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## A PROPOSED PROVINCIAL MINING ASSOCIATION.

IT is impossible to overestimate the far-reaching importance of the results that may be expected to follow from the inauguration during the past month, of a movement to organize an association on lines so broad and comprehensive as those suggested by the promoters of the plan. The objects for which this association is to be formed are, in brief, the promotion of the welfare of the mining industry, and invitations have been issued to practically every resident of the Province, on the assumption that he must necessarily be either directly or indirectly interested in the development and prosperity of this our principal industry, to become a member of the association and assist in sending delegates to a convention that is to be held in Victoria on the 25th of February next. So far the project has met with a most enthusiastic reception, and the only criticism that has appeared has been on a matter of minor detail and not directed against the principle or general aim of the movement. These are that by the co-operation of all classes an improvement in conditions may be brought

about. It will be for the convention to adopt a line of action and decide upon a plan by which the organization may be made to serve a really useful purpose. But it is clear enough that the opportunities in the direction indicated are boundless. The opening sentence in the circular issued by the provisional executive committee of the new association states that the "conditions surrounding the mining industry of the Province have become so burdensome that capital has ceased to flow into this country."

This statement expresses, we fear, something very like the truth. It is strictly true that capital is not being invested in the mines of the country, except in very limited amounts, and that British capital, at least, has ceased to flow into the country; it is true that the silver-lead mining industry of the Slokan and East Kootenay is in a terribly depressed condition, that the copper mines of the Boundary are operated on a very slender margin of profit; that hydraulic and placer mining effort is badly handicapped, and that in the whole country there is not a single mine on a regular dividend-paying footing. If these are facts, we must either admit that the mineral resources of the country have been grossly over-valued, or that they have not been exploited to the best advantage. But there is not a mine manager or mining engineer in British Columbia to-day who would express the opinion that the present unsatisfactory state of affairs was attributable to any but removable causes, or refuse to share the belief of the late Dr. Dawson and other eminent scientific men who have made a special study of our mineral deposits, as to the wonderful opportunities for mining operation in so vast and rich a territory. Some months ago we attempted to investigate the causes responsible for the depression that then existed, and which still continues to overshadow the industry, and the following hypothetical reasons were offered: Exaggerated anticipation on the part of investors; extravagance and incompetence on the part of representatives of investors; bad mining laws; unstable relations between labour and capital; over-taxation and injurious incidence of taxation; extensive swindling on the part of company promoters; and abnormally high cost of production from inefficiency of labour. To these may now be added the low price of metals, inadequate marketing advantages and high costs of transport. Of the causes suggested some are merely imaginary and some are real; some have exerted a slight and some a strenuous influence in retarding development and discouraging the further investment of capital; but if the real

and removable evils of which we do agree exist can be remedied, so that legitimate enterprises will have a fair chance to succeed, we shall have made a big stride towards bringing about prosperity to the Province. It will be the part of the Association to ascertain what are real evils and what are imaginary, to suggest remedies, to devise improvements, to reconcile conflicting interests, to advertise the resources of the country and generally to take such a stand in the community as will best serve the great interests we all have at heart.

The work that has been undertaken so far by a provisional executive committee is, of course, of an entirely preliminary character, and the Association will not be a properly constituted body until after the convention in February, when a constitution will be adopted and organization finally effected. It is, therefore, to be hoped that the general value and importance of the movement will be adequately recognized throughout the country, and that all sections and classes will enter into a friendly rivalry to send a large and representative body of delegates to the meeting. The present movement is not an original conception. Some twenty years ago conditions in the State of California were a great deal worse than they are in British Columbia to-day, and mining, especially that carried on by hydraulic methods, was practically at a standstill. In consequence, the California Miners' Association was formed, to whose efforts is directly traceable the prosperity which the mining industry in that State has since uninterruptedly enjoyed. Among the members of the California association are the Governor of the State, judges, professional men, merchants, farmers, teamsters, as well, of course, as mine operators and mine labourers; and that is what we want in British Columbia, the earnest co-operation of all classes for a work in which we are all vitally interested.

We have magnificent timber resources, the salmon fisheries are important, there is much land that may be turned to agricultural uses; but none of these industries will ever by themselves make British Columbia great and prosperous. It is to mining we look to do that. Once the mines begin to pay, as under normally favourable conditions they assuredly will, the confidence of capital will be revived, new fields will be opened up, and we shall have what we require most—settlement and population. Considering the drawbacks and difficulties, the obstacles that have had to be overcome, the engineering and metallurgical problems that have presented themselves at every turn, it is no less wonderful than satisfactory that the mining industry of the Province has progressed so far as it has. Remember that hardly a dozen years ago Kootenay was an unexplored waste, a wilderness of mountains and pine forests; that when the first mines were discovered it was no uncommon thing to pay

twenty and thirty dollars a ton transportation charges, and then after railways had been built, came one trouble after another, such as are to be expected in a new country situated as we are. The difficulty of securing efficient labour, the high cost of smelting, the ruinous cost of marketing, injudicious legislation, lack of capital, and last but not least the visitation of the fraudulent promoter.

We hope to see the new Association do much both to ameliorate existing conditions and prevent the occurrence of difficulties which should be avoidable. The Association for instance, cannot regulate the prices of metals, but it can assist in removing the burdens imposed on the industry by the Dominion Government in the form of heavy duties on mine supplies; it can bring about a better understanding between employers and employees to the avoidance of strikes; it can by proper suggestion, representing the majority view of those chiefly interested, prevent the introduction of injudicious legislation and see that the mining laws in future are framed in such a manner as to encourage not only the investment of capital in the Province, but to stimulate exploration and prospecting; it can, as the Miners' Association has done in California, compel the Government to increase the efficiency of the Mines Department; it can do much to advertise the great mineral resources of the country, and inspire confidence by discouraging "wild-catting" and dishonest promotion; in short, if now for once prejudice and apathy can be overcome, and capital and labour induced to join hands for the common good, we confidently assert that the new Association will be the means by which at no distant date British Columbia will become one of the most productive and most prosperous mineral areas on the American continent.



#### COKING AND NON COKING COALS.

**T**HIS question is of such general interest that a few notes thereon should not be out of place.

The districts to which this article refers are, generally speaking, those valleys of the interior plateau of British Columbia where tertiary coal basins exist, such as the Similkameen and Tulameen Basins, Nicola Valley, White Lake, etc. But the following remarks would apply to any further discoveries of a similar class of coal. These small basins are probably all due to similar geological causes and are of approximately similar age, the cause being the filling of pre-tertiary lake basins, or enlarged river valleys, by vegetable debris and the further growth of coal forming plants on the marshy land thus formed. Periods of uplift and depression alternated with, in some cases, the addition of beds of volcanic ash, either deposited directly in the lake from adjoining craters or brought down in floods from outlying centres of eruption.

Fossils, both vegetable and insect, abound, and are, generally speaking, of similar type. These have been referred by the Geological Survey of Ottawa to the oligocene period of the tertiary.

It is not proposed here to enter into a lengthy discussion as to how coal is deposited, but as to the actual composition of coal it might be well to clear up some points upon which misconception exists.

The general division of coals is made by the amount of carbon shown to exist by a proximate analysis. Coal analyses may be of three kinds, viz: Proximate, which shows the amount of carbon, volatile matter, ash (non-combustible), moisture, sulphur, and sometimes phosphorus.

Sometimes this analysis is given after the coal is dried, thus increasing the constituents apart from moisture proportionately.

2. Destructive analysis gives the further subdivision of the volatile matter into hydrogen, oxygen, nitrogen.

3. Assay of the per cent. of combustible only, volatile and non-volatile matter.

The coking analyses show the capacity of the coal for coking and its percentage. In this connection it should be noted as important that no estimate as to the coking quality of a coal or the nature of the coke if made can be deduced from its analyses. They do indicate, however, the probable purity of the coke made. It must be remembered that the ash is, in the case of an unwashed coal, made part of the coke, and in the case of a coal making 50 per cent. coke, i.e., two tons of coal making one ton of coke and containing 7.5 per cent. ash, there will be possibly 15 per cent. ash in the coke. For metallurgical purposes it may be said that a coke should be firm, tough and bright, sonorous, of long fibre, and should not contain more than 1 per cent. sulphur or 6 per cent. ash. A dense coke is objectionable by not allowing the air to penetrate and a very porous coke will not probably sustain the weight of the ore in the furnace. All the tests so far made seem to have been made for iron furnaces, where a weight of 50 to 60 feet of iron ore is supported by the coke. In a copper furnace there is probably never more than 8 feet of ore on the coke and therefore the question of strength may not be so important.

Roughly speaking it may be stated that with less than 20 per cent. volatile matter the coal will not fuse properly and with more than 30 per cent. the strength of the cell walls may be so small that the coke will be non-coherent. This refers mainly to the ordinary coke made in bee-hive ovens, unwashed. With washed coal and externally fired or narrow ovens these limits may be considerably expanded, and at the same time coals well within these limits will not coke at all. Probably the cause of this may be in proportions of O. H. and N., but this point has never been settled.

It is important in looking at a coal analysis to know

which of the three styles of analysis has been used, as the following table will show:

|              | Ordinary Proximate Analysis. | Analysis of Dry Coal. | Per Cent. of Combustible. |
|--------------|------------------------------|-----------------------|---------------------------|
| Moisture     | 10                           | .....                 | .....                     |
| Vol. Matter  | 30                           | 33.33                 | 37.50                     |
| Fixed Carbon | 50                           | 55.56                 | 62.50                     |
| Ash          | 10                           | 11.11                 | .....                     |
|              | of moist coal.               | moisture eliminated.  | includes ash in carbon.   |

The general classes of fossil fuels are: Peat, lignite, bituminous, semi-bituminous, semi-anthracite, anthracite.

The following analyses of coals, American and English, are given in order to define the boundaries of the various classes of coals. For the sake of clearness the decimals have been omitted, but the tables are taken from the best authorities.

Great misconception exists as to semi-bituminous coals. These occur between the bituminous and the semi-anthracites. Authorities differ somewhat as to the limits of these, but speaking generally it may be said that in a proximate analyses:

|            | Moisture. | Volatile Matter. | Fixed Carbon. | Ash.       |
|------------|-----------|------------------|---------------|------------|
| Peat       | *20 to 30 | *25              | *40           | *10 and up |
| Lignite    | *10 to 20 | *35 to 50        | *35 to 45     | *5 to 20   |
| Bituminous | 1 to 10   | 30 to 40         | 45 to 60      | 3 to 10    |
| Semi-B.    | 1 to 5    | 15 to 25         | 60 to 75      | 3 to 10    |
| Semi-Anth  | 1 to 3    | 7 to 10          | 75 to 85      | 3 to 6     |
| Anthracite | 2 to 4    | 3 to 5           | 80 to 90      | 5 to 10    |

\*Physical properties enter larger into the classification of these.

As an instance of the unreliability of analyses as to coking qualities of coal the following may be of interest:

Montana coal 29 per cent. vol. comb. matter, uncokeable.

Colorado coal 30 per cent. vol. comb. matter, very good coke.

Cornellville, Pa., 31 per cent. vol. matter, standard coking coal of U. S.

Montana coal 32 per cent., uncokeable.

British Columbia coal 36 per cent., makes good coke.

When the volatile matters are divided up with O. H. and N. the matter becomes more complicated, but within one individual coal field it is possible to establish some limits.

It is also doubtful whether the ordinary laboratory test is of much value as to coking qualities, that is to say, a good coking coal may, and possibly will show coke in an analysis, but a poor coal may refuse to do so in a small crucible but might coke in a coke oven under proper technical direction. A good deal may also be done by using some of the later pattern coke ovens and finding which system is suited to the particular coal in question. The ash may be so disseminated through the coal as to form a barrier to its fusing properly. This can be eliminated by washing. The

washing of coal is a very easy matter in most cases, and can be done on similar lines as ordinary gold mining, viz: by having long runs of 12 in. x 12 in. sluice boxes, doubled for a portion of the distance so that the water and coal may turn from one race to the other while the dirt and impurities are being shovelled out. This necessarily entails breaking the coal and screening it. Putting through coarse rollers is the simplest method of breaking. The larger dirt can be picked out on sorting belts. In many cases, this wetting and breaking up the coal increases its value for coking purposes.

It must also be remembered that in the coke oven a certain proportion of the volatile matter or hydro-carbons is deposited on the coke in the upward passage of the gases through the fused mass. Thus a coal will sometimes yield a larger percentage of coke than its analysis shows of fixed carbon. This is seen in the coke in the form of globules or films of bright carbon in the cells of the coke and no doubt increases in some degree its heating capacity and its lasting power in the furnace.

It is generally assumed that the class known as bituminous coal is the normal condition and that the lower volatile matter and higher carbon is due in part to geological flexure and folding through long ages. It does not seem that speaking generally the actual contact or proximity of a coal bed or field to volcanic or trappean rocks affects it the same as the heat and pressure developed by the stress and strain due to the actual folding of the beds. Undoubtedly age has something to do with it and the coals comparatively low in carbon are seldom found in the same basin and having undergone the same strains as an underlying bed of anthracite.

It has been assumed that a coal field which on its outcrop shows bituminous and lignitic coal may with depth develop into a semi-bituminous or semi-anthracite coal. There is, it would seem, absolutely no authority for such an assumption. Of course the coal at the outcrop will certainly contain more moisture and probably more ash, and as these diminish the percentage of carbon will appear higher and so will the volatile matter, but that anything more than that will happen is improbable, the truth of the matter being that the outcrop in these cases was not a fair test of the coal. Undoubtedly the coal which is non-coking at the surface may develop into a coking coal with depth.

There is one point, however, in this matter that appears to have been neglected in assuming that anthracite may have been formed by flexure pressure and heat exerted on bituminous coals, viz., the amount of ash. It is hard to see on the face of it how a bituminous coal carrying, we will say, 8 per cent. of ash, can be converted into an anthracite carrying only 4 by any amount of pressure and heat.

Anthracite is as a rule denser and heavier, which would be explained by this local metamorphism.

Many of the seams in the small coal basins have been fired by the burning roots of trees, etc., and the influence of this combustion may extend for long distances, nearly destroying the volatile matter. It would appear as if it would be a fairer way to test a coal by the amount of its volatile matter and not as is usually done, by the percentage of its carbon.

It is not probable that the amount of sulphur in coke for copper smelting would affect it in any way or possibly phosphorous through the latter is deadly for iron smelting. If the ash were to any extent lime it would be no deterrent. Whether anthracite coal has ever been tried for copper smelting is not known. At any rate no records have been published of tests. Sulphide of lime is volatilized in coking—sulphate is not. There is a general impression that coke made from beehive ovens is much superior to what is known as retort oven coke. This would appear to be quite unwarranted; at any rate, so far as the iron industry is concerned, it has been found that retort oven coke, whilst not so brilliant in appearance, serves its purpose just as well. Probably so far as B. C. is concerned the by-products of tar, ammoniacal liquor, etc., may not be disposable, but the sulphate of ammonia certainly should have a value to our farmers and market gardeners.

Coals which are uncokeable in the ordinary beehive oven owing to small percentage of bituminous matter may be made to return good coke in these by-product ovens. Coal which is too high in bituminous matter may also be made to yield a fine coke by firing under pressure by mixture with other dry coals or by washing or slacking.

The nature of the ash in the coal makes considerable difference in its quality. For blacksmiths' purposes sulphur is objectionable, making the steel or iron "short" in its nature and poor weld; for domestic purposes the amount of ash is the main feature. If the ash is in the form of iron sulphide it is more fusible and increases its tendency to clinker on the bars, which prevents the ingress of air. As a rule a white ash or a light red or yellow is the best providing it be light and pulverulent. Bituminous coals, apart from the question of smoke, make better steam raisers than anthracite. But semi-bituminous are probably the best for this purpose.

Probably the fairest system of judging the value of a coal for heating purposes is by the number of B. T. U.'s (British Thermal Units) it contains. A B. T. U. is the quantity of heat required to raise the temperature of water 1 degree F. at or near 39 degrees F.

Lignites will carry from ..... 6 to 10,000 B.T.U.  
 Bituminous coals from ..... 10 to 14,090 " "  
 Semi-bituminous from, ..... 14 to 15,000 " "



Anthracite and semi-anthracite coals do not go any higher.

Petroleum has a heating capacity theoretically of 20,000 B.T.U.

It may be of interest at this point although outside the question, to compare oil as fuel with coal. It has been found by repeated experiments that 1 lb. of petroleum under the same boilers will equal practically  $1\frac{3}{4}$  of coal, therefore a gallon of petroleum will equal 12 lbs. of coal. That is that oil at 3c. per gal. equals coal at \$4.70 per ton; one ton of average coal should be equivalent in heating value to  $1\frac{1}{2}$  cords of good dry wood, fir or pine.

These calculations depend so largely on the qualities of the coal and wood that they are probably of little value except for the purposes of comparison.

#### THE RARE METALS IN BLACK SANDS.

SOME comment has been made in the press lately on a letter addressed by the Provincial Mineralogist to the sender of a sample of black sand from Cariboo. This sample on assay gave a value of \$1.42 per ounce of gold and \$10.65 for platinum. Osmiridium, we believe, is \$10.00 per ounce. This would add about \$5 in osmiridium to the value, which must have been highly concentrated, as in tests of black sand made from the Tulameen River over a long period a value of about \$1 per lb. only was obtained from the ordinary black sand from sluice boxes. What this would have given on assay is another matter. The Tulameen sand contained little or no osmiridium. One Chinaman working out the gravel under an old cabin obtained 40 ounces of platinum in one day, which had evidently been discarded by earlier gold workers.

It must also be remembered that the price of metal platinum so called as found in these sands varies considerably from pure platinum. The platinum dust as brought in by the miners, even if properly cleaned by them, is only saleable at probably half the finished price of the metal. This is on the principle that although gold is at \$20.67 per ounce, placer gold rarely fetches \$18.00 and may run as low as \$12.50. It usually carries more or less iron and contains other metals of the same group, viz. iridium, osmium, vanadium, ityrium, etc., etc., either in separate grains or alloyed. If these individual grains could be separated they could be sold at very high values, but this is not practicable under ordinary conditions and they become a deterrent to value. Osmiridium is usually found in small flat scales which seem to bear evidences of having been flat hexagonal table crystals with a more silvery lustre than platinum, which is usually in rounded or irregular grains more or less black according as they approach or recede from the matrix. The question of

this matrix is assuming a more interesting aspect every day and it would certainly appear advisable for any prospector owning copper or quartz prospects in locality where placer platinum has been found in any quantity to have one assay made for this metal. The price of platinum approaches very close to gold now and is not unlikely to pass it before long. Native platinum has, so far as we are aware, only been actually seen in rock on one occasion. Mr. Carmichel, Provincial Assayer, in his report published in 1895 mentions having seen it in a dyke rock from Vancouver Island and that the assay was very high. The actual specimen was unfortunately lost, and the owner states that he spent several hundred dollars on assays made by various parties in the States without having succeeded in getting, not even a trace, in any sample other than the ore mentioned above. It has been reported from Wyoming in corellite, in copper claims in the Similkameen District, Christina Lake, B. C., and sperrylite (an assenide) from Sudbury, Ont., where it is associated with the nickel ores. In placer form it occurs in Colombia, S. A.; Trinity and Shasta Counties, California; Rio Pardo, Brazil; Sonora, Mexico; Yukon, and New South Wales. Russia still continues to ship 90 per cent. of the world's output. It would seem to occur almost unreservedly associated with the heavier basic magnesian rocks, peridotites, pyroxenites, etc., which easily become serpentized, and wherever chrome iron or chromiferous magnetite is found it should be carefully examined for by crushing and panning the rock in as large a quantity as possible.

The report of Mr. W. F. Robertson, Provincial Mineralogist, and of Messrs. Faulds and Shepherd, M.E.'s, on the Fernie explosion is now issued. It consists almost entirely of a diary and list of places examined with a resumé as to the probable source of the explosion such as was found at the inquest. No speculations of any interest are entered into as to this mysterious explosion. There is one thing pretty evident, and that is that instructions should have been sent immediately to the mine officials to stop any work of clearing the mine up, except to save life, until after examination by the Government officials. The question which arose as to McDonald's room having been the source could then have been properly settled. It would not appear that tamping being in a hole is any evidence of a shot not having fired gas, as it might fire from the back, particularly in the case of machines undercutting long faces. The system of working while possibly eminently suitable to the roof and floor in question is certainly an expensive system to ventilate, entailing considerable expenditure in cloth and temporary air stops, etc. The long wall system where the roads are made more or less in the waste, while in some cases difficult to maintain, is one

in which the dust on the roads is largely composed of non-inflammable material, and gas, if it does come off, may rise to the higher parts of old wastes where it is unlikely to be disturbed. In one case with which the writer is acquainted gas fired by a shot-lighter burnt out in the roof of the "goaf" without spreading at all, and gas lit by the spark from a petroleum pump burnt along the roof of the slope (packed goaf) without finding a particle of coal dust to hang on to. The writer spent several months experimenting with various new explosives in gassy mines in England, and out of many thousand shots fired never saw the least sign of a spark. The worst feature of these new nitro-explosives is the fumes, which require good ventilation and all shots to be fired nearly at one time to drive them off.

As we go to press an important announcement is made of a rich strike of ore at the Silver King mine, by Mr. M. S. Davis, who last year leased the property from the Hall Mining & Smelting Company. It is said that Mr. Davis has by this discovery, encountered the main lead which was lost in 1897, and that the values are very high. We sincerely trust that this report will prove to be true, as under the terms of the lease, the Hall Mining Company can under certain conditions resume operations at the mine, and in consequence may yet have a successful career. Some short time ago a London financial paper made an attack on the company, suggesting fraud, on account of the arrangement with Mr. Davis. We gladly avail ourselves of the opportunity to declare the insinuation to be absolutely foundationless, the company having only ceased to operate the mine upon the advice of two independent mining engineers who were called in to report.

The shareholders of the Snowshoe Gold & Copper Mines, Limited, have every reason to be satisfied with the position of affairs as explained at the second ordinary general meeting last month. The mine is being developed, under a good and careful management, in a very satisfactory manner, and ultimately will without doubt pay handsomely. If all British-owned mines in British Columbia had been administered in the same way as is the Snowshoe, the proportion of successes to failures would have been entirely reversed. The chairman referred in his speech to the "unjust two per cent. tax." This tax bears exceptionally hard on the Snowshoe Company, although the ore is of somewhat higher grade value than most of the other large mines in the Boundary District. The reason for this is, that the Snowshoe has not yet, probably with justifiable caution, followed the example of the other Boundary companies in the matter of estab-

lishing its own smelting works; but we gather that this step is now under contemplation. We have, meanwhile, strong reasons for believing that the Government has already decided to abolish the tax in question, or rather suspend taxation on mines until conditions improve.

It is reported that the Cariboo Consolidated Company has leased, with the option of purchase, the property and works of the ill-fated Golden River Quesnell, on the Quesnell lake and river. As Mr. Hobson never believed that the latter concern could be successfully undertaken, on the grounds that the river had been thoroughly wing damed and mined both by whites and Chinese in the pioneer days, the idea of the present lease is probably that a utilization may be made by conveying to the Cariboo mine the water from Quesnell Lake, at the foot of which the large dam was constructed.

In British Columbia, and in Rossland in particular, the London directorate boards of both Le Roi and Le Roi No. 2 have been suspiciously regarded, the exit of Mr. Whittaker Wright notwithstanding. It has been thought for some time, whether rightly or wrongly, that the mines were being worked with a view more to stock-manipulating purposes rather than with the legitimate object of earning dividends for shareholders, and quite recent events have not tended to better opinion in this regard. We are, therefore, glad to note the election of such men as Mr. G. S. Waterton and Mr. Anthony J. McMillan to directorate positions on the Le Roi Board. It is some assurance at least that this mine will be managed in the future in an honest and businesslike manner.

The half-yearly report of the Mount Lyall (Tasmania) Coy's Reduction Plant should be worth studying. It appears that economies have been effected as the result of experience admitting of the smelting by two furnaces at No. 2 plant of 1,000 tons per day, entirely without coke; at No. 1 plant one furnace is running without coke, the other will be ere long. A saving has thus been made of at least \$100,000 per annum. Furthermore, by reducing the amount of hot air used in the furnaces the number of men firing hot air stoves has been cut down from 24 to 6, and in a few months it is hoped hot air will not be required at all. The air from six blowers is now concentrated into two furnaces, instead of four or five. From the condensed report from which the above is taken it would seem as if the company would soon be able to smelt without furnaces.

## MINING MEN OF THE PROVINCE.

**MR. JOHN B. HOBSON** is a native of Ireland, where his father was for many years engaged as manager of coal mines. In 1848 Mr. Hobson's parents arrived in New York, where he resided until 1857, in which year he accompanied them to California, where he studied metallurgy and mining engineering and became closely identified with many of the large quartz and deep gravel mining enterprises in the central part of that State.

In the fall of 1891, Mr. Hobson, associated with the Hon. Jacob H. Neff—the present Lieut.-Governor of California—Mr. D. W. Lubeck, of the Placer County Bank, and other gentlemen, met at Auburn and formulated plans for the organization of the California Miners' Association, which has done so much to place the mining industry there on a prosperous footing.

Prior to the organization of the California Miners' Association, Mr. Hobson published in San Francisco the *Mining and Industrial Advocate*, for the purpose of calling public attention to the necessity for uniting in an effort to secure at the hands of the National and State administration the legislation necessary to improve the conditions of the mining industry and to remove the many disadvantages under which miners were laboring. Immediately upon the organization of the California Association, that body selected Mr. Hobson as one of the legislative committee, where he had associated with him the Hon. Niles Searles, ex-Chief Justice of the Supreme Court of California; the Hon. J. K. Luttrell and others. They were sent to Washington to draft a bill and urge its adoption by Congress. They did this so effectively that Congressman Caminette introduced the desired measure, which was finally passed and resulted in the complete rehabilitation of an industry which has since produced from ten to fifteen million dollars annually.

In 1892 Mr. Hobson was invited by Sir Wm. Van Horne and the directorate of the Canadian Pacific Railway Company to visit British Columbia and explore the vast areas of auriferous deep gravels in the northern districts of the Province and determine their value. As a result of his investigations the Consolidated Cariboo Hydraulic Mining Co. and the Horsefly Hydraulic Mining Co. were formed to take up the large properties here, the equipment and opening of which for production on a very extensive scale has been in progress for the past ten years. Prior to Mr. Hobson's departure for British Columbia he had been associated for many years with the Geological Department of the California State Mining Bureau, and the results of his field work may be seen in the annual reports of that institution. Shortly after Mr. Hobson commenced mining operations here he encountered many of the difficult and objectionable features of the Mineral, Placer Mining and Water

Clauses Acts, and for the past seven years he has been urging on Parliament the necessity for adopting such remedial legislation as would result in throwing the country open for exploration by individual miners, prospectors and investors in such a manner as would encourage the settlement of the province and the development of its mineral resources.



MR. J. B. HOBSON.

We have not seen the report of the Anglo-Klondyke Mining Company, but a notice of a contemporary states that the result of working by drifting 20,000 yards (presumably cubic) gave an average of \$13.50 per yard. This seems very rich. Under the hydraulic monitor 29,000 yards were sluiced showing a value of \$1.25 per yard. It is stated that 80 per cent. of this ground had been previously drifted, which would imply that the value was in the top gravels. Costs per cubic yard including cost of plant and cleaning bed-rock amounted to 30 cents per yard. Exclusive of plant, which is now paid for, the cost of hydraulic mining is estimated at 14 cents per yard. The company have a water supply which was exceptionally good last year.

## B. C. MINES IN LONDON IN 1902.

## THE COURSE OF PRICES.

(From our own Correspondent.)

THE course of prices for British Columbian mining shares in London during the past year has been depressing in the extreme, quotations having in many instances dropped to merely rubbish prices. For instance, Le Rois have been as low as £1, or 80 per cent. discount, while Le Roi No. 2 were at one time no better than 9-16, or at little more than 10 per cent. of their face value. Then we had the fall in Ymirs, which, after having been as high as £2 5-8 in 1901, have been quoted at one time during 1902 at no better than 2-6. London & B. C. Goldfields also, which it was freely predicted was to take rank as the leading London financial concern connected with B. C. mines, have also fallen from their high estate, and in the last month of the old year could be bought for a few shillings, after having stood at one time at about £1 7-16. Hall Mines were as low as 6d., whilst the weakest quotation for Enterprise was 1-16, the same figure representing the lowest point reached by New Goldfields of B. C., a Tupper concern, which was at one time expected to take a high position in the ranks of B.C. companies. Whitewater fell once to 1-16, and are little better now, whilst apparently so little was thought of the prospects of the united Kootenay Mining and Rossland Great Western Companies' shares that they were quoted as low as 5s. Velvets were never regarded by the market as worth more than 8s. and fell once to 2s. 3d. About the sole exceptions to the general rule are furnished by Snowshoe—which has just held a satisfactory meeting—and Tye Copper; the former have remained remarkably firm at 14s. 6d. to 15s. 6d., the extremes of the year, whilst the Tye after having been as high as 1¼ and as low as ½, close firm at 7-8. Otherwise the whole list has shown extreme weakness, prices have been at the lowest points, I believe, since the mines of British Columbia were first regarded as of sufficient importance to merit the attention of the London Stock Exchange. No doubt the general conditions have been adverse; but they can hardly be said to have been sufficient to explain the inveterate condition of the B. C. market. The fact of the matter is that British Columbia has been under a cloud the whole year. Ever since the collapse of the London & Globe group the public have looked askance at anything British Columbian. So many people were badly hit over the fall of the B. A. C. that it can hardly be surprising to find them unwilling to run any further risk in this direction at present. There is no fault found with the industry, and generally speaking the London press have shown every desire to give prominence to news about the mines. As an instance of this I may cite the fact that London *Financial News* (a leading daily newspaper) has published a series of articles week by week from the pen of a well-known special correspondent. But the public, although following the news from the

Province carefully, have throughout the year shown a decided disinclination to meddle with British Columbian interests. Even the loan, tempting as it looked, —and in fact was—was only successfully issued owing to the precautions taken by its sponsor to have it fully underwritten. Certainly the energetic Agent-General and those working with him deserve every credit for obtaining this loan in London, especially when we remember that Natal, which was a borrower the same week, fared no better than British Columbia.

If any of your readers will refer to back numbers of the RECORD they will find that I have frequently drawn attention in the past to the evil results likely to attend the machinations of the London promoter. We are now suffering from the sins of the wildcat-ers and promoters of indifferent properties absurdly over capitalized. There are thousands of investors loaded up with B. C. shares who would only be too delighted to have a chance of marketing those shares at 50 per cent. of what they paid for them, and not all shares in English registered companies either. I seem to remember the arrival about five years ago of provincial brokers with bags full of dollar shares of locally registered companies which they left behind them in England, taking back instead British sovereigns. Have any of these local companies ever sent a sixpence over to England in the way of dividends? Is it a wonder, then, that English investors have in their own minds formed a bad impression of B. C. mining shares, and are only desirous of cutting their loss as soon as possible? Whether or no they will ever recover their confidence in the Province remains to be seen; but it is a reassuring fact to note that the Government have seen the wisdom of keeping the chief points of the country before the public; whilst it is also fortunate that they are so efficiently represented in London. Mr. Turner is always accessible, always courteous, and ready to accord information to those who need it. He cannot, of course, be expected to interview every dissatisfied investor, but by means of circular matter, lectures before the members of various societies, and judicious advertising, he can at all events in a measure counteract the ill effects of the boom of five years ago. So far it is only the promoter who has benefited from that untimely event, but despite the depression of the past year, it is confidently predicted by people whose long acquaintance with the Province entitles their views to respect, that the country is inherently sound—especially in regard to its mines—and it will yet justify those who have pinned their faith to it as a country which will take a front place amongst the producers of both precious and base metals. It is to be sincerely hoped, however, that it will never again suffer from the malevolent attentions of a Whitaker Wright. Every effort has been made to obtain a Government prosecution of those concerned in the management of the London & Globe group of companies, but despite the efforts of Mr. J. Flower and others, the Attorney-General in the last days of the year decided that not enough matter had been produced to him to justify a Government prosecution. It is yet possible that some of the shareholders of the collapsed companies may combine to bring about a reopening of the whole of the matters involved, and effect more than an official censure of the directors responsible for the remarkable financial jugglery which characterized the management of the Globe group—an end most devoutly to be desired.



## THE ELMORE PROCESS IN BRITISH COLUMBIA.

(By H. Hayman Claudet, A.I.M.M.)

THE MINING RECORD of August of last year contained a very interesting article on the concentration of ores by means of oil, written by Mr. H. E. T. Haultain, in which he gave an historical and descriptive account of the Elmore Process. As interest on this subject is being keenly revived just now in this country through the Canadian Ore Concentration, Limited, who hold the patent rights for the process in Canada, having started a small testing works in Rossland, and as everyone concerned in low grade properties is expecting great things from this process, probably a short account of the experimental plant, together with a few details as to costs of working on the commercial scale may be of use to your readers.

In the experimental plant exactly the same operations take place as on the commercial scale, only without some of the appliances which make the latter automatic, but the method is identical, and if an ore will give good results on the small scale it is practically bound to do so on the large.

For convenience the process may be described in three stages:

1. The mixing of the pulp with oil during which operation the oil comes in contact with the mineral values and holds them in suspension.

2. The separation of the oil from the mineral in a centrifugal machine with a specially constructed solid basket.

3. The drying of the product from (2) in a second centrifugal machine with a perforated basket.

In the hand plant (1) the mixing is performed in a three-foot drum, shown in the photograph, about one foot deep which revolves vertically and has an opening in the front through which the sample in the form of pulp is poured in. The oil is then added in about the proportion of one-quarter to three-quarters the amount of sample taken, depending on the quantity of mineral therein. There are small baffle plates inside the drum which cause the mixture to get thoroughly agitated simply by turning the drum slowly a few times by hand. When the oil has picked up enough mineral it is skimmed off the water and the tailings are run out through a plugged hole in the circumference of the drum. The tailings are allowed to settle and then are dried, weighed and assayed.

2. The separation of the oil which has been collected takes place in a small type of centrifugal machine

which has a speed of 2,000 revolutions per minute and is driven by an electric motor. (See photo.)

3. The drying is accomplished with the same machine by interchanging the solid basket for the perforated one, which has a cloth bag fitting inside and in which the concentrates are dried.

These are weighed and assayed, and both the actual recovery of values is obtained and also that by difference between the original sample and the tailings.

Having proved in the testing plant that any particular ore is thoroughly suitable to the treatment it must next be considered, before going further, if the local conditions allow of the concern to be a commercial success, and it may be well to look into these conditions as they would affect the oil process.

It must be expected that the field for the Elmore Process will be greatly on low grade properties, which

will necessarily mean that everything must be designed and worked on the most economical lines, and while it is possible to treat at a profit certain ores which could not be worked by any other method the margin must not be cut too fine and it should be proved beforehand that there will be sufficient profit to allow for the fluctuations in the metal market and any other contingencies which are likely to crop up.

There should be sufficiency of water, a good site for the mill, allowing the pulp to flow from the battery to the oil plant by gravity, also suitable space for depositing tailings and a fairly accessible position for the transportation of stores and oil, and for shipment of the concentrates to smelter.

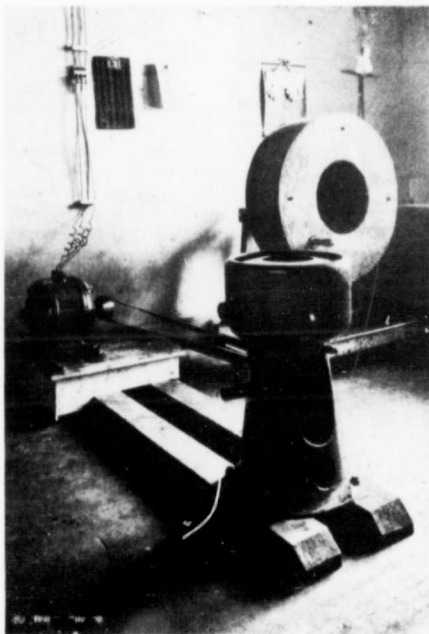
If water power is not available electricity should be used, if there is an installation anywhere near, as the power required is very small and a plant capable of handling 100 tons of ore per day could be most economically worked by ar-

ranging a few small motors to drive the different machines, and in this way a lot of shafting and frame work for same could be dispensed with.

Let us now view the cost of buying and erecting an oil plant of 100 tons daily capacity, not going into the milling machinery or power:

1. Price of 100 tons plant, which is approximately \$10,000.
2. Cost of freight of machinery to mine.
3. Cost of erection, including excavation for foundations, concrete, timbers for buildings, etc.
4. Cost of running and up-keep.

The first item to go into in detail is the cost of freight of machinery. At present this is made in England and the weight of a 100 ton plant is approximately 48



The Canadian Ore Concentration Company's Experimental Plant at Rossland.



tons, the freight to Rossland being about \$48 per ton, including shipping and railway.

The cost of erecting will depend on the amount of blasting, if any, required in connection with the excavating on the site of plant, the amount of concrete to be put in, the price of labor and timber, and will vary at different places. The size of building required would be approximately 33 ft. high by 35 ft. long by 40 ft. wide and should be built on the side of a hill in order that the least amount of foundation work will be required to arrange the plant so that the pulp and oil flow by gravity.

The last item, namely, cost of running plant, includes labor, supervision, loss of oil and royalty.

Three hands per shift should be enough to attend to the 100 ton oil plant, say one man at \$3 and two at \$2.50 each.

|  |         |
|--|---------|
| Reckoning two shifts of 12 hours a day each<br>the labour per day treating 100 tons of ore<br>may be taken at..... | \$16 00 |
| Power, electric.....   | 5 00    |
| Loss of oil and royalty.....   | 45 00   |
| Adding, for supervision, repairs and depreciation.....   | 10 00   |
| Total expenses per day of 24 hours.....  | \$76 00 |

This on 100 tons equals \$0.76 per ton of ore treated.

Although from the above figures the total expenses in connection with the oil process are only 76c. per ton including everything in that department, it should be noted that in many cases it will be even less, as for instance in the event of water power being available, or an existing company having two or three hundred horse power, or more, at their disposal, it would cost very little for an additional thirty horse power to drive the oil plant.

Further, the charge against loss of oil and royalty is put high to allow for the heavy freight on the oil, viz., about double the price of the oil itself, and probably this may be considerably reduced when dealing with large quantities. The loss of oil may be taken between 1 to 1½ gallons per ton of ore treated.

Thirdly, the \$10 per day for supervision, etc., is no doubt high, as repairs and depreciation should be very small, and generally the supervision could be shared with that of another department, but the writer considers it better not to minimize costs and to err on the high side, if at all.

The royalty is fixed on the capacity of the plant used and in the case of an oil plant installed to treat the tailings of a concentrating mill of a capacity of 100 tons per day it might be that the method of concentration consisted of sizing and jiggling and that the final tailings were only one-quarter the amount of the original ore milled. In this case a 25 ton per day oil plant would be installed and the royalty charged on that tonnage.

In order to form an idea as to what grade ore may be treated successfully by the process, below is given expenses, but the cost of mining is not included as it is impossible to give a fixed figure when it is so variable, according to each district, the nature of the mine, the width of the lode and many other conditions. But it may be safely said that concentration will invariably tend to reduce mining expenses, as the ore will then be mined as it comes, therefore at a cheaper rate, while in the case of direct smelting the poorer ore

either remains in the mine or is dumped on a heap and left to its fate :

|                           | Per Ton of Ore Treated. |
|---------------------------|-------------------------|
| Concentrating by oil..... | \$ 76                   |
| Milling.....              | 90                      |

|   |        |
|---|--------|
| Cost per ton of ore, of producing concentrates..... | \$1 66 |
|---|--------|

To this would have to be added freight of concentrates to smelter, which is, in Rossland, about 75c. per ton; also smelting and realization charges, which can be taken at \$6 per ton.

Now if we take a case of a concentration of 10 to 1 the charges on these two items would be 1-10 of the above figures when working out the costs on the ton of ore treated, viz.:

|   |        |
|---|--------|
| Freight to smelter per ton of ore treated.....              | \$ 75  |
| Smelting and realization charges, etc., per ton of ore..... | 6 00   |
|   | <hr/>  |
|   | \$6 75 |

Adding this to the cost of producing concentrates we get the total expenses, mining excluded, (on the assumption of the 10 to 1 concentration) to be \$2.335 per ton of ore treated, so when treating a dump heap and taking a case of 85 per cent. recovery of contents by process any ore over \$2.75 can be treated at a profit.

In taking the smelting and realization charges together it must be remembered that the smelting charge is based on the amount of concentrates to be smelted while there are some of the items in the realization charge, such as interest on mining and concentration, freight on matte to refinery, and one or two other small items which will be just as much when concentrating as when smelting direct, but these will not cut much figure and can be overlooked.

It will be readily seen that the larger the ratio of concentration the more favorable it is for the process, not only on account of freight of concentrates but also as regards the loss of oil, as the concentrates contain in their final state a small percentage of oil.

The question of a mine concentrating a portion of its output to mix with the rest in the crude state in order to make a more nearly self-fluxing product is worth noticing, and it may be quite likely that this will be one of the many cases where the oil process will come in, and in this case it is possible briquetting would not be required. It seems a plausible idea to dump all the ore as it is mined over a series of grizzlies, shipping the coarse to the smelter and treating the fines by the oil process. In this way a preliminary crusher might not be required, the fines going direct to the pulverizer which would be relieved to some extent of its work.

In the case of ores that are not self-fluxing economic concentration should be especially adaptable, as it is only natural to expect that smelting a concentrate would be a less lengthy process than smelting the crude ore and in most cases the amounts of ingredients which have to be added to get a suitable flux will be greatly reduced, hence the smelting charges should be very much less. The loss of copper in the slag should not show anything like so high a percentage when dealing with a concentrated product as when smelting the ore direct.

In conclusion the writer intends that the figures supplied are only meant to convey a good idea to those

interested in and likely to patronize the process, and in all cases they appear to be on the high side if anything, especially in the case of milling which under good circumstances with water power available would probably be as low as 60c. to 70c. per ton. As is the case with most estimates, they must not be taken as exact, and any suggestions or criticism on this article with a view of making things clearer in any way will be appreciated.

#### MINING DEVELOPMENT IN THE OKANAGAN DISTRICT.

(By A. A. Watson, B.Sc.)

It is a well known adage that "a man cannot eat his cake and have it too," and a survey of the mining development in the Okanagan District of British Columbia is a forcible reminder of the truth of this saying. Its soil is so rich and its climate so mild and favourable to the growth of all kinds of fruit that the attention of men of means in the district is irresistibly attracted to the possibilities of fortunes to be made out of fruit-growing, with the result that while the prospects for the successful mining of gold and copper are as good in the district as in any other district of British Columbia no serious attempt at mining has ever been attempted. This year, however, several claims have changed hands and in one or two instances energetic efforts at development have disclosed conditions justifying the expenditure of large sums of money for further development.

The Okanagan District is bounded on the north by Sicamous Lake, on the east and west by ranges of mountains and extends south into United States territory. Vernon, the chief town of the district, is situated four miles north of Okanagan Landing on Okanagan Arm. The whole valley north of Vernon is adapted to the growth of nearly everything that can be raised in a temperate climate, while at favourable spots on the lake small settlements are continually being made. At Kelowna the climate is so mild that tobacco is successfully grown, while on the west shore of the lake fruit ranches are being planted wherever level land can be found.

Geologically the district in the lower valleys consists of clays and shales with exposures of porphyry and granite, while the summits of the mountains for, at any rate, sixty miles east of Vernon, reveal granite as the prevailing country rock with numerous veins of quartz, in some cases carrying gold. The summits of the range west of Vernon show a little granite and a great deal of porphyry with some diabase. The quartz claims are located, I think, without exception, in granite and porphyry formations, while the exposures of copper ore are found in diabase.

Taking Vernon as the centre and dealing with the claims in the order of their proximity to the town, the nearest locations are two claims located last October, called the Glenoro and the Tranmere, the locators being respectively Messrs. Milligan and McPhail. They are situated on the west shore of Long Lake two and a half miles from Vernon. The ore is a very fine lime conglomerate on the Glenoro and a fine

quartz conglomerate on the Tranmere. On the Glenoro the bed of ore is two hundred feet wide and is exposed clear up from the lake shore to the top of the hill. Following the ore up the hill to the top we find it overlaid with clay shale and following the apparent direction of the bed of ore we find ourselves on the edge of an inaccessible cliff. Five hundred feet of the cliff in width consists of quartz conglomerate from a point a hundred feet from the summit of the hill to the bottom of the cliff. The few samples that have as yet been taken have run from \$1.80 to \$2.20 per ton, while a five-foot hole on the lime conglomerate showed quartz conglomerate underneath which assayed \$3.20 a ton in gold. It appears that the bed of quartz conglomerate cuts through the hill from the cliff to the lake and is overlaid with lime conglomerate on the lake side of the hill. Work will be actively pursued on both these claims next spring with the object of seeing whether the values diminish or increase inside the ore. The bed of ore is so situated that it could be quarried. No shafts whatever would be required. Two men are already at work on the Glenoro. The next mineral field as regards distance from Vernon is situated on the peninsula at the northern end of Okanagan Lake four miles from Vernon and directly opposite Okanagan Landing. The most important of the claims is the British Empire owned by Messrs. Highman, Miller and Muller. On this claim there are altogether nine veins of free milling gold quartz ranging in width from ten inches to two feet, in value from \$8 to \$48 per ton and running about north and south. Clay and shale cover the hill largely, but there are numerous exposures of porphyry. On one vein a shaft is now down 68 feet, in all the width of the vein averaging two feet and its value \$16 per ton in free milling gold. At a depth of thirty feet a slight fault was encountered and at a depth of sixty feet from the surface a cross-cut was run due east which struck the vein again five feet from the shaft. Eight feet more sinking on the vein showed the richest quartz yet encountered, a piece supposed to be about an average assaying \$168 per ton. The vein is a true fissure, the walls consisting of porphyry, schist and talc and assaying over \$2 per ton. The Sarah claim north of the British Empire claim shows the same vein as the one on the British Empire on which the shaft has been sunk and is owned by Messrs. Highman and Seydel. The following extract from the report of the Provincial Mineralogist for the year 1901 on the British Empire claim is of interest:—

"There is here a quartz vein two feet wide having a strike 45 degrees west cutting through schist and slate and apparently associated with an igneous dyke. The development consists of a shaft from 40 to 45 feet deep, from the bottom of which a drift has been run some five feet. The shaft which at the time of inspection was half full of water, was timbered and encased in planks and provided with a good ladder, etc., but it could not be closely examined. The quartz was mineralized with iron sulphides carrying gold values and a certain amount of free gold. While the mineralization is sparse, such as there is must be quite

rich, since an assay on a sample showing no visible free gold and containing but a small percentage of mineral in the quartz gave \$44 in gold and an ounce in silver per ton."

Since the Provincial Mineralogist visited the claim the vein has improved in width and in value and there is no doubt that the British Empire claim has the making of a first-class mine.

There are numerous other locations on the same hill but work has been so unskillfully performed upon them that nothing can be said as to their value. The idea seemingly held by most of the holders is that a vein should be absolutely perpendicular and consequently every shaft is found to have left the vein in the first twenty feet or so and no cross-cuts have been attempted.

At Siwash Creek on the west side of Okanagan Lake, due west of Vernon, at an elevation of about 3,000 feet and a distance of four miles from the lake, are some very promising copper prospects. The writer visited these claims this fall for the first time. They were originally located about four years ago by J. Cameron, who held them until last summer, when he abandoned them and went to Dawson. They were re-located by J. Hamilton under the names of the Gail, the Dawson, the Bluebell and the Phoenix. The writer visited the group with Mr. Hamilton last September and was able to obtain a very fair idea of the prospects. They lie on top of a hill wooded to its summit and covered over with drift but here and there are outcroppings of oxide of iron carrying copper in diabase rocks. The only claim showing a ledge then was the Dawson, and while the iron capping assayed four per cent. in copper and \$2 in gold, the work had been done, however, in such a fashion as to have proved nothing and sufficiently explained the abandonment. The cross-cut had been run on the edge of the capping and parallel to the ledge instead of across it. Since then two men have been employed in cross-cutting the same ledge about 300 feet east of this hole; they state that the cut is now twenty-five feet long and is not yet across the ledge. A sample brought as an average assayed 6.5 per cent. copper. It is satisfactory that these claims are now in the hands of men who will work in such a way as to definitely determine the value of the properties. Work will be continued all winter. Copper properties are held at White Man's Creek, about six miles south of Siwash Creek, but here again the work has been so unskillfully performed as to show nothing one way or the other. Shafts sunk on little stringers and tunnels through the country rock never completed appear to have been the usual mode of procedure in developing prospects in this part of the country.

About sixteen miles northwest of Vernon is the Proieb claim, held by Messrs. Clark and MacMullen. This claim is also situated on the summit of a mountain about 2,000 feet above the sea and directly above the Armstrong wagon road. The work done consists of a cross-cut on the ledge showing its width to be six feet, three feet of which assayed \$4 and three

feet assayed \$19 in gold. The formation is diorite interspersed with calcite and strongly mineralized with sulphide of iron. At a point two hundred feet below the ledge a tunnel has been driven to cross-cut it. The tunnel is now in 220 feet. At a distance of 100 feet from the mouth of the tunnel some iron oxide about a foot wide was encountered which assayed an ounce to the ton and the last hundred feet of the tunnel has been run along a narrow vein assaying \$16 per ton in gold, which is at right angles to the ledge and appears to be an offshoot from it. The tunnel is expected to shortly strike the ledge. Work will be continued on this claim all winter.

At Trout Creek on the west shore of Okanagan Lake are some outcroppings of coal. As the writer has not seen the properties he cannot do better than quote from the report of Mr. W. Blakemore, published by the Ashnola Company:—

"At a point where an outcrop of coal has been located Trout Creek has cut its way through the tender rocks of this formation to a depth of about 150 feet below the level of the surrounding country. The coal is visible on the west bank of the river at an elevation of nearly 100 feet and is easily accessible along the banks of the creek. The geological formation is in the upper cretaceous series consisting of light colored clay, sand stones, shales and rocks. This formation is more or less continuous from Fairview in the south to Kamloops in the north. At a point 100 feet above the level of the creek I found in the bank a good exposure of a workable seam of coal which I measured and judged to be at least four feet in thickness. The coal is bright, strong and of uniform quality, being free from interstratifications of any kind. At the exposure a tunnel has been driven in a distance of 20 feet, but owing to the disturbed character of the ground it is not of material assistance in determining the position of the seam. I found indications of the seam continuing for at least half a mile along the banks of the creek to the west, the main strike of the coal being north and south and the dip westerly. The elevation of the exposure is 600 feet above the level of the lake."

So far the only productive camp in the Okanagan District is Fairview, and this camp has been so often described that a brief statement of the present prospects of the camp should be all that is necessary. The most prominent feature is the improvement in width and value of the vein in the Stemwinder mine, which at the third level is now thirty feet wide and of an average value of \$6.32 per ton. Near the surface the width was ten feet with a value of \$2.60 per ton. A clean-up yielded a gold bar worth \$20,000. A force of men averaging forty in number has been employed at the mine and a mill of 16 stamps has been in operation. Large cyanide vats are to be erected in addition to those already in position.

The Dominion Mining Company in the same camp have done a great deal of work on their property, which is understood to have the same vein as the Stemwinder with average values of about \$9 per ton.

## A TRIP DOWN QUESNEL RIVER ON A DREDGE.

(By Thos. Drummond, M. E.)

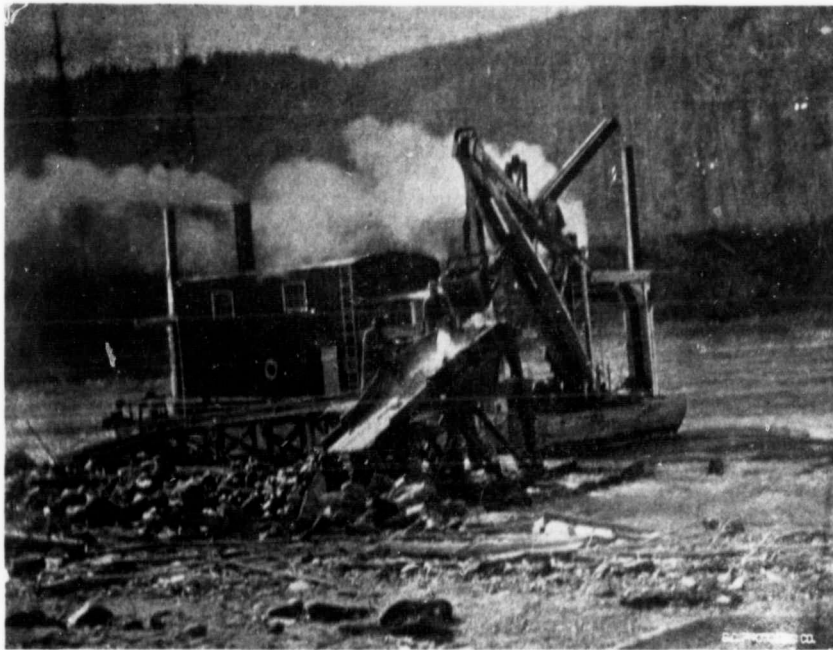
**D**URING the summer the writer took a small dredge down the Quesnel River to make a working test of gravels on dredging leases extending up stream on Quesnel River for a distance of about ten miles from the mouth of the Beaver. It was a novel trip, with a considerable amount of excitement and some danger, and it may be of interest to your readers.

The Quesnel River is one of the principal water-courses of the country; it has a well-defined valley

a soft miocene clay rock which apparently came in as a filling upon the top of the true slate bed-rock which shows in many places along the bank. This soft bed-rock is particularly suitable for dredging purposes and there is a strong probability that rich tertiary gravel underlies it.

The river has yielded a large amount of gold and many well-known creeks, benches and bars were were passed in going down, prominent among which are Four-Mile, Nine-Mile, Twenty-Mile and China Creeks, all of which have been worked continuously for the last thirty years and are still yielding considerable quantities of gold.

In the straight stretches of river the banks as a rule are steep, but at the bends low bars are formed



The Drummond Dredge on the Quesnell River.

one mile in width gradually dropping from the mountains on either side in benches and terraces to the level of the river. It has two principal branches, the north and south forks, both of which rise in large lakes. They join at the town of Quesnel Forks and then flow onward in one united stream for a distance of about seventy miles to the junction with the Fraser River. The main river is from 400 to 600 feet in width. It is a turbulent stream full of strong rapids and riffles, with awkward rocks, and several sharp "Z" shaped bends. It has a swift current, and in high water runs from 8 to 10 miles an hour, and it is a dangerous river to navigate even with small boats. The rise between low water and high water is from 7 to 8 feet. The bed-rock is what the author takes to be

on the short side of curves, while the stream cuts into the opposite banks. The river, therefore, consists of low benches alternating with cut banks and higher benches. In the upper stretches the soft banks contain a good deal of slum capped with gravel, but below Twenty-Mile Creek the banks are wholly formed of gravel often from 200 to 600 feet in height. These banks are constantly enriching the river and in many places they have yielded a considerable amount of gold as evidenced by the work which has been done upon them.

As I have stated above, the river is a rough, turbulent, dangerous stream and it was with some considerable anxiety that I undertook to move the dredge down stream, but under the careful and efficient sup-

ervision of Wm. Reeves, of Vancouver, the work was successfully accomplished. Every possible precaution was taken to avoid accidents.

The dredge is only a small prospecting dredge with a dipper of one-third yard capacity and a digging capacity of 100 yards per diem. The hull is 55 feet long and 19 feet wide, and it draws about 30 inches of water.

In going down rapid streams in a boat steering way can only be obtained by going either considerably faster or slower than the stream. The latter plan was adopted as being safer, and a slow rate of speed was maintained by means of a chain drag on the end of a wire cable and this also acted as steering gear.

The arrangement was, as in sketch, the dipper going down stream first. The dipper was fitted with a piece of 12-inch plank passing through it, which served as a rudder and by means of it a threatened obstruction, rocks, etc., could be avoided by swinging the dredge quickly away from it. In the sketch, A, B, C, D, represents the hull of the dredge, C D being the down-stream end and G the dipper. E and F are the working drums of the dredge. The main cable passes from drum E through sheaves and pulleys at the angles along the left-hand side of the dredge to the stern and carries the chain, L, at the end. From the drum, F, passes a shorter rope along the right-hand side of dredge to main cable at stern where it connects with a running pulleys. By manipulating this latter rope the dredge could be moved from corner B to corner A and to all intermediate positions. When leading from B the down-stream end of dredge swings to the left and the current moves dredge bodily across towards the right-hand bank; when in the A position it works in the opposite direction to the left-hand bank, and when in the centre the dredge runs straight. The chain drag weighed about 1,700 pounds, and it could be wound up close to boat or dragged from behind, and in this way the speed was regulated. The drag maintained an average speed of one and a half miles an hour, being faster on the rapids and slower on the quiet stretches. The arrangement worked like a charm and the dredge could be steered like a small row boat and put any place in the width of the river in a distance of 200 to 400 feet. The only difficulty occurred in turning very short bends when the drag was far behind and in such cases the chain sometimes dragged over the point and forced the dredge into the same bank below.

It was quite a novel trip and one well worth taking, but I would not care to repeat it with the responsibility of a dredge on my shoulders, for though all possible precautions were adopted there is always danger of possible accidents even under good management, and certain chances have to be taken. It also had its dangers, for in case of accident both dredge and crew would have been lost. The arrangement, however, worked beautifully; the boat moved slowly over the quiet stretches and danced merrily down the rapids, avoiding the rocks in grand style, and our destination was reached safely without accident. The whole distance travelled was about sixteen miles, and many

rapids and bad places were passed. The dredge has been at work for about two months with satisfactory results.

#### THE GOAT RIVER MINING DIVISION.

(By W. P. Sloan.)

**I**F the hematite iron ore at Kitchener holds out the future of the Goat River Mining Division is assured. Dating back to the time of discovery and partial exploitation of these great deposits the district has taken on a more hopeful air and further discoveries north and south on the same lead tend to "stiffen" the existent good feeling.

On the north of the C. P. R. company's property a vein with from eight to twenty-one feet of solid hematite iron ore is said to have been discovered by R. Laib and partners, and on which a group of claims were located. The claims lying south of Goat River which were found last fall are looking very well.

Except for assessment work the Kitchener mines have been idle for the past year. Mr. C. P. Hill states that until the company can secure suitable coal lands on the Crow's Nest line no extensive development



Typical Prospector's Camp, Goat Mountain.

work would be undertaken at Kitchener.

The latest iron finds were made quite recently on Gray Creek, a tributary of Crawford Bay. Some people believe it to be a continuation of the Kitchener deposits, which, if true, is marvellous, the distance between points being thirty miles at least. Be that as it may, many of the best known mining men of Nelson have taken a hand at putting up stakes—Bruce White among the number, which is evidence that something is "in sight." Development is being carried on as far as possible till the snow gets too deep for surface stripping. The Crawford Bay ore goes, I hear, as high as 66 per cent metallic iron. The low price of lead and the other common metals has had a deadening effect on development generally except in cases where gold values only were looked for.

In the immediate vicinity of Creston there is the Alice mine with an excellent showing and a large quantity of ore on the dumps. The workings aggre-



gate 1,500 feet, three-quarters of which was dead work. A waggon road was built by the Government a distance of three miles from the C. P. R. depot at Creston to the mine, over which some ore was hauled and the returns satisfactory, but almost simultane-



Hightown Bluff and Slide, Goat Mountain.

ously with the completion of the road and making connections with the vein in the lower tunnel came the slump in lead and the mine was shut down. It is a low-grade galena proposition, but with a little better price for lead it could be operated at a profit. It is owned by an English concern—the York and Lancaster Syndicate, of Manchester.

On Goat Mountain there is a promising group of claims owned by Creston parties. Ore from the Ibis is galena of good grade carrying up to 168 ounces silver and 80 per cent. lead besides \$6 or \$7 in gold per ton. The development was going on in the lower tunnel at the time of my visit, and the owners expect to strike an ore body almost any day. The work done on this claim consists of two tunnels, one a hundred feet long when I saw it, another thirty feet long and a number of shafts from ten to forty feet deep all showing ore. The waggon road to this claim has been put in, partly at government expense. In this group two of the claims, the Hightown and Edith, show copper in fair quantities.

A peculiarity in the occurrence of ore on this mountain is that the lower down the mountain the higher the gold and the lower silver values become. As an instance of this I might mention the Blenheim group owned by George Alexander, of Kaslo. The

ore from the shaft on this claim has frequently given from \$100 to \$180 in gold besides a fair amount in copper, while the silver values per ton were small. These assays were from hand samples. Development has been limited here and it is doubtful whether the owner has so far determined what class of ore carries those high values,—but if rumour can be trusted Mr. Alexander intends shortly to go in for extensive exploitation, not only on this property, but also on the Show Down group, where there is a good showing of cobalt bloom or erythrite. The main filling of this vein is a copper sulphide of exceptional density. The erythrite appears to be more or less segregated from the other vein contents, which probably is accounted for by a re-opening of the fissure and further deposition of mineral.

On a small shaft within 100 feet of the Canadian Pacific Railway there is about one and a half feet of ore, from which I obtained samples and had assays of 10 and 12 per cent. of cobalt. The copper ore from two open cuts on this claim goes almost uniformly 25 per cent. copper per ton. That from the shaft is not so high grade. Mr. McEvoy, late of the Geological Survey of Canada, sent a sample of erythrite



Haleyon Clean-Cut Ledge of Copper Ore, Goat Mountain.

from this claim to the museum at Ottawa, mention of which is made in the Geological Survey Report for 1901. Samples from this claim were among those on exhibition at Paris, Glasgow and other Old Country places, and met with much attention and many enquiries from cobalt refiners.

Apparently large quantities of it are procurable

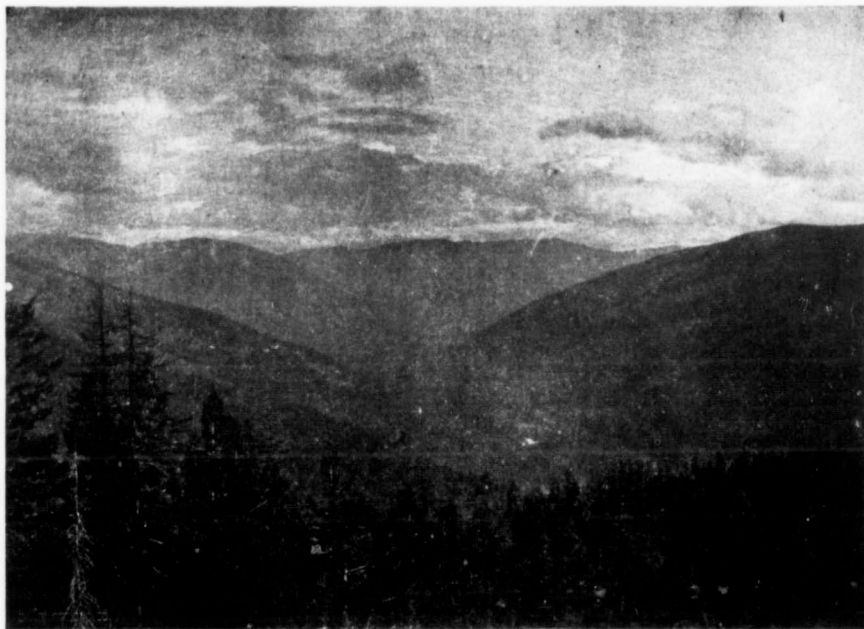
from this source, and in the future we may have cobalt added to our resources—likewise nickel. This is a class of ore not usually looked for, yet it exists in the low foot-hills of Goat Mountain, though whether in paying quantities remains to be seen. So little has been done in the way of opening up deposits of almost every class of mineral on this hill that no reliable idea as to its future can yet be arrived at.

There are some good showings on the K. V., and Hecla south of the Blenheim, which may really be called the same ore area, while on the Nil Desperandum, Stemwinder, Last Hope, and Last Chance the veins appear to be much larger than farther north. The last time I visited this property I measured the

by water. Steamboat communication on Kootenay Lake is had all the year round, on Kootenay River for nine months in the year, and is available for the greater part of that time right up to the foot-hills.

There are a sufficient number of local smelters for present needs. There is some talk of Pilot Bay smelter being converted into a zinc plant. The inauguration of oil concentrating plants will have the effect of making available deposits of ore never before dreamt of.

We have the White Grouse country in this division—virgin soil and a vast extent of rich country. In some instances the ore is high-grade. Copper sulphide, bornite and copper glance form a large pro-



Goat River Valley, Looking Towards Kitchener.

lead and it tapered 22 ft. wide and no wall in sight. What is true of the other properties is also true of this. Without digging nothing can be ascertained definitely. It is unfortunate for the country that the owners of this group do not go ahead with development, as their showings are exceptionally good and the prospects for this turning out a mine are bright. I am told by one of the owners who is quite reliable that assays of 27 per cent. copper have been obtained and the gold values from \$12 to \$37.50 per ton—in one instance the returns from test gave \$117 in gold per ton.

One of the chief features of these low-lying claims is their close proximity to transportation. The C. P. R. and Nelson & Bedlington R. R. traverse the majority of them. There is the alternative of carriage

portion. Galena is also met with. Roads have been built by the Government by way of Kitchener via Goat River, a distance of thirty miles, and from Sanca near the head of Kootenay Lake. Large veins seem to be the rule in this camp and were railroad communication once established many prospects could ship ore which, under present conditions, cannot be done profitably.

There is a choice of routes for a railroad, any of which could be utilized at comparatively small cost for this class of work. Indeed, it would be no great surprise to see construction of a railroad commenced at an early date to tap this rich region. Duck Creek, Arrow Creek, Goat Creek and numerous others have their quota of claims—promising, many of them, which need only capital and development.

On Crawford Creek the Silver Hill is looking well and shipping ore steadily at this writing. It is being worked on the lease system by Italian labour, which arrangement appears to be satisfactory alike to lessee and owners. On other properties work is being systematically carried on, and it is safe to say that Crawford Creek will be quite a factor in mineral production in the course of a year or two.

On Summit Creek, which flows into Kootenay River near the head of Kootenay Lake, the gold excitement held all summer and many new discoveries are recorded. During the last winter and away into the summer Finch and Campbell had a force of men at work on the Bayonne (the banner mine) and drove a long tunnel besides cross-cuts a 40-foot winze, 50-foot upraise and other work, but they failed to take up the property, and it is now shut down. A large dump of free-milling ore is ready to be treated, the estimate being that there is upwards of \$50,000 net worth of ore on the dump and "in sight." I visited this property in the latter part of August and it looked well. The only thing in connection with the work that struck me forcibly was that those operating the property might just as well have run their tunnel in on a level 100 to 200 feet deeper. The cost would not have been greatly in excess of that already contracted.

New locations have not much work done on them, the most promising that I encountered being the Black Watch, Granite, Lone Star and Red Horse. They easily take the first place so far as surface appearances go. I am informed that the owners had assays of the ore of from \$28 to \$80 per ton in gold. Joe Campbell, of Erie, is one of the lucky owners in this group.

Taken as a whole, the Summit Creek camp has some excellent ground and there is a vast area as yet unexplored. Time and money usually work wonders.

The "strike" of the season was undoubtedly made on Shaw Creek this year. The property was first discovered in 1897 under romantic circumstances. The original locators did a considerable amount of work for two years and then left for the Yukon, where they evidently perished, as they have dropped completely out of sight. The claims did not lapse until the summer of 1901, when numerous parties of prospectors at once began to search for the lost claims, which were reputed to have the best showing in the district. The search was again taken up with enthusiasm by many parties this season and finally the old workings were discovered and the ground re-located in July. It is evident that the original owners intended to return and prosecute the development, as their whole outfit of tools, cooking utensils, etc., were left on the ground boarded up in the tunnel nearest water.

The country rock is gray granitoid rock traversed by large dykes of lime and quartzite. The ore occurs in a mineralized zone which can be traced over the whole length of the claims. The ledge matter presents two main characteristics, the hanging wall side being composed mainly of a silicious schist strongly impregnated with iron, and the foot-wall of calcite,

the whole ledge carrying gold values. This peculiarity would appear to indicate two different origins to the mineralization occurring at different times, a view sustained by the two-fold character of the ore bodies themselves. The ore consists of pyrrhotite and chalcopyrite on the one hand and gold-bearing quartz on the other, and there is also a series of mineral deposits which apparently connect these two main classes.

The origin of the mineralization has not yet been clearly worked out, but it would appear to be due to deposition from solutions contained in thermal waters arising from great depths along the lines of fracturing and fissuring in the mineralized zone. The width of the lead at different surface exposures varies from 100 to 300 feet. Parallel to this lead on the same ground is a second ledge which averages 150 feet in width on the surface and which shows similar characteristics. I understand that negotiations are under way for the sale of this property to American capitalists. For the good of the district it is to be hoped that the claims fall into the hands of a strong company, as from surface indications one is warranted in believing that we have here a rival to the great Boundary mines.

To sum up, it is quite evident from the above that there are many promising properties in the Goat River Mining Division. Others could be mentioned as well, but I have only referred to such claims as are most in evidence at present or to those representative of whole groups. The crying need of the division is for capital, which alone can make possible the necessary development work—and to obtain the money a spirit of live and let live is absolutely indispensable. The "knocker" flourishes here exceedingly and through his baneful influence many a promising prospect is lying idle. But to the strong of heart the country offers many inducements. Blest with an ideal climate the day is not far distant when a comprehensive scheme of irrigation (as of dyking now under way) will be carried out and the river valleys will "be standing so thick with corn that they shall laugh and sing."

Many a mountain has yet to be trodden by the prospector. For my own part I feel confident that another decade will work a marvellous transformation, when the valleys will be full of prosperous farmers, when steel plants will be in full operation at Kitchener or on Lake Kootenay, and when numerous mountains which now re-echo but the mournful howl of the coyote shall be scenes of bustling activity.

#### THE HISTORY AND PROGRESS OF MINING IN THE BOUNDARY DISTRICT.

By. E. Jacobs.

(Continued from last month.)

THE mines mentioned last month, together with a great many mineral claims upon which but little development work has been done, are situate in one or other of the two mining divisions of the district. The Kettle River Mining Division is the older and larger of the two; the other, the Grand

Forks Mining Division, being but the eastern portion of what formerly was but one large division. The office of the Gold Commissioner and Mining Recorder for the former division is at Greenwood, with sub-recording offices at Beaverdell, Camp McKinney and Vernon. The office of the official holding similar appointments for the Grand Forks division is at Grand Forks. These divisions have within their limits subdivisions known as "camps," but since the dividing line between the divisions is the summit of the mountain range, so that each division takes in all the mineral claims on the watersheds of the several streams flowing through it, it happens that in two or three instances part of a "camp" is in one division and the remainder in the other. It may be mentioned, by the way, that the location of Greenwood

IN KETTLE RIVER MINING DIVISION.  
 Old Ironsides and Knob Hill group (Granby Mines), Greenwood Camp.  
 Brooklyn and Stenwinder group, Greenwood Camp.  
 Mother Lode mine, Deadwood Camp.  
 Sunset and Crown Silver group, Deadwood Camp.  
 Morrison mine, Deadwood Camp.  
 King Solomon mine, Copper Camp.  
 Big Copper mine, Copper Camp.  
 Jewel mine, Long Lake Camp.  
 No. 7 mine, Central Camp.  
 Providence mine, Providence Camp.  
 Sally mine, West Fork of Kettle River.  
 Carmi mine, West Fork of Kettle River.  
 Rambler mine, West Fork of Kettle River.



B. C. Copper Co's Smelter, Greenwood, with Mother Lode and Sunset Mines on hills in background.

is not, as would naturally be expected, in the vicinity of the town of Greenwood, but has the the more recently established town of Phoenix as its centre. Locally the camp has come to be called Phoenix Camp, but officially it is still Greenwood Camp, which latter was its official name before either town was in existence. Greenwood town was named after the camp and about three years later, following the opening up of neighbouring mines, Phoenix commenced to develop from a little camp of prospectors into a mining town. These matters are mentioned for the reason that reference to Greenwood Camp might otherwise convey a misleading idea as to the exact locality of certain mines.

The more important mines of the respective mining divisions are as under:--

Cariboo mine, Camp McKinney.  
 Waterloo mine, Camp McKinney.

IN GRAND FORKS MINING DIVISION.  
 Snowshoe mine, Greenwood Camp.  
 Gold Drop mine, Greenwood Camp.  
 Golden Crown mine, Wellington Camp.  
 Winnipeg mine, Wellington Camp.  
 Athelstan mine, Wellington Camp.  
 B. C. mine, Summit Camp.  
 R. Bell mine, Summit Camp.  
 Oro Denoro mine, Summit Camp.  
 Emma mine, Summit Camp.  
 City of Paris and Majestic group, Central Camp.  
 Pathfinder mine, Brown's Camp.  
 Golden Eagle mine, Brown's Camp.  
 Humming Bird mine, Brown's Camp.

As indicating the extent of territory covered by the Kettle River Mining Division it may be mentioned that the Cariboo mine, in the south-western part of the division, is distant by waggon road 48 miles from the Jewel, in the north-eastern part of the division.

Turning now to the development and equipment of some of the larger mines, the following summary will in a measure indicate their relative importance.

#### GRANBY COMPANY'S MINES.

As having, so far as yet known, the largest ore bodies, truly described as enormous, and as having done more development work and shipped more ore than any other mine or group of mines in the district, the Granby Company's mines come first. The group consists of the Old Ironsides, Knob Hill, Victoria, Fourth of July, Phoenix, Aetna, Grey Eagle, Banner, Tip Top and Triangle fraction, all adjoining claims in or adjacent to the town of Phoenix. These claims

Ironsides and Victoria, as the writer can testify from personal observation, having, when underground in these mines in 1900, walked around three blocks of ore each not less than an acre in area. Nothing short of seeing for themselves suffices to overcome the incredulity of most people as to the immense proportions of the ore bodies occurring here, and exposed both in the underground workings and in the big open quarries. So large are these that no difficulty is experienced in maintaining a minimum daily output of 1,500 tons of ore for treatment at the company's smelter, whilst additions to plant and equipment are being made to provide for an output up to 5,000 tons per diem whenever the available treatment capacity shall have reached that tonnage.

The aggregate footage of development work done on the Granby mines to the end of 1902 was 16,359 lineal feet—more than three miles—of which 3,013



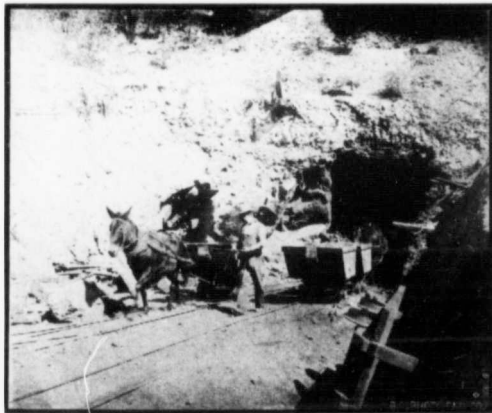
General View of the Snowshow Mine, Boundary District.

were acquired from the four companies which were consolidated into the present Granby Consolidated Mining, Smelting & Power Company, Ltd., viz., the Old Ironsides Mining Co., Knob Hill Gold Mining Co., Granby Consolidated Mining & Smelting Co. and the Grey Eagle Mining Company. The Old Ironsides and Knob Hill claims were both located on July 25th, 1891, and they are the oldest mineral locations in Greenwood Camp. But little underground work was done on the Old Ironsides prior to 1897, but in that year development was actively entered upon, and a steam hoisting engine, which much facilitated mining operations, was installed. From that time on the opening up of the enormous ore bodies occurring on this group of claims has steadily proceeded until to-day the showing of ore exposed in the extensive workings of these mines is simply marvellous. It is a literal fact that "acres of ore" have been blocked out in the Old

feet was in sinking and raising and 13,346 feet in cross-cutting and drifting. These figures show the number of feet done in underground development work proper, but leave entirely out of account the numerous large drifts and raises in the huge ore bodies preparatory to opening out the big stopes characteristic of these mines, which are being worked down to the 300-foot level. One shaft on the property is 400 feet in depth, but no levels have yet been run below 300 feet depth. Rising ground on the Knob Hill makes the 300-foot level of the Old Ironsides about 550 feet, vertical depth, below the apex or outcrop of ore on the Knob Hill, with the ore body proved to be continuous from the summit of the mountain on the Knob Hill through the Old Ironsides to other claims beyond, also owned by the Granby Company. The use of the diamond drill has shown that the ore continues down to a depth of at least 1,000 feet.



The system of ore quarrying followed here constitutes one of the most remarkable features of mining seen in the district. On the north side of the hill on which the mines are situate workings have been opened at half a dozen points along a distance of about 1,000 feet in a body of ore known to have a length of fully 3,000 feet on the company's ground. The removal of the surface debris has exposed ore for a width of about 400 feet. Three big open quarries are being worked at different levels. The top one was the first opened and its output of ore consequently has been by far the largest. It has an ore face about 80 feet high, and large raises from the Knob Hill main tunnel below serve as chutes down which the ore is thrown to be trammed thence to ore bins above the main shipping track of this mine. The middle quarry is on the same level as the main tunnel, 84 feet vertical depth below the floor of the top one. The lowest quarry is about 50 feet lower down still, so that when it shall have been carried back far enough to be immediately under the apex of the ore body it will have an ore breast, as proved by tunnel and raise, of more than 200



Hauling Ore at the Mother Lode Mine.

feet vertical depth. Railway tracks run into the two lower quarries, so that the ore broken down in them can be loaded direct on to the railway cars and thus obviate further handling until it reaches the smelter. No. 2 tunnel connects with the 100-ft. level—that is 100 feet below the main tunnel—of the Knob Hill, and this provides another outlet for ore from the lowest quarry by means of chutes, whence it is trammed to ore bins placed above the main shipping tracks of the Old Ironsides. A third tunnel, started still lower down the hillside, will eventually be extended to connect with the 100-ft. level of the Old Ironsides and the 200-ft. level of the Knob Hill.

The machinery and plant installed at these mines some time ago includes 2 80 h.p. steam boilers, 10-drum duplex Rand air compressor, air receivers, etc., on the Knob Hill, and a similar plant on the Old Ironsides. Each of three shafts on the Old Ironsides and Victoria is provided with a steam hoisting engine. A timber-framing machine driven by a 45 h.p. steam engine, an electric light engine and dynamo, steam pumps and much other plant and machinery are also included in

the power equipment of these mines. An ore-crusher with jaws opening 42 in. by 32 in. to crush rock to not larger than 7 in. or 8 in. at a rate of 150 tons per hour, and a 100 h.p. electric induction motor to drive same, also a 2,000 ft. gravity tramway from the top quarry to crusher, with 3-wheel brake system head-works, were recently put in and are now in operation. Two tandem compound Rand air compressors, together rated at 60  $\frac{3}{4}$  in. machine drills, and two 700 h.p. electric induction motors for motive power, are being installed. The equipment of the machine shop on the mines is also being largely added to, so as to provide it with modern improved appliances.

Prominent among the mine buildings are large bunk and boarding houses for the accommodation of employees, with a number of comfortable cottages for men having their families with them. The several buildings for housing plant and machinery are roomy and substantially built. Ore bins give storage capacity for a large quantity of ore, and railway trackage about the mines is comparatively extensive. From the time ore shipping was commenced in July, 1900, to the close of 1902, the output of ore aggregated 606,151 tons, of which about 310,000 tons were produced in 1902. All this ore was treated at the company's smelter at Grand Forks. When shipping 1,500 tons a day these mines employ about 425 men. The Mine Superintendent, Mr. Wm. Yolen Williams, has been in charge for nearly six years, during which period he has developed the property from mere prospects into the most important and productive group of mines in the Boundary District and one of the largest copper-producers in Canada.

#### THE MOTHER LODE.

The Mother Lode, situate in Deadwood camp, about three miles west of the town of Greenwood, was located on May 28, 1891. In 1896 it was bonded by Col. John Weir for himself and several other New York mining men, who in that year formed the Boundary Mines Company to develop the claim. About March of 1898 the British Columbia Copper Co., Limited, was organized in New York, to acquire and work the Mother Lode and several adjoining claims. The group now owned by the company consists of the Mother Lode, Offspring, Primrose, Ten Broeck and Don Julio and Sunflower mineral claims.

When Mr. Frederic Keffer, M.E., took charge of the Mother Lode in 1896 there was not a prospect shaft or a tunnel 25 feet in depth or length on the claim. To-day the development work totals between 7,000 and 8,000 lineal feet, besides which big stopes underground and quarries at the surface represent much productive work. The lode occurring here is large, its surface width varying from 80 to 160 feet. It has been cut in trenches along a distance of about 1,100 feet north from the main shaft to where it disappears under heavy drift, while a big surface exposure, on the Primrose, about 700 feet in an opposite direction, indicates its continuity south as well. The main shaft is down 325 feet, and long levels have been run at both 200 and 300 ft. depth. The ore body as opened at the 200 ft. level has a width varying from 80 to 100 feet, and cross-cuts show it to be continuous at this level for at least 350 feet. At the 300 ft. level the workings are not yet so large, but as far as they have gone they have proved the ore body to maintain its large proportions. A second shoot of ore, 18 to 20 ft. in width, was met with at the 300 ft. level and followed for 200 ft. without its dipping out of the level. The

"pillar and stope" system of mining the ore underground, as here adopted in 1901, was fully described and illustrated in the April, 1902, issue of the MINING RECORD. Most of the exploratory work done underground has been done north of the main shaft, which is situate about the centre of the claim, so that little is known of the conditions as regards the occurrence of ore south of the shaft. Underground work was suspended last spring, the opening up of big surface quarries in ore having made it practicable to maintain a sufficiently large production to supply the company's smelter at Greenwood with plenty of ore to keep its two furnaces running continuously.

The main quarry is well up the side of the Mother Lode hill. Two other openings were made at lower levels, big tunnels having been driven under No. 1 quarry and connections made by means of wide raises; these serving as chutes down which the ore is thrown to No. 3, from which a double-track tramway, with three-ton ore cars drawn by mules, conveys the ore to a Farrel rock crusher. During recent months two quarries were opened higher up the hill in ore containing more sulphur, and the ore from these is either shot down more than 200 feet to the mule tunnel or run down a gravity tramway to another crusher above a different set of ore bins. All the ore is crushed at the mine before being shipped to the smelter, a saving being thereby effected, the ore going direct into the smelter mixture bins instead of having to be first passed through the smelter sample mill crusher with the attendant expense of this further handling. The mine shipped 5,564 tons of ore in the latter part of 1900; 99,548 tons in 1901, and 136,657 tons in 1902, making an aggregate of 241,769 tons. When there is no shortage of coke or other difficulty in the way of both furnaces being kept in blast at the smelter, the daily output of the mine is about 800 tons. The Mother Lode was the first mine in the district to have a power plant equal to doing much underground work. In 1898 a ten-drill straight line air compressor, two 60-h.p. boilers, hoisting engines, etc., and electric light plant, were hauled in from Marcus, then the nearest railway point, at a cost for hauling alone of about \$3,000. In 1901 a 40-drill cross-compound condensing Ingersoll-Sergeant air compressor, with two 100-h.p. boilers; a big double cylinder, first-motion Jenckes hoisting engine, with two 80-h.p. boilers; a Robins ore-sorting and conveying plant; a No. 5 Gates rock crusher, with a 70-h.p. steam engine to run it; a full equipment of tools for a machine shop, and other plant were added. Last year a 24x36 inch Farrel improved crusher, to crush 65 to 80 tons of rock per hour to a size not exceeding five inches; a Jeffrey elevating machine with a chain of 20 inch by 9 inch by 12 inch buckets, to lift the crushed ore to ore bins over the railway track; a plain slide-valve engine, to run crusher and elevator; a 250-light Westinghouse dynamo, with 25-h.p. engine, and other machinery, to bring mine equipment up to the requirements of an increased ore output, were installed. The mine buildings are commodious and those for the accommodation of the men are comfortable. The ore bins have a total holding capacity of about 3,000 tons, and the railway facilities are sufficient for handling much larger quantities of ore than are at present produced. During construction work periods and when underground mining was in progress up to 150 men were on the payroll, but not more than half that number are now regularly employed in getting out ore and incidental

work. Mr. Keffer is still in charge of the mine, he being the company's general manager.

#### THE SNOWSHOE.

The Snowshoe group, owned by the Snowshoe Gold & Copper Mines, Ltd., of London, England, and situate in Greenwood Camp, comprises the Snowshoe mine and the Pheasant, Alma Fraction and Fairplay Fraction mineral claims. The Snowshoe was purchased by the British Columbia (Rossland & Slocan) Syndicate, Ltd., in 1899, and after that company had spent about \$130,000 in development work and in machinery, plant and buildings, the Snowshoe Company was organized in London in June of 1901 to acquire and operate the group. Development work done to the end of 1902 totals 6,440 lineal feet, nearly 2,000 being sinking and raising and the remainder cross-cutting and drifting. The earlier work was done in the eastern part of the Snowshoe. It consisted of an incline shaft, sunk 200 feet, with levels at 100 and 200 feet depth, respectively. On the former level some 520 feet and on the latter about 740 feet of cross-cutting and drifting were done, and two raises were made from the 100-foot level to the surface. Much of this work was in ore, which dips easterly into the other claims owned by the company.

Later workings, in the western part of the claim, have opened up a big body of ore, which is now being mined by quarrying as at the mines above described. The Phoenix branch of the C. P. R. company's Columbia & Western Railway crosses the Snowshoe. Below the railway, in the southern part of the claim, a tunnel, known as No. 1 level, has been run westward 677 feet into the hill, which rises rapidly to the western boundary of the property. For about 300 feet, excepting where a 25-foot dyke of waste crossed it; the tunnel was continuously in ore, apparently a parallel body to that in which the old shaft was sunk. Beyond this the tunnel was run about 477 feet, exploring for other ore bodies. Some 730 feet of cross-cuts and drifts, mostly in ore, were run on this level. A raise 150 feet to the surface was also in ore most of the way, and a winze, sunk 100 feet was in ore for 40 feet, and the ore shoot was again encountered in a 250-foot cross-cut from the bottom of the winze, which was in ore for 170 feet before the wall was met with. Altogether 660 feet of cross-cutting and drifting have been done on this No. 2 level, and a raise in ore 140 feet on the incline makes a second connection with No. 1 level. The ground has been explored below No. 2 level with a diamond drill, with satisfactory results. During 1902 a large main working shaft was sunk 300 feet, connecting with levels Nos. 1 and 2.

After removal of the surface debris from a comparatively large area of ground above No. 1 level, quarries were opened and drifts were run under them. Chutes were made at convenient intervals, and through these the ore is drawn and trammed direct to ore bins above the railway. It is calculated that these big open cuts will go back about 120 feet before reaching the western limit of the ore, and that a maximum face of about 60 feet in depth to floor of quarries will be obtained. A railway spur lately put in below the mouth of tunnel on No. 1 level gives shipping facilities that will admit of a much deeper face of ore being cut when quarrying operations shall have been carried down to that depth. Prior to 1902 only 2,028 tons of ore were shipped, but towards the close of that year the output was materially increased, so that the total

tonnage for the year was 20,800 tons, making the aggregate 22,828 tons.

The power plant installed at the mine in 1900-1 included two steam boilers, two air compressors together rated at about twelve drills, machine drills, hoisting engine at the shaft and an auxiliary engine in No. 1 tunnel, steam pumps, etc. Last year the high pressure half of a 30-drill Rand-Corliss air compressor, two 80-h.p. high pressure boilers and an electric lighting plant were added, and a 150-h.p. electric hoist was ordered. This hoist will shortly be in operation. Meanwhile headworks over the main shaft are in course of construction. The mine buildings include bunk and boarding houses, offices, residences for superintendent and foreman, new compressor and boiler buildings, hoist house, etc., and ore bins with a holding capacity of 2,500 tons are about completed. Some 2,000 feet of railway tracks afford accommodation for shipping. The transmission lines of the Cascade Power Company cross the property, so that when electric power for operating the air compressor hoist shall be required it will be right at hand. The average number of men employed is 44, but at times nearly double this number have been on the payroll. Mr. J. W. Astley, C.E., is the company's superintendent, resident on the mine. The Snowshoe has been brought to its present stage of development under his direction. Mr. Anthony J. McMillan is managing director, and Mr. Geo. S. Waterlow, another director, is one of the best friends the district has in England, since he loses no opportunity to express his confidence in the eventual profitableness of legitimate mining in the Boundary.

#### MINING IN THE COWICHAN DISTRICT.

(From our own Correspondent.)

**D**EVELOPMENTS in the Mount Sicker last year were of a very extensive character.

##### TYEE MINE.

The main shaft is now down to the 400-ft. level and crosscutting has been started, to intersect the lode. The main ore body has been opened up along a length of 800 feet, all in ore and is now in fine shape for winning 150 tons of ore per day.

The stopes range in width from 15 feet to 40 feet of solid ore and the further the various levels are driven into the mountain, the richer the ore becomes.

The following machinery is installed at the mine:—Four boilers, viz.—1 of 60 h.p., 2 each of 50 h.p., 1 of 20 h.p. A double drum hoist by Joshua Hendy, of San Francisco, capable of hoisting to a depth of 800 feet, and one smaller hoist by the same firm. Two compressors by the Ingersoll-Sergeant Co., viz.—1 of 5 drills and 1 of 3 drills. A Gates crusher, engine and belt conveyor, for crushing and sorting the ore preparatory to shipping to the smelter. Also a well equipped saw mill.

The Ribbet tram, which conveys the ore to the E. & N. Railway at Stratford's Crossing is running very well indeed and has now taken down over 8,000 tons of ore to the Tyee Company's Smelter at Ladysmith.

The Tyee Company's Smelter at Ladysmith, which was blown in on the 16th December, is running continuously and smelting at the rate of 4,500 tons of ore per month. Mr. Kiddie, the smelter manager, has managed every detail with a view to the most

economic handling of the product of the mine, and from the time the ore leaves the mine until the matte comes from the furnace, it is only handled twice by hand. The work that the Tyee Company commenced nearly four years ago has thus been brought to a most successful conclusion.

With ore reserves to the present developments at the mine sufficient to keep the smelter running continuously for the next three years and with every facility for marketing the product of this ore to the best advantage, this company has the highest prospects before it, of giving the shareholders large returns for the labour and money expended, which latter amounts to over \$400,000 in hard cash.

##### RICHARD III.

A two compartment shaft is being sunk on the foot-wall of the lode. This shaft is now down 150 feet and is following a heavy gouge matter, full of bright yellow ore.

This is the typical ore of the Tyee and Lenora mines and proves beyond a doubt that the ore bearing zone is continuous to the "Richard III." and that a solid ore body is within easy reach. This not only points to the possibility of the "Richard III," making a good mine, but doubles the values of the ore reserves in the "Tyee."

##### KEY CITY.

The shaft is down 300 feet and crosscutting at that level will soon commence.

##### COPPER CANYON

A compressor, boiler and hoist have been taken on to the ground and I believe will be put in operation early in the year.

The other work done on a large number of claims scattered over Mount Sicker and Mount Brenton amounts to very little, being just sufficient assessment work to hold the claims. Various reports of strikes etc., have been made from time to time, but the work done has not been of such a character as to prove continuity and values, and the owners of these claims are evidently waiting for "something to turn up," in increased values for properties, resulting from the successful working of the very few mines really operating on a large scale.

At Cowichan Lake and the upper waters of the Chemainus River fairly heavy development work has been done, but in neither case has the presence of ore bodies of commercial value been proved to exist.

On Molohat Mountain, near Shawnigan Lake, the usual development work has been done on some twenty claims. The surface ore showings on this Mountain consist of pyrothite and magnetite and are very large. They occur in a lime contact and carrying as they do some values in copper and occasionally very good gold, they are well worthy of exploitation on a large scale. The work up to the present time is scattered all over the mountain side, which is a pity, as if concentrated it might possibly have opened up a really good mining camp, as the whole country along the line of contact contains large out-crops of ore.

Some good samples of iron ore, also quartz and copper pyrites, have been brought in by prospectors from the new trail at Ladysmith. No work however, has as yet been done on these claims.

A development company has recently been formed in London, England, for the purpose of opening up mineral claims on this Island and the adjacent coast.

It is called the "Vancouver Island Mining and Development Co., Limited, with a capital of £50,000 in 50,000 shares of one pound each. The registered offices are at Duncans, Vancouver Island, B. C., and Clermont Livingston is the general manager and local director.

#### COMPARISON OF COSTS OF COMPRESSING AIR WITH STEAM AND ELECTRICITY AT ROSSLAND, B.C.\*

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

**C**OMPRESSED air has become so generally used in connection with mining operations, and so well recognized as the most useful and economic power, with its unlimited range of uses, and special adaptability to underground work, that an introductory to this paper on the subject would be superfluous to mining engineers.

The comparative economy of prime movers for air compressing engines is, however, of great interest to all, and a subject on which any engineer can read with interest. This is particularly the case with engineers practising in British Columbia, where a large number of the mining problems include the extraction and reduction of large bodies of low-grade ores and the consequent necessity for a thorough study of economical methods for mechanical handling.

The general mobility of compressed air as a power allows a wide range of generators, or prime movers, but we can, in nearly all cases rely upon having to adopt primarily, one of two sources of power, viz., water or heat.

Water, the first of these can, as we know, be used in many ways, each terminating finally at the mine, as compressed air ready for service. The initial water power may come from one or more sources situate either at the mines or many miles distant, and can be used either as a directly connected unit of power for the compression of air, or as a prime mover for some intermediary power.

British Columbia has been fortunately blessed with magnificent water power, more particularly in the Kootenays. In many cases these water powers are situated close to the mines; in others, as at Rossland, they are several miles away.

Distances over which power can be economically transmitted by electricity are yearly becoming greater, until it seems that distance is no longer an obstacle, and it has become simply a question of capital investment to successfully transmit the power generated by water almost any distance.

Heat, the second great source of power for the generation of compressed air, has been successfully used as steam for many years, even in places which seemed to be utterly inaccessible either for the erection of the necessary machinery, or the securing of fuel after the machinery had been installed and made ready for operation. So accustomed have we become to surmounting difficulties of this kind, that we are apt to look with suspicion upon any suggestion to utilize distant water powers, preferring to resort to steam as being the power we best understand, and one which has been successfully installed and econ-

omically operated under very adverse circumstances.

British Columbia has been abundