gold came from men employed some time in the fifties in connection with the location and survey of the 49th parallel, which had eventually come to be agreed upon as the boundary line between Canada and the United States. Some of these men found gold in the Similkameen River, near where the boundary line crossed that stream. Later, gold was found in Rock Creek, within a couple of hours' drive of what is now the heart of the most prominent copper producing camp in Canada. It is difficult to obtain reliable information as to either the number of miners at work or the quantity of gold produced in those early days. All that is really known is that in the early sixties Rock Creek was worked by numbers of men, many of whom secured comparatively large quantities of gold. Boundary Creek also had some attention along about a mile of its course. Nearly twenty years elapsed though, the "diggings" meanwhile having had only intermittent notice from white men, though Chinese persistently worked it, before the source of the gold was sought. In 1883 an enterprising prospector, named F. W. Goericke, came up from Yakima, Washington, prospecting along the eastern slopes of the Cascade range. He reached the Similkameen, crossed over to the Okanagan, which he forded below where now Fairview camp is located, and headed for Old Baldy, a prominent mountain landmark on the divide between the Okanagan and

the west fork of Kettle River. There were at the time settlers at Osoyoos Lake and lower down the Okanagan River, but Goericke did not know this. The following year, however, he came up again, and this time he happened on some of them. At that time (1884) Hiram F. Smith, known among the old-timers as "Okanagan Smith," kept a store near Osoyoos, on the boundary line, and here Goericke



A Glory Hole at the Snowshoe Mine.

met one George Washington Runnels, known as "Tenas George," who told him of the Rock Creek placers. Goericke took little interest in placering; he was looking for gold quartz, so he arranged for Tenas George to take him to the head of the placers on Rock Creek, so that he might seek the lodes from which the placer gold had come. Within a quarter of a mile above the highest placer workings he found some "float" in the creek, and climbing the steep hillside discovered, about 100 feet above the bed of the creek, a decomposed quartz vein. He staked a claim, which he named the Victoria, and Tenas George staked one adjoining, naming it the Washington. (The Victoria was recorded at Kamloops in either the spring or summer of 1884, and was kept on continuous records until it was Crown-granted three years later, so it is the oldest mineral claim on record in the Boundary country. The Washington was allowed to run out, but was re-staked in 1887 by Henry Nicholson, who called it the Old England.) Goericke immediately returned to Osoyoos, where the late Judge Haynes and Mr. C. B. Bash were customs officers for Canada and the United States respectively,

and these gentlemen agreed to supply money for the development of the Victoria, acquiring an interest in it in return. Mr. Bash is living on the property today, representing the Rock Creek Mines, Ltd., of Victoria, B.C., the present owners, for whom he was manager whilst the company was working the mine.

The Cariboo, Amelia, and other Camp McKinney claims, now owned by the Cariboo McKinney Mining & Milling Company, were discovered and located in 1885. It was either in that year or a year or so earlier that Geo. D. Leyson and two others located the ground now partly covered by the Big Copper, in Copper Camp, six miles west of Greenwood, but this claim was neither worked nor long held in those early days. The None Such, near Boundary Falls, was located by W. T. Smith in 1886, and this claim has been on continuous record ever since. In 1893-4 ore from the Elkhorn, Providence, Defiance, D. A., Skylark, the American Boy, all situate near Greenwood, was taken over Boundary Mountain to Grand Prairie on pack horses and hauled thence to Marcus for shipment by rail to the smelter on Puget Sound, and so high did it run in gold and silver that even after paying a freight and treatment rate totalling, including cost of packing, more than \$30 per ton, there re-



Quarrying at the Mother Lode.

maintained a satisfactory margin of profit. But the narrow veins yielding this ore were so uncertain in their occurrence, occasionally pinching out, that after a while work on them was discontinued, and it was only lately that attention was once again turned to them. In 1896 the opening up of the big ore bodies on the Mother Lode, Old Ironsides and Knob Hill claims was begun in earnest. The Jewel commenced work

in 1897, as also did the B. C., large quantities of the ore from which latter mine have returned more than twice as high a percentage of copper than those of the other mines of the district, the King Solomon excepted. The Sunset and Snowshoe came later, and now the Emma gives much promise of becoming a big mine. Among others the City of Paris, No. 7, Winnipeg, Golden Crown, Athelstan, R. Bell, Brooklyn group, King Solomon, and Carmi opened up their ore deposits and shipped ore, but all of these mines are inoperative at the present time.

TOPOGRAPHY AND CLIMATE.

Turning now to the physical features of the country the district is generally mountainous, though few of its mountains exceed 5,000 feet in height. Nearly all

district have been receiving the attention of the Canadian Geological Survey during the two years last past. Mr. R. W. Brock, geologist, who was in charge of the party examining the district, in a paper on "The Ore Deposits of the Boundary District, B.C.," read before the Canadian Mining Institute last March and published in the May issue of the British Columbia MINING RECORD, dealt at some length with the geology and mineralogy of the district. Space limitations prevent more than short extracts from his observations being here given. He describes the geological structure of the district as being complex. "Eruptive rocks, including granites, greenstones, lavas (and associated tuffs) and various intrusive dykes, have the widest distribution. More or less altered sedimentary rocks (limestones, argillites,



Ore Dumps and Glory Hole at the Snowshoe.

of them are easily accessible to their summits. They are mostly clothed with forest trees, but their western and southern slopes are often open, affording good pasturage. Though not rugged, these hills are not easy to prospect, on account of the covering of drift that conceals the rocks over a considerable portion of the surface. The valleys and some of the foothills are adapted for agricultural and horticultural purposes, though comparatively little of the land has as yet been cultivated. The climate is excellent, extremes of heat or cold seldom being experienced, with summer and winter seasons usually mild. The snow lies on the ground during only three to four months of the year and the precipitation is light. The official and meteorological records show the mean temperature for the year to be from 40 to 45 degrees, and the rainfall about 13 inches.

GEOLOGY.

The topography, geology, and mineralogy of the

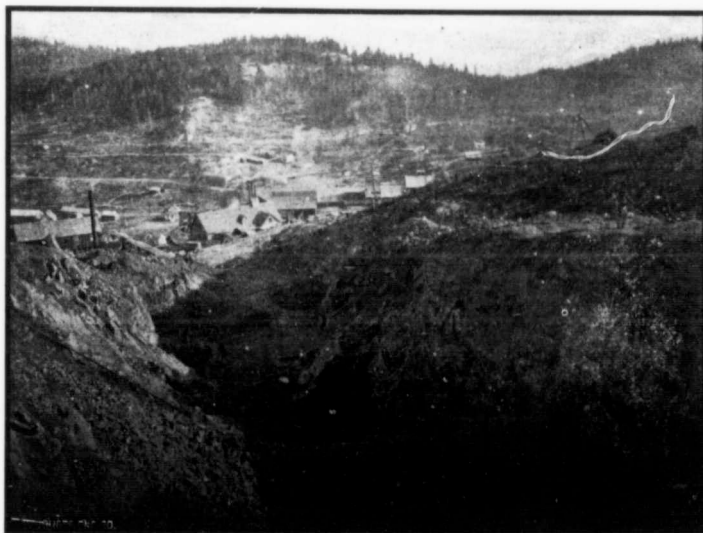
quartzites), together with more highly altered metamorphosed rocks, including serpentine, are met with in all parts of the district; but do not, as a rule, have large dimensions in any one place, being usually nothing more than inclusions of older formations, caught up in the inclusive rocks. The oldest recognized in the district are the sedimentary and crystalline rocks. In the south-eastern part of the district some crystalline mica and hornblende schists and crystalline limestones occur, which resemble, lithologically, the rocks of the Archean series, but they may possibly represent, in a more highly metamorphosed form the argillites and limestones found elsewhere in the district."

MINERALOGY.

Regarding the mineralogy of the district Mr. Brock remarks: "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 deposit of the first class is their enormous size. In structure these deposits belong to the 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.* * * According to the most prominent mineral content, this class of deposits may be subdivided into a pyritic type, in which pyrrhotite and chalcopyrite, with some pyrite, are the chief minerals. Excepting that the pyrrhotite of the one is represented by the magnetite

always the case. Away from the chief centres of mineralization, while magnetite and pyrrhotite are still sometimes found, the copper and gold are sparingly present. A striking feature in the deposit is the lack of surface oxidation or alteration. A few feet, at most, below the surface of the ground the ore exhibits the same characters as are found in depth. The soil overlying a deposit is often quite unstained, offering no indication of the presence 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. This



The Knob Hill Glory Hole and Surface Workings.

in the other, these two types appear to be identical. Both replace the constituents of the country rock in the same way; both are accompanied by the same accessory and gangue minerals, and the country rock shows the same alterations in both cases. Rarely do both 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, zincblende and molybdenite; but these are in all cases subordinate in quantity. Tetrahedrite has been found on the City of Paris claim; specular iron occurs somewhat sparingly, and in one instance bismuthinite has been found. * * * 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

type is probably an oxidized and secondarily enriched form of a sulphide deposit similar to the first-named 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 or 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 neighbourhood 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,

arseno-pyrite, 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. * * * Some of the practical deductions from an examination of the ore deposits may be summarized as follows: (a) Ores may be found in any of the older rocks where the other conditions for mineralization were favourable. (b) Districts which show evidences of late disturbances, through vulcanism, manifested by intrusions of recent eruptives and heavy dyking, are promising fields for prospecting. (c) Limestone contacts in such areas should in particular be carefully prospected. (d) 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 unchanged, no loss of values is to be expected in depth."

PRODUCTIVE IMPORTANCE.

In the introductory paragraph of his paper Mr. Brock made the following reference to the importance of the Boundary as a copper-producing district: "Following upon the construction, a little more than two years ago, of the Columbia & Western Railway, and the installation, a year and a half ago, of smelters at Greenwood and Grand Forks, 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." The position of the district in this connection will be more adequately understood if a comparison be made of its copper production during the year 1901 with that of the whole Dominion for the same period, taking the official statistics for the purpose. The total for the Dominion, according to the published statement of Mr. Elfric Drew Ingall, head of the Department of Mines of the Geological Survey of Canada, was 40,951,196 lbs. That for the Grand Forks and Kettle River Mining Divisions, which practically constitute the Boundary District, was, according to the published Annual Report of the Minister of Mines for British Columbia for the year 1901, 14,511,787 lbs. These figures show that more than one-third of the copper production of Canada for 1901 came from the comparatively little-known Boundary District of British Columbia. Still more significant is the fact, as indicating that copper production is as yet only in its infancy in the district, that practically the whole of this copper came from three of the district mines, which together contributed more than nine-tenths of the total tonnage of ore the district produced last year.

ORE TONNAGE.

During the two and a half years over which ore shipments have extended nearly 1,000,000 tons of ore have been produced and shipped to the smelters, and of this large quantity more than one-half was the production of last year. The tonnage for the years 1900, 1901 and 1902, respectively, was as follows: 1900 (six months), 97,837 tons; 1901, 386,675 tons; and

1902, 519,962 tons; total, 994,474 tons. The tonnage shipped during 1902 by no means represents the full shipping capacity of the mines now in operation, for at least 100,000 tons more would have been added to last year's tonnage had it not been that owing to shortage of coke (consequent upon a disastrous explosion wrecking one of the coal mines from which the greater part of the fuel supply had been coming,) and of power (low water restricting the generation of electric power), the larger mines were compelled to keep their output of ore down to the reduced treatment capacity of the smelters, the ordinary capacity of which, with seven furnaces running, is 2,200 to 2,300 tons per diem. Taking 2,250 tons as the daily average capacity and allowing all the furnaces to be idle three days in every month, or 36 days in the year, there still remains a total treatment capacity of 740,000 tons available under favourable conditions, and that quantity of ore could be supplied by the mines now working in the district, leaving out of account others already opened up to a stage admitting of their maintaining an appreciably large steady output. Shipments of individual mines were as under:—

	Tons.
Granby Con. M. S. & P. Co.'s Old Ironsides and Knob Hill group	310,601
B. C. Copper Co.'s Mother Lode mine . . .	137,577
Snowshoe Gold & Copper Mines, Ltd.'s Snowshoe mine	20,800
Cariboo-McKinney M. & M. Co.'s Cariboo mine (Camp McKinney) (estimated) . . .	16,000
B. C. Chartered Co.'s B. C. mine	14,627
Montreal & Boston Copper Co.'s Sunset mine	8,010
Dominion Copper Co.'s Emma mine . . .	7,900
Jewel Gold Mines, Ltd.'s Jewel mine . . .	2,175
Winnipeg Mines, Ltd.'s Winnipeg mine . . .	785
Golden Crown Mines, Ltd.'s Golden Crown mine	625
No. 7 Mining Co.'s No. 7 mine	532
Providence Mining Co.'s Providence mine . .	172
Sundry small shipments	158
	519,962

For purposes of comparison the following figures, showing the tonnage of the mines that shipped more than 1,000 tons each during 1901, are given:—

	1900.	1901.	1902.	Total.
	Tons.	Tons.	Tons.	Tons.
Granby Mines	64,531	231,762	310,601	606,894
Mother Lode	5,564	99,548	137,577	242,689
B. C.	19,618	47,517	14,627	81,762
Snowshoe.	297	1,731	20,800	22,828
Sunset.	800	8,010	8,810
Emma	7,900	7,900
Jewel	160	325	2,175	2,660

The B. C. did not ship any ore during the first half of 1902. The Snowshoe and Emma did practically all of their shipping during the latter half of the year. The Sunset's output has been restricted to

making up the difference between the quantity of custom ore received at the owners' smelter and the total requirements of the smelter. The Jewel did not send out any ore during the latter half of the year.

(To be continued)

THE YEAR IN ROSSLAND.

(By Alfred W. Dyer.)

THE year in Rossland for very many reasons will be a marked one in the annals of the camp.

For the first time in its history the public has obtained an actual knowledge of the conditions. Problems which will greatly affect the future history of Rossland have been successfully attacked. The labour situation has been cleared up. The mines are on a better shipping basis than ever they were before. Both transportation rates and the price of coke have been more or less satisfactorily settled.

Beginning with the shipments, Rossland has made another record. The estimated output for the year will certainly not come under 350,000 short tons, which are distributed as follows:—

	Tons.
Le Roi	223,000
Le Roi No. 2	52,500
Centre Star	37,500
War Eagle	22,000
Giant	3,000
Velvet	1,500
Others	500
Total	350,000

The total value of this output will be found to be in the neighbourhood of \$5,250,000, giving an average of about \$15 per ton.

It will be seen that not only has the record of Rossland greatly surpassed all other records, the shipments for 1901 being well under 300,000 tons, but that the values amount to one-fifth of the total product of the whole of the province, including the coal output. Thus, Rossland has once more demonstrated the truth of its boast, that it is the premier mining camp of British Columbia.

The difficulties which faced the camp at the beginning of the year, namely, the strike, the drop in copper and stock-jobbing managership, have all been successfully met with the possible exception of the last named. As to the strike difficulty little need here be said. Operator and operative have come to the very practical conclusion that the conditions prevailing had better remain undisturbed.

The drop in copper from 17 cents to 11 cents per pound had a tremendous bearing upon the output of the camp. Ore that could at the beginning of the year be shipped straight across the vein could no longer be handled. Estimates made of the probable profits during the early months were found to be largely in excess of the actual results. So far indeed was this the case that in the premier mine, the Le Roi, the apparent return showed the mine to be working almost at a loss. Now it is well understood that the

narrower the margin of profit upon an ore the larger the incidence of the two per cent. mineral tax. This alone, therefore, was sufficient to largely curtail the output. Further, when it is considered that the transportation rates both for raw ore and for matte were much heavier here than in the mining camps of the Northwestern States of America, and yet further, when the price of coke, \$11.00 at Northport, as against \$6.00 at Trail, is also taken into account the seriousness of the situation which occurred last April is fully apparent. After long continued negotiations with the transportation companies an arrangement was made which greatly lessened the freight rates. Further, a reduction was made in the cost of coke which will bring it down to something in the neighbourhood of \$7.00 per ton. Other reductions in various directions, outside the mine, brought these various items together to a total saving of about \$1.29 per ton, or the difference between shipping at a profit and shipping at a loss. More than this, Mr. MacKenzie, manager of the Le Roi mine, discovered that it was possible, through the unexpected locations of new high-grade bodies of copper ore, to ship at a profit without gophering his main stopes. A similar policy has been followed by the Le Roi No. 2 and by the War Eagle and Centre Star mines. It is, therefore, for these reasons that the ore shipped shows an increased average value over last year. It must be understood that nearly all these mines had gone in for heavy expenditures on machinery, justified by the high price of copper, which, however, as a consequence of the strike in 1901, full advantage was not taken of and the mines were therefore left considerably in debt. To clear off this debt the high-grade ore was shipped. At the time of writing these debts have been so reduced as to remove all doubts concerning the future and there is, moreover, every prospect of dividends being paid during the forthcoming year.

But it must not be understood that these high-grade shipments can be indefinitely continued. On the other hand, it must not be deduced that the mines are being gophered. Future profitable operation depends largely on concentration and pyritic smelting, both of which problems are being successfully attacked.

During the year the Le Roi has discovered many new bodies of ore, but where high grade these bodies have been found chiefly in the upper levels. As depth is gained the copper values seem to decrease, the gold values remaining about the same, the silicious percentage in the ore increasing. This has been found to be the case at the War Eagle, the Centre Star and the Le Roi No. 2. With depth the ores have become more silicious and therefore present a difficult problem for the smelters. On the other hand, with depth the ore bodies seem to gain in extent, in permanency and in freedom from faulting. It is for this reason that concentration is so urgent a problem. The Le Roi No. 2 has shipped constantly up to the end of October, the operations being then suspended on what is generally taken to be a mandate

from London, and which has probably less to do with the mine than with the London Stock Exchange. The War Eagle and Centre Star shipped little until the end of August, but since that date, having received favourable rates from the Trail smelter, production has been maintained at the rate of about 3,000 tons per week, the Centre Star ore averaging about \$13.00 and that of the War Eagle nearly \$19.00. On the Giant mine but little work has been done; but late in the summer a new body was developed with, so far, satisfactory results. Whatever work has been done has been paid for out of the profits of the mine. The Homestake has again started work. The White Bear has been working continuously but with what results are not accurately known. The Velvet mine, like many others, has undergone a change of managership, but the new engineer, Mr. Gray, has just reported the discovery of two or three courses of \$35.00 ore, found in the upper workings.

To meet the facts as discovered a new theory is more or less generally accepted in the camp as to the conditions of deposits. It is supposed that there have been two enrichments, the second of which was heavier in copper than the first. The first enrichment was from below the second enrichment from above and does not seem to have percolated more than 500 or 600 feet from the surface. The other theory, which has also found favour with many mining engineers, is that the low values which are found below are simply due to intrusive matter which will probably be got through at further depth. Sufficient work has hardly been done to demonstrate either theory. The fact remains that at depth increasingly large bodies of ore are found which under certain conditions can be made to yield a large profit.

The ore of this camp can be divided into the silicious and into the ferruginous varieties and it is doubtful which of the two will eventually prove of the greatest value. Dealing first with the silicious ore it can readily be understood that these will yield to concentration, the silica being practically eliminated by this process. It is estimated at the present time that these silicious ores will concentrate about 10 to 1, which will give an enormous profit on \$6.00 and \$7.00 ore. Further, it will permit of even \$5.00 ore, if the two per cent. tax be eliminated, being treated at a fair profit. These silicious ores are found mainly on Red Mountain in the group known as the Le Roi No. 2, the War Eagle, Centre Star and the Le Roi. For many months past the Le Roi No. 2 and the Le Roi have been carrying on experiments in concentration with a special reference to the Elmore process. These have been conducted in England. So far have these experiments been a success that it is probable that an experimental plant will be erected by the Le Roi during 1903. The War Eagle has been carrying on experiments locally and has decided to erect a concentrating plant, which will probably be at first of small capacity, during the next few months. This should be in operation by next April or May. A host of smaller mines are awaiting the results of these experiments before proceeding to develop with a view to

ship. And in this connection it may be observed that the shipment of concentrates to the smelters will much facilitate smelting, inasmuch as less lime, and consequently less coke, will have to be used in the furnace charges. Consequently it will be possible to smelt at a profit ore of less value. It is meanwhile doubtful whether the water necessary to run these concentrators will be brought to the camp or whether the concentrators will be taken to water. As the low-grade ore bodies are of vast extent the concentrators will have to aggregate a capacity of hundreds of tons per day.

Expensive as the bringing of water to the camp will be it will probably be found far more expensive to ship the ore to concentrators on the Columbia River, a dozen miles away.

With regard to the ferruginous ores, the problem is altogether different. These ores are probably of not less extent than the silicious. Indeed the deposits on the Kootenay mine and on the Big Three (Mascot) are larger than in any other mines in camp. An output from the Kootenay alone could be made of 300 to 600 tons daily and as the tunnel work is now well over two miles in extent and the series of adits is connected with raises it is a conservative estimate to say that these ores could be mined for \$2.00 per ton. The probable average of the mine would run about \$6.00, although, of course, there are rich deposits which would greatly exceed this in value. Now iron ore is a most valuable flux in the reduction of lead and it is for this reason that so much interest has been taken by Rossland in the Slocan lead question.

The Trail smelter is reducing about 50 tons of lead ore daily. It could therefore take about 50 tons of iron ore as a flux. If the production of lead could be increased many times the present amount, the solution of the question of shipment from such mines as the Kootenay would be solved. It is for this reason that a bounty was advocated locally to the lead miner. Other influences strongly at work have rendered it probable that a duty and not a bounty on lead will become the ruling policy. The advocates of the duty on lead only pretend that its imposition would increase the home market about 9,000 tons per annum. This being the case, the ferruginous mines had to look for another solution. It was hoped at one time that the Garretson furnace would fill the requirements. More lately an examination into the chemical constituents of the ores which have been successfully treated pyritically in Mexico and in Keswick, California, have led Rossland mining men to the conclusion that some such system will solve the question for Rossland. It is well known that propositions of this nature have been laid before the London directors of such mines as the Kootenay, but although it seems indubitable that some such process will eventually be established, its present consumation seems to be deferred to the wishes of the London Stock Exchange. Indeed, generally speaking, there has been too much mining for the Stock Exchange and too little for results in the past, and, from all appearances, in the present, for the good of this camp. Apparently all

that is wanted in London is a hole in the ground and not a mine. Still these influences are losing their power and it is more than probable that 1903 will see many changes here, the ground for which changes has been well laid during 1902.

With the successful treatment of both the silicious and the ferruginous ores upon the mines already treated of, will come in a host of others developed and abandoned in the past, such as the Commander, Big Three, North Star, Georgia, Alberta, Iron Colt, Iron Horse, Virginia, City of Spokane, Monte Cristo, Cliff, St. Elmo, Gertrude, Novelty, Coxy, Evening Star, Jumbo, Abe Lincoln, and a host of others upon the southern belt.

It is to this future with its brilliant prospects that concentration borrows its great importance. Shortly speaking, the above is a resume of the actual conditions and prospects of this camp and it may easily be gathered that the future will more than make up for any shortcomings in the past.

THE YMIR DISTRICT.

(By Percy J. Gleazer.)

THE year 1902, more than any previous year, has marked a period of progress and improvement in the Ymir District. Not only has the mining industry of the section been established on a more substantial basis than heretofore but commercially and industrially the Ymir District now commands a large share of attention. The mere fact that Ymir has been made the centre of an electoral district is not perhaps a direct indication of growth, but indirectly this indicates that its contributions to provincial revenues have been sufficiently considerable to deserve separate representation. The output tax derived from the Ymir District, whilst of itself a very considerable item is by no means the largest source of Government revenue made. There are few sections in the Province from which a greater revenue is obtained from miners' licenses, recording fees, etc., a fact which, rightly read, indicates an immense future for the district. For out of the many worthy taxable prospects some at least will make mines. If, in fact, only five per cent. of the prospects in the Ymir District which are held on from year to year, eventually become producing mines, there would be work here for all the miners at present in the country, and the output would equal that of the whole Boundary District.

The natural situation of the district is a matter greatly in its favour, the facilities for mining developments on a large scale being very good. The district is in direct railroad communication with three large smelters (Northport, Trail and Nelson). Trunk wagon roads have been built up all the chief producing creeks, with branches to each mine. The surrounding mountains are densely covered with timber admirably suited to mining purposes, and water power is available in nearly all instances. The development of the timber resources has become a separate local indus-

try and two large sawmills have been established on the Salmon River, one in the Ymir town limits and the other in Salmo, eight miles south.

The geology of the district is very complex, and an extended description thereof hardly comes within the scope of this article. The chief rocks found in the district are, however, roughly divisible into four main groups: (1) The granites; (2) the dark eruptives and associated fragmental rocks; (3) a schistose series (of exceptional thickness) including schists, slates, crystalline limestones, dolomites and quartzites; (4) the basal Shuswap series.

The oldest eruptive rock is the diorite, after which come the granites and porphyrites, and finally a system of basic dykes which form a regular network over the country, and are found associated with the veins in many developed properties. Usually the dykes occur almost at right angles to the veins cutting through and often dislocating them, but in a few cases they follow the course of the vein. Such dykes are very noticeable in the Ymir, Bluecock and Tamarc mines.

Coming now to the individual mines, the best-known is, of course, the Ymir mine. During the first year the total net profit has been about \$75,000 only, as against four times that amount in 1901. During the early part of the year the output was greatly curtailed in consequence of the excess of water in the deep workings. Instead of installing expensive new machinery it was determined to wait until such times as connection should be made between the shaft and the tunnel on the 1,000-foot level when the mine would have a natural drain. Consequently a proportion of the stamp batteries have been idle during the year. Further, a slight diminution in the grade of the ore, together with the general decrease in the price of silver and lead have materially affected the net product. The tunnel on the 1,000-foot level reached the vein at a distance of 2,100 feet from the portal at the mill in April last. At the point in the vein which was there encountered the ore was found to carry no payable values. Acting on the surmise that the ore body had an eastern trend, drifting was continued in that direction. When apprised of this conditions of affairs, the directors sent out Mr. Edward Hooper, the well-known English expert, to make a thorough investigation. In his report Mr. Hooper stated his opinion (in which he concurred with Mr. Fowler, the company's engineer) that the ore chute had a trend towards the east, and further stated that at the easternmost face of the drift on the 1,000-foot level, the average value was \$7.50 or were up to the average mill stuff already so profitably handled. Since then developments have chiefly been directed towards making the connection with the upper workings, and when this is accomplished there is every probability that the mine will resume its full rate of output and be as profitable as in 1901. The cyanide plant, which was placed in operation this year, is working satisfactory and is affecting a greater saving than originally estimated.

Three miles further up Wild Horse Creek lies the

Wilcox mine, where the new stamp mill is, at this present time of writing, making its initial run. This property is owned and operated by the Broken Hill Mining and Development Co., a local incorporation, and has been extensively developed during the past three years with the result that large bodies of high-grade ore have been placed in sight. Shipments of crude ore to the smelter from the Fourth of July vein on this property have returned the company as high as \$75 per ton. In this vein there is a large chute of ore which will average \$40 per ton, whilst on the Wilcox veins blocks of ore averaging \$11 to \$13 per ton have been developed. An aerial tramway brings the ore from the Fourth of July tunnels to the mill, which is of the "two-two" triple discharge type, equal in capacity to a ten-stamp single discharge mill.

Two miles past the Wilcox lies the Foghorn mine, operated by the Golden Monarch Mining and Milling Company of Spokane. This property has been continuously developed during the past two years. It is traversed by several parallel veins which have been shown up on the surface by prospect shafts. In one of these shafts a magnificent showing of free gold rock was obtained. A tunnel has been driven to cross-cut these veins at depth, and is now in nearly 800 feet. The first vein was encountered in the spring of the year, when a fine body of ore was passed through. The tunnel, however, was pushed ahead to reach the rich vein mentioned above, and it was found that the rock was all more or less mineralized between the two main veins. One section forty-five feet wide was passed through, all of which is a fine concentrating ore, while several smaller sections of richer ore were also traversed. As this ore is shown up at a depth of about 450 feet below the surface, it will readily be seen that the Golden Monarch has an immense deposit of ore, capable of quick development, so that at almost any time a considerable rate of output can be commenced and steadily maintained. The plans of the company include the erection of a large concentrating plant next spring.

In the Porcupine Creek section the Active Gold Mining Company, of Cincinnati, is operating the Union Jack mine. About 1,000 feet of development has been done and good bodies of ore, principally galena and zinc blende, shown up. The company is putting in a couple of Durham electric drills, the first to be installed in this district. The power is derived from the south fork of Porcupine Creek, whence it is transmitted to the generators by means of a flume and Pelton wheel and sufficient will be generated to run the machinery at the mine, and in addition supply electric light to the town of Ymir should it be deemed advisable later on. The Government finished the construction of a first-class waggon road up Porcupine Creek this summer reaching from the railroad to the power house at the Union Jack mine, a distance of six miles. The Active Company has purchased some 5,000 acres of magnificent timber in the Porcupine Valley and are contemplating erecting a sawmill near the mouth of the creek.

The Hunter V. mine lies on the divide between

Porcupine and Hidden Creeks, and until recently was owned and operated by William Davis, well known to the South African mining coterie. It has now been acquired by a new incorporation of Nelson capitalists known as the Standard Development Syndicate, which is now actively prosecuting development work. The group consists of the Hunter V. and Double Standard claims, on the latter of which a fine strike of native silver ore has just been made. Some 500 tons of rich ore has been got out, and is being sacked and rawhided down to the railroad as fast as possible. This property is greatly handicapped by the want of a waggon road, the lack of which has hitherto prevented shipments except during the winter. Next year this difficulty will probably be removed.

A year ago Messrs. Holmes, Cameron, Hopkins and Forin secured a lease on the Queen mine, which adjoins the Yellowstone. The mill at the latter property not being in use, they rented it and constructed a tramway from the Queen workings thereto. Since then, until the present time of writing, the property has been working continuously and has produced a large quantity of ore. The four lessees are reported to have each made a net profit of from \$6,000 to \$7,000.

In the Erie section of the district lying ten miles south of Ymir the Arlington and Second Relief mills have been running steadily although the latter is now temporarily closed. The Arlington has produced some 8,000 tons of ore with a net profit in the neighbourhood of \$25,000.

On the north fork of the Salmon River in the same section there has been quite a placer excitement during the year, and two large companies have been formed to prosecute hydraulicing. On some of the claims the owners are reported to have washed out as much as \$15 per day per man.

From these brief descriptions of the principal mines of the Ymir section, it will be seen that during 1903 at least five mills may be expected to be in steady operation. These mills have a capacity of over 10,000 tons per month and besides the shipment of crude ore are being made or will be made during the year from the Wilcox, Foghorn and Hunter V. mines. It may, therefore, be confidently anticipated that the total output during the coming year will not be less than 100,000 tons of ore, which it must be remembered, is mostly free-milling and of higher grade than that of the Rossland and Boundary camps. Nevertheless it is evident, and has been remarked by many visiting experts, that the present actual number of working mines is but a small fraction of what may be expected to assume that stage later. The mineral wealth of the district has practically only been scratched and it is safe to say that there are many properties now only in the prospect stage, which have as good and better surface showings than the mines now producing. During 1903 many of these will doubtless come to the front and with further exploitation many new potential shippers will become actual producers. With all this potentated wealth awaiting exploitation, and its many natural advantages, the great future

which lies before the Ymir District can hardly be overestimated.

THE FUTURE OF THE COAL AND COKE SUPPLY OF THE INTERIOR OF BRITISH COLUMBIA.

(By W. Blakemore, M.E., Fernie, B.C.)

THE future prosperity of this Province depends on an abundant supply of the best quality of fuel at a low price. This controlling factor is determined by two conditions—the general low grade value of our ores, and the fact that the geological formation forbids the existence of coal in proximity to the metalliferous deposits, and so involves more or less costly transportation. This governs the conduct of our mining industry absolutely, and, as I shall be able to show further on, is of equal force as applied to other important industries that may be established, the only important consumers of fuel not likely to be handicapped in this respect being the railways, and that because the matter of quality is not so important as in the case of smelting and manufacturing.

Steam Fuel.—As there can be no considerable development without railway transportation, it may be well to consider first how our coal deposits will serve existing and prospective railways in British Columbia. The natural surface conditions will probably limit railway construction from east to west to three lines. In the north, the Canadian Northern, from the Yellowhead Pass to the Coast. In the centre, the Canadian Pacific, from the Kicking Horse pass to Vancouver, and in the south, the Crow's Nest Pass, with some continuation of the same by way of the Similkameen Valley to Vancouver. The difficulties and the cost of building across the mountain ranges of this Province are sure to militate against more than these. The natural method of serving the interior will be by means of branch lines running north and south between the mountain ranges. In order that transportation may be as cheap as possible, it is necessary that these main lines should pass through or near to large coal deposits of suitable quality for steaming; at any rate this is a present necessity, and will remain so until some day, in the possibly not very distant future, when our magnificent water powers are harnessed to electric locomotion.

The main line of the C. P. R. has hitherto been well served with fuel by the Canmore mines, and it is likely that for at least ten years these will continue to furnish all that may be required. The unworked area, however, is not large, and already it is time to look further afield. On the eastern slope of the Rockies, eight miles west of Calgary, we have exposures of coal seams running north and south which are probably continuations of the large bituminous coal field lying to the south. Little or no development work has been done at this point, but the exposures are consistent with the theory named, and I have little doubt that a season's work would show up a series

of seams of good quality. A line can be gotten as to this by examining the coal at Sheep Creek, which, though inferior to that at Canmore, is still of fair quality and such as could well be used in the absence of a higher grade. Recent investigations convince me that the coals found in the Blairmore district and as far south as the entrance to North Kootenay Pass continue northwards parallel to the Rockies far beyond the Yellowhead Pass, and, if so, although they are on the Alberta side, they are in an ideal position to furnish steam fuel for the main lines at least half way across the Province of British Columbia.

As far as the Canadian Northern is concerned, no portion of this system has yet been constructed, but the route has been surveyed from the Yellowhead Pass to the coast, and at three points, at least, good steam coal has been located in large quantities. Two hundred miles east of the Pass, upon the Saskatchewan River, a high-class lignitic coal has been discovered, yielding on analysis—

Fixed carbon	52 per cent.
Volatile combustible matter	35 "
Ash	12 "

This is about the same grade as the Lethbridge coal, of which more than 1,000 tons a day is mined in the season for steam and domestic purposes, and which is a far superior coal to that used by the Great Northern south of the International line.

At a point 200 miles west of the Yellowhead Pass, outcroppings have been met with by the surveyors, and at the moment these are being traced. They no doubt represent the northern continuation of the cretaceous measures, and, if so, the quality will be that of a high-grade bituminous coal, and the only question will be as to the extent.

On the Pacific Coast, 400 miles north of Vancouver, there are extensive coal seams near the route of the proposed railway. The measures run north and south, and the average of several samples recently taken by a reliable expert shows:

Fixed carbon	54 per cent.
Volatile combustible matter	37 "
Ash	14 "

This coal, although high in ash, compares favourably with the fuel recently used on American lines in the West.

Coming to the Crow's Nest Pass line and prospective continuation to the Coast, we have the highest grade of steam coal known on this continent in the Crow's Nest Pass and its extensions, and it is not necessary that I should say anything about it except that its only limitation as a railway fuel is one of distance. It will always control the market for this purpose as far west as the Arrow Lakes, but recent discoveries farther west tend to show that, as the Columbia and Kootenay extension is built, it will open up new coal fields, which, by reason of their shorter haul, will secure this trade.

On the north fork of Kettle River, outcroppings of high-class bituminous coal have been found and are

being traced. My own analysis of a sample taken from a 4-foot seam gives:

Fixed carbon	62.6 per cent.
Volatile combustible matter	29.6 "
Ash	7.8 "

If any considerable quantity of such a fuel as this can be found, it will dominate the steam coal trade from the Okanagan Lakes east to the Arrow Lakes, but it lies nearly 100 miles north of the Boundary District, and out of the route of the proposed railway, although it can only be a question of time until a branch is constructed up the Kettle River. Farther west we have two well-defined coal fields near Princeton and Nicola. The former, with Ashnola as its centre, is undoubtedly upon the route of any railway from the Boundary District to the Coast, as such a railway must pass up the Similkameen Valley at least as far as Princeton, whatever route it may take thence westwards. Here we have a well-defined coal basin, eight miles from east to west and ten to twelve miles from north to south. Many seams of lignitic coal outcrop, of which a fair average analysis gives:

Fixed Carbon	42.0 per cent.
Volatile combustible matter	42.7 "
Ash	3.0 "

In the absence of a better fuel this would be used by the railway from the Boundary District to the Hepe Mountains. Only a month ago, however a 9-foot seam of good coal was bored through at a depth of 625 feet, which yielded:

Fixed carbon	54 per cent.
Volatile combustible matter	23 "
Ash	8 "

This is full of promise for the future and there are, doubtless, other seams of equal if not superior quality. Thus, the supply of an excellent steam coal for the Columbia and Kootenay is assured.

At Nicola (near which the projected railway will pass if it joins the main line of the C. P. R. at Spence's Bridge) there is an extensive coal field, probably of the same character as the Princeton basin, which would be easily available.

If in connection with these various sources of supply it be borne in mind that we have extensive coal mines in full operation on Vancouver Island, you will see that every part of the Province is well furnished with good steam fuel, and that the first essential for cheap transportation abounds wherever an important railway is likely to be constructed. I estimate that on the Canadian Northern the maximum haul of steam fuel within the Province will not exceed 250 miles; on the main line of the C. P. R., 200; and on the Crow's Nest line, 150. This should give fuel at an actual cost ranging from \$2.00 to \$3.00 a ton, a figure which would certainly be favourable for the development of the Province on the lines of cheap transportation. These figures take no account of other discoveries which will be made in the near future, as there are abundant evidences that there is a continuity in the coal seams of the Rockies, from Mexico to the Yukon; and there are few valleys of

British Columbia in which some traces of these does not exist.

Smelting Fuel.—We now have to consider the subject of smelting fuel and probably this will appeal more directly to our members because it "comes home." Without cheap and good smelting fuel the mining industry of British Columbia would come to a standstill. The men who were reviled in 1895 for pronouncing our ores "low grade" have had an ample revenge, and it is now not merely a proven, but an acknowledged fact. Transportation and treatment on Rossland ores have been reduced from \$13 to less than \$5 a ton, and shipping values from \$25 or \$30 or \$8 or \$10. To this result the Crow's Nest coal and coke have contributed not a little, having brought the delivered price of the former down from \$12 to \$4, and the latter from \$17 to \$6. During this period we have learnt many things, and some yet remain to be learnt. It must now be admitted that our ores are so low grade that every cent in cost tells and that to develop the industry will require the cheapest fuel that can be obtained. Take for example the great self-fluxing copper district, the Boundary. Is it taking too low an estimate to say that with the exception of a few rich chutes, which may run to \$7 or even \$8, the vast bodies of ore in that camp will not exceed \$4? If this is so, and if, as Dr. Ledoux says, fuel represents 65 per cent. of a total smelting cost of \$2, then every dollar saved in fuel would mean about 25 cents on the ton of ore treated, a sum which probably represents the difference between profit and loss, since it is admitted on all hands, and confirmed by the highest experts, that everything has been done in the way of appliances and economic management to reduce the cost of treatment to the lowest possible figure.

Let us enquire, then, how the future of smelting in British Columbia is likely to be affected by the fuel question. This practically resolves itself into the enquiry—how can smelting fuel be still further cheapened? There is only one way, by competition. This involves the development of other coal fields and the liberation of some portion of the Government coal lands in the Crow's Nest Pass.

First, as to the opening up of other coal fields. At the moment of writing there is, so far as I know, only one place in the interior of British Columbia (outside the Crow's Nest Pass) where coal of a suitable quality for making a first-class smelting coke has been found, viz., on the north fork of the Kettle River. The analysis was given under the heading of "steam fuel." If this deposit should be large enough the quality is all right, and the location being only about 100 miles from the Boundary District, would give it an advantage of at least \$1.50 in cost of transportation and would save 40 cents a ton in treating the ore.

The same coal would serve any smelters that might be erected further west in the event of no coking coal being found in the Similkameen or Nicola Valleys, where it is certain there are valuable copper ores and at least three promising camps—Twenty-mile Creek, Copper Mountain and Aspen Grove.

For any relief in the cost of fuel in East Kootenay

and the eastern camps of West Kootenay, we have to look to the Crow's Nest Pass coal field. Leaving for later consideration the Blairmore section of this (because it is in Alberta) we are confined to three sections, viz., the coal areas owned and operated by the Crow's Nest Pass Coal Co.; those lying to the south beyond the B. C. Southern Reserve in the neighbourhood of Lodgepole Creek, Greenhills and Wigwam River; and the 50,000 acres recently selected by the Dominion Government. The former are being developed slowly and having regard to the statement made by the managing director that in addition to the home market the Great Northern Company require 10,000 tons a day, it is not likely that this demand will be overcome for many years. In addition, the liability to accidents like the recent deplorable disaster, and to strikes, renders it extremely undesirable that the fuel supply upon which every industry in the Kootenays depends should be in the hands of any one firm, however competent and well-meaning. Then there is the impossibility of getting the lowest possible price from a monopoly. At the moment the charge for fuel is \$2 and for coke \$4 a ton at the ovens. As I shall show, effective competition would reduce these figures to \$1.50 and \$3 at the ovens, and possibly a little lower. The actual cost of shipping one ton of coal need not exceed \$1 and will almost certainly be less after allowing for every item of charge. This would give coke at a cost of \$2.25 to \$2.50 and leave a margin of 50 cents profit on coal and 75 cents on coke, which is at least double the average rate of profit on coal and coke in the Eastern States or in England over the last twenty years. The present British Columbia consumption of Crow's Nest coal is 1,000 tons and of coke 300 tons a day, and a reduction such as the above would mean a saving to the industry of the Kootenays (and mainly to the mining industry) of about \$1,000 a day or \$300,000 a year. As the country is growing so rapidly this tonnage would be largely increased in the near future. From what areas could fuel be produced at these figures? Possibly from the sections south and east of the B. C. Southern reserve already referred to. That, however, is at present a matter of speculation, because nothing has been done beyond locating the coals, and until development work has been carried to a much more advanced stage it cannot be stated with certainty whether the measures are sufficiently continuous and regular to yield a large working area. In any case it will take two years to prove this and will involve the building of a branch railway nearly thirty miles up Lodgepole Creek.

If, however, the Government would liberate say 5,000 acres of their selection adjoining and on the south side of Morrissey, all the conditions exist to bring about the result I have foreshadowed. At this point the coal seams of the basin are exposed and are most accessible. The measures are regular and dip under uniform strata to the east for several miles until they meet the eastern unthrow which terminates the basin. From exploratory workings conducted here

last season I got samples yielding the following analysis:—

No. 1—18-foot seam—

Fixed carbon	78.7 per cent.
Volatile matter	17.0 "
Ash	4.3 "

No. 2—4-foot seam—

Fixed carbon	77.3 per cent.
Volatile matter	18.4 "
Ash	2.8 "

These figures show that the celebrated coals of the Crow's Nest Pass are at their best on Morrissey Creek, as a comparison with the following samples taken from two other points in the Pass indicates:

Fernie—6-foot seam—

Fixed carbon	69.14 per cent.
Volatile matter	25.45 "
Ash	3.62 "

Michel—14-foot seam—

Fixed carbon	62.40 per cent.
Volatile matter	24.10 "
Ash	12.05 "

This is the only point where coal of equal quality to the best Fernie coal has been discovered and explored sufficiently to enable me to speak with certainty of its extent, and in this view I am confirmed by Mr. J. McEvoy, former Government Geologist. In the interests of the Province, and especially of the mining and smelting industry, no effort should be spared to induce the Government to place this area on the market. There is no legal impediment or obligation in the way and I have little doubt that an unanimous request would attain a result so important to the future of the Kootenays in particular.

This brings me to consider another source from which relief may come in any case through the ordinary healthy channels of competition. I refer to the Blairmore coal field. Having done most of the prospecting work that has been done here this year I am able to give you the latest information. Here we have what I believe to be the same series of coal measures as are found in the Pass, only instead of having been uplifted in the form of an elongated basin or trough they are uplifted and fractured in longitudinal lines and exposed in ridges running north and south, or nearly so, parallel with the Rockies. The result is much folding and duplication, but at the same time many more exposures of the same seam, and increased facility of access.

These conditions have been proved in extensive properties owned and controlled by Mr. Leslie Hill, Mr. T. G. Proctor, Messrs. McVittie and Leitch, Messrs. Davenport and Paine, and others. The coal seams which correspond in thickness and occurrence with those of Fernie and Morrissey have been traced from the entrance to the North Kootenay Pass, where Mr. J. J. Hill has secured 10,000 acres, to a point 20 miles north of Blairmore. Messrs. Frank and Geho have developed a successful mine on the east side of Turtle Mountain, which has already attained an output of 800 tons a day, the coal being excellent for

steam purposes. My own object in taking up certain bonds in this important coal field was to determine its character for coking purposes and to ascertain how it compared with Fernie coal. The result you can best judge from the following analyses taken by me from comparatively shallow workings, the ash is certain to be less at greater depth:

	Fixed	Car.	Volatile	Ash.
No. 1.	63.4	29.1	7.4	
No. 2.	64.5	26.5	9.0	
No. 3.	67.7	25.5	6.8	
No. 4 (20 miles north of Blairmore).	58.9	28.5	11.8	
No. 5.	60.3	31.3	7.4	

Samples Nos. 1, 2 and 3 are all first-class coking coals; Nos. 4 and 5 good steam.

This coal field is so near to the Province of British Columbia that it will seek its natural market there for coal and coke, especially the latter, and the mode of occurrence of the seams being more favourable for cheap working than in the Pass, there is no reason why the cost of production may not offset the extra transportation, a matter of 30 to 50 miles. At any rate I am convinced that in less than two years from date we shall see coal and coke of satisfactory quality being produced in this district at the figures I have already named, to the enormous benefit of the various industries of Southern British Columbia.

PROGRESS AND DEVELOPMENT OF THE COMOX COLLIERIES DURING THE YEAR.

(By John Matthews.)

MINING here during 1902 has been marked by a comparative freedom from accidents. The mines have been worked continuously, notwithstanding the keen competition of fuel oil in the California market. The high grade of this coal as a steam fuel insures it a ready market. The output for the year has been above the average and the outlook for the incoming year is better. There has been considerable development work done during the year; a railroad four miles in length has been constructed to connect No. 8 slope to the main line. No. 8 is a new mine and will be opened out by two slopes. It is situated two miles in a northerly direction from No. 4 slope. The ground was examined by the writer early in the spring, and the configuration of the surface was such that led to the conviction that coal would be found near the surface. A diamond drill was sent to the new prospect, and the work of boring pushed, which resulted in the main seam being discovered at a depth of a hundred feet from the surface. Four holes were put down, the last one which was 1,200 feet from the first hole, in the direction of the dip of the seam, struck the coal at a depth of 188 feet. The seam proved to be of very uniform thickness, averaging four feet and dipping about 1 in 12

to the northeast. The coal was of a compact texture and very clean.

Float was found in the creeks to the west and a thorough search was made, and the strike or outcrop of the coal was traced for two miles in a westerly direction to Brown's River, where a seam four feet thick was found, exposed in the bank of the river. This coal was also found to be of an unusually compact nature. A sample of 100 pounds from here and some of the cores of coal from No. 8 were sent to the company's geologist, Mr. Sutton, at Victoria. He, after making an assay of the sample sent, pronounced the coal to be a high-grade anthracite assaying a little over 80 per cent. carbon, while the percentage of ash was very low. Mr. Sutton was up here last month and spent a week exploring the ground and after a careful survey concluded that there was at least a field of one thousand acres of anthracite coal between No. 8 and Brown's River. The strike of the coal extends in a westerly direction from Brown's River, but an opinion cannot be given as to whether or not it is anthracite, as no tests have been made as to its quality. The value of this discovery cannot be over-estimated, as it will fill a want that has been long felt on the Coast.

After the discovery of coal at No. 8 the work of developing it was vigorously pushed. A site for a slope was selected and a large gang of men put to work slashing and clearing the ground. A large well-constructed pit-head has been erected and an hoisting engine put up, and the work of driving the slopes is progressing. The slopes dip 1 in 8 and will have to be driven through the surface measures (clay) to a depth of 95 feet before reaching the seam, which will take about four months to accomplish.

There is a most sanguine feeling in the town of Cumberland, the centre of the mining district, as a result of this new discovery. The mines are working steadily, the miners are doing well, and business is prosperous. An electric lighting system has been recently installed by a private company. A High School was opened here last September. The townspeople therefore, look forward, and with sufficient reason, to a prosperous future.

MINING IN THE YUKON.

IN reviewing the mining operations in the Yukon region for the past year, the *Sun*, published at Dawson, remarks that activity has been limited to the territory known as the Klondike and Indian River districts, which, however, has already produced gold to the value of a hundred million dollars. Our contemporary proceeds to remark that if this territory, which is but a small part of the known gold-bearing area, is capable of so large a production, it is reasonable to suppose that with the country opening up on a more extensive scale, with dredges, steam shovels and other modern appliances to work the low-grade grounds and with modern machinery to work the richer claims, that the output will be on the increase

from now on and will continue to grow for many years.

Quartz, which was not taken into consideration as a product a few years ago, has now commenced to attract both local and "outside" attention with the result that important discoveries have been developed, and experts who have visited a number of the more promising locations pronounce the ledges to be of exceptional value. Already, as the official returns show, very considerable initial expenditure has been made in exploiting these finds.

The returns of the placer and quartz departments of the Gold Commissioner's office from November 1, 1901, to October, 31, 1902, are as follows:—

PLACER DEPARTMENT.

Month.	Certificates of work.	Renewals.	Locations.	Water Rights.	Paid in lieu of assessment.
1901—					
November.....	362	308	358	1	3
December.....	347	388	202	23	0
1902—					
January.....	199	225	197	0	3
February.....	274	281	129	3	1
March.....	480	398	159	3	8
April.....	420	346	156	23	5
May.....	244	200	139	32	5
June.....	373	314	190	8	5
July.....	533	588	163	8	7
August.....	498	481	367	33	12
September.....	646	603	108	13	7
October.....	562	596	106	8	4
Total.....	4938	4728	2274	155	60

QUARTZ DEPARTMENT.

Month.	Certificates of work.	Grants.	Certificates of partnership.	Assignments.	Paid in lieu of assessment.
1901—					
November.....	28	77	5	26	1
December.....	24	66	0	151	2
1902—					
January.....	13	64	2	39	1
February.....	9	56	2	21	0
March.....	24	88	8	31	3
April.....	49	46	1	35	0
May.....	54	38	7	28	2
June.....	64	90	13	48	11
July.....	122	111	16	54	1
August.....	74	153	14	83	5
September.....	142	212	12	66	3
October.....	114	148	5	104	3
Totals.....	717	1149	85	685	32

For the twelve months there were 2,055 re-locations, and during the same period 6,232 free miners' certificates were issued.

COAL EXPORTATION AND TRADE.

IN an interview the other day in Toronto Mr. Elias Rogers, a director of the Crow's Nest Coal Co., stated that a largely increased output is to be made from these collieries in the early future. The company has spent this year in addition to its previous

expenditure approximately \$1,000,000 in further development of its mines and extensions of its plant and works. These works, now nearing completion, Mr. Rogers says will have a capacity of about 10,000 tons per day, the present daily output being 2,000 tons of coal and 600 tons of coke. By April the output will be 4,000 tons of coal and a proportionate increase in coke. The increase will continue until the output is 10,000 tons a day, or as much more as is marketable. The balance of the unissued stock was sold to shareholders this month at \$62.50 or a premium of 150 per cent.

An important transaction is reported this month in the sale of the New Vancouver Coal Mining and Land Company's property and assets to a corporation known as the Western Coal Company, the capital of which is \$1,500,000. Besides the mines at Nanaimo and the extensive tract of land owned by the Vancouver Coal Company on Vancouver Island, the sale includes the fleet controlled by John Rosenfeld's Sons, the agents at San Francisco of the old company, and the coal business of Messrs. J. C. Wilson & Company. As far as can be learned, the officers of the new company are as follows: President, Mr. John Howard; Vice-President, Mr. John Wilson; Secretary, Mr. D. C. Norcross. The New Vancouver Coal Mining and Land Company was an English corporation, its head office being at 12 Old Jewry, London, and the board of directors were resident in the Old Country. The company was re-organized under the present title in 1889, the capital being £215,000, while there was also an issue of debentures, most of which have, however, been paid off.

Coal mining has been carried on in Nanaimo since 1853. In 1882, Mr. S. M. Robins took over the duties of resident superintendent for the New Vancouver Coal Co., and by his unflinching courtesy and tact has won the respect and esteem of all with whom he has been brought in contact. It is with much regret we learn that he is now about to resign this post.

Market conditions in San Francisco appear to have somewhat improved of late. Sales are being made of household coals at fairly good prices. For other grades fuel oil will permit but a small quantity to be sold, and the prices named are very low. There is a disposition on the part of oil producers to advance their prices. Contracts are now being made for delivery next year at fully 25 per cent. advance over prices of three months ago. It is reported, however, that the recent explosion of oil on board the steamer Progresso has attracted the attention of the public to the danger which accompanies oil as a fuel, and the necessity for greater care with respect to it. Hitherto there has practically been no restriction enforced with respect to the use of fuel oil on steamers. Now there will be enforced strict rules, which must be obeyed. Light oils which blazed at 85 to 100 degrees have even been used.

The exportations of coal from Vancouver Island collieries in November were as follows:— Tons.
 New Vancouver Coal Co. 33,280
 Ladysmith 24,380

Comparative Statement of work done and its cost, General Expenses included, per foot or ton to September 30, 1902.

	Oct. 1, '98 to Sept. 30, '99			Oct. 1, '99, to Sept. 30, '00			Oct. 1, '00, to Sept. 30, '01			Oct. 1 '01, to Sept. 30, '02		
	Work done, Feet or Tons.	Total Cost.	Cost per Foot or Ton.	Work done, Feet or Tons.	Total Cost.	Cost per Foot or Ton.	Work done, Feet or Tons.	Total Cost.	Cost per Foot or Ton.	Work done, Feet or Tons.	Total Cost.	Cost per Foot or Ton.
DEVELOPMENT WORK—												
General work, stations, retimbering, machinery & equipment repairs, etc.		\$ 12,223.38			\$ 15,216.59			\$ 15,663.36			\$ 13,517.06	
Sinking main shaft	344.	34,941.19	101.57	228.5	28,250.81	123.63	337.	33,415.68	99.16	362.	34,445.82	95.15
Sinking small shafts or winzes.	319.5	16,075.95	50.31	103.5	6,107.39	59.01	50.5	2,268.93	44.93	50.5	2,283.67	45.22
Raising	371.5	15,275.81	41.17	903.5	50,606.61	56.01	324.5	10,099.31	31.12	153	5,081.80	33.21
Drifting	2,375.5	56,663.59	23.85	2,421.	64,942.85	26.82	2,107.	42,927.22	20.37	3,997.5	87,664.29	21.93
Total development work	3,410.5	\$ 135,179.92		3,656.5	\$ 165,124.25		2,819.0	\$ 104,374.50		4,563.0	\$ 142,992.64	
ORE-PRODUCTION—												
Ore from development work sold—tons.	63.5			4,034.94			4,522.			1,018.166		
Ore from dumps, storage, etc.—tons.							7,774.	2,291.80	0.29			
Stoped ore sold	6,533.0	19,054.59	2.91	20,489.95	73,591.37	3.39	68,123.0	151,682.93	2.23	10,069.479	29,559.82	2.93
Total ore sold	6,596.5	\$ 19,054.59	2.89	24,524.89	\$ 73,591.37	3.00	80,419.0	153,974.73	1.91	11,087.645	29,559.82	2.67
SUMMARY—												
Expense of development, per ton of ore sold	6,596.5	135,179.92	20.49	24,524.89	165,124.25	6.73	80,419.0	104,374.50	1.30	11,087.645	142,992.64	12.89
Expense of production, per ton of ore sold	6,596.5	19,054.59	2.89	24,524.89	73,591.37	3.00	80,419.0	153,974.73	1.91	11,087.645	29,559.82	2.67
Total expenditure, per ton of ore sold	6,596.5	\$ 154,234.51	23.38	24,524.89	\$ 238,715.52	9.73	80,419.0	\$ 258,349.23	3.21	11,087.645	\$ 172,552.46	15.56

Statement showing Values and Smelting Charges, per Annum, to September 30, 1902.

For Fiscal Year Ending	Real or full assay value Total metallic contents at full N. Y. quotations	Indirect smelting charge. Difference between N. Y. quotations and smelter's price for the metals	Direct smelting charge including freight from the mine	Total smelting charge direct and indirect	Smelter's gross assay value after deducting indirect charges only	Smelter's net value after deducting both the indirect and direct charges from the real assay value (i. e. net value of ore F. O. B. cars at mine.)
Prior to October 1, 1898.				\$ 9.93	\$ 18.91	12.91
September 30th, 1899	\$ 22.84	\$ 3.93	\$ 6.00	9.33	18.91	12.91
September 30th, 1900	20.14	3.57	6.00	9.57	16.57	10.57
September 30th, 1901	18.12	3.48	6.00	9.48	14.64	8.64
September 30th, 1902	16.24	2.93	5.22	8.15	13.31	8.09

*From the Annual Report of the Centre Star Mining Company.

RECENT PUBLICATIONS.

"SONGS of an English Esau" is the title of a very attractive little volume of verse, published by Messrs. Smith, Elder & Co., London. The author, our friend, Mr. Clive Phillipps-Wolley, hardly needs an introduction to our readers. Few literary men are more widely known throughout the Province than he, and few have done more by their writings to popularize the country and advertise its resources. Many of the verses in this collection are familiar to us, two or three in fact, "Fooled" and "To Dr. George" have been published in the MINING RECORD, but in all, the keynote is the same. It is the voice of the strong singer—not always perhaps the sweet singer—but that of a truculent, forceful man, one nevertheless possessed of deep sympathetic feeling, and a large knowledge of nature. There are two distinct sides to Mr. Wolley's character, and those of us who know and understand him like and admire both. In a curious degree he combines the temperament of the sportsman and of the artist, and that is why he writes such delightful verse. Listen to this:

Colonial Esau? wouldst thou change thy pottage
For Jacob's birthright, morning air for smoke—
Take Jacob's palace for thy backwoods cottage,
His fettered feet for thine which know no yoke.

His victories won for thy delight in winning,
His wedded fortunes for the fate you woo,
His work well ended for thy work beginning,
Memories of deeds for deeds still left to do?

The tender lines "To My Wife" and "Seed Corn" might have been penned by Tennyson, the stirring sentiments in "England's Day" and "The Chain of Empire," "The Blooming of the Rose," and "To Britain's Grand Rounds," "The Sea Queen Wakes," have been uttered by Kipling in his moments of happiest inspiration. In "Failed," "The Worth of the Prize," "The Kootenay Prospector," and "Fooled" the grand lesson is taught, and that lesson is,—in better language than we are capable of clothing the sentiment:

You were not meant to win, God chose to pay
Your life the price of some position won.
What is it to the soldier, if the day
Sets on his duty done.

And if there be no crown, is that you lost
So priceless, now you see it from the goal?
Is that thy won, worth half the work it cost?
You may have won your soul.

The volume contains possibly a little too many references to colonial patriotism and loyalty. "The pride beyond all speech that seals our lips," to quote one of Mr. Wolley's own lines, aptly describes the attitude of the average Britisher. We don't talk about our love for our country and our flag. There is no need. But when the proper time comes we are not

backward as a rule in proving in deeds not by mere words that we are a patriotic nation. You will remember the story in "Stalky & Co." of the disgust and resentment of the school at being compelled to listen to the well-intentioned but vulgar vapourings of an under-bred member of Parliament who made "Patriotism" the subject of a discourse? It is true, perhaps, that when an Englishman leaves his motherland he becomes more demonstratively patriotic, and Mr. Wolley has made the most of that. One other word, the only other that can be said in the way of adverse criticism. To our mind, it would have been better if "An Invitation" had been excluded from the collection. Anybody might have written it.

Lead Smelting. The Construction, Equipment and Operation of Lead Blast Furnaces, and Observations on the Influence of Metallic Elements on Slags and the Scientific Handling of Smoke, by Malvern Wells Iles, Ph. D., etc. First edition. New York. John Wiley & Sons, London. Chapman & Hall, Limited, 1902. Price, cloth \$2.50. This work, by a man pre-eminent in his profession, will, we feel sure, be greatly appreciated by metallurgists. Dr. Iles is one of the pioneers of lead-smelting in the United States. He writes, therefore, with the experience of twenty years' practical work to his credit and possessed of a knowledge and grasp of his subject to an extent of which few men can lay claim. Although several well-known books have been published on smelting gold, silver and lead ores, the majority of these have not dealt with the hard problems which under varying conditions and environment are constantly met with in actual practice. In his present work the author endeavours to render practical assistance in the way of suggesting the best methods of overcoming such difficulties as they may arise. Nearly half the volume treats on the blast furnace, the chapter being sub-divided into sections, under such headings as "Drawings and Specifications," "Inne Lines," the "Foundations," "Water Jackets," "Power Plant," "Blowing-in," "Calculation of Charges," etc. And following chapters are occupied with a discussion of the influence of metallic elements on wall accretions, handling of smoke, metallurgical results, antimonial lead, roasting furnaces, smoke, the draft factor on lead blasting furnaces, on bag-house on hand roasting furnaces, on mechanical roasting furnaces, and on refinery furnaces. There is also a chapter on Fume Experiments and on the Bag House. What pleases us in particular is that the work contains no useless or unnecessary padding. The author plunges at once *in medias res*; he writes to the point and he manages to make his meaning clear and impart very valuable information in the fewest possible number of words.

BOOKS RECEIVED.

Annual Report of the Board of Regents of the Smithsonian Institution, showing the operations, expenditures and condition of the institution for the year ending June 30, 1901. Washington. Government Printing Office, 1902.

THE FEDERAL GOVERNMENT AND
THE SILVER-LEAD INDUSTRY.

AT a meeting of the Silver-Lead Mine Owners of East and West Kootenay, held at Sandon, British Columbia, on December 10th, 1902, the following resolution was presented by J. L. Parker, and carried unanimously:—

1. Whereas, The silver-lead industry of British Columbia, notwithstanding the usual richness of the ore, the proved continuity of the veins, and the favourable natural conditions of mining in the Province, is, and for some time has been, in a declining condition, which, if not ameliorated, will end in total stagnation. **And**

2. Whereas, the lead-mining camps of the United States, and particularly those in the adjoining state of Idaho, are, and for years have been, enjoying great prosperity, due to a protective tariff conserving the home market. **And**

3. Whereas, the silver-lead mining industry has been for some years of national importance, and, unless allowed to decline, will speedily attain to a much greater degree of importance, benefitting by its increased expenditures the trade and advancement of both Eastern and Western Canada. **And**

4. Whereas, our domestic market for the manufactured products of lead is chiefly supplied from the products of ores mined in Mexico and Europe; where the labour cost of production is much lower than in this country; a condition of affairs permitted by the wholly inadequate protection afforded by the existing tariff; while the prices of white lead, lead pipe, sheet lead and shot, in the Dominion of Canada, are approximately equal to the prices charged for the same commodities in the United States, all to the detriment of the producers, consumers, and transporters of lead in this country. **And**

5. Whereas, under the existing tariff, little or no protection is afforded to the lead producing industries; whilst adequate protection is afforded to all other industries of equal importance, known to us. **And**

6. Whereas, these conditions result in the exportation of a preponderance of our crude ore and bullion, the former to American smelters and the latter to the markets of the world; there to enter into competition with the products of cheap European and Mexican labour, and the surplus product of the protected lead industry of the United States.

7. Therefore, we, the silver-lead miners of the East and West Kootenay Districts of British Columbia in convention assembled do hereby recommend and respectfully urge the enactment of a Tariff Act which will afford ample protection to the producers, manufacturers and transporters of lead, thereby creating and fostering a new and expansive home industry calculated to benefit all classes by the stimulation of national trade and commerce.

Having in view the interests of the producers, manufacturers and consumers of lead, we would re-

commend a duty equal to that imposed by the United States, viz.:

On lead in ores, 1½ cents per pound.

On lead in bullion, pigs, bars, and old lead 2½ cents per pound.

On lead in sheets, pipe, shot, etc., 2½ cents per pound.

On white lead, etc., 2½ cents per pound.

On all other products of lead as provided in the Dingley Tariff Act of July, 24, 1897.

Provided always that if at any time it shall be proved that a combination has been formed for the purpose of unduly increasing the charges made for smelting lead ores produced in Canada, or for refining or marketing lead bullion, or if the charge for smelting and refining in Canada is proved exorbitant, then the Governor-General-in-Council may at his discretion permit the admission into Canada of lead bullion smelted and refined, or smelted or refined in foreign countries, from Canadian lead ores, upon payment of an ad valorem duty of 15 per cent. upon the cost of such smelting and refining.

8. And the Secretary is hereby instructed to forward copies of the foregoing resolutions to the Senators and Members of the Dominion Parliament, representing British Columbia, with the request that they present the same to the Federal Government as a memorial with their endorsement.

LOUIS PRATT,

Secretary Silver-Lead Mine Owners Meeting.
Held at Sandon, B.C., December 10th, 1902.

THE ELMORE OIL PROCESS AT ROSSLAND.

TO THE EDITOR:—I beg to acquaint you that I have recently arrived here to represent the Canadian Ore Concentration Ltd., who own the patent rights for the Elmore Oil Process in Canada. I am making Rossland my headquarters and am installing an experimental hand plant at the above address for the purpose of testing any ores submitted to me. It is quite possible to form a very good idea from these small tests not only whether an ore is amenable to the process or not, but also whether the proposition would present a satisfactory result from a commercial standpoint.

Further and more extensive tests may no doubt be required before the erection of plants of any considerable size would be considered to be justified, but my object now is to make it generally known that a hand testing plant is in the country and that I am here to find out the mines whose ores are most suitable and to inform all people concerned about the various particulars in connection with the process, which they may write for.

Yours faithfully,

H. H. CLOUDET, Assoc. Inst. M. M.

Technical Representative of the Canadian
Ore Concentration, Ltd.

Rossland, B.C.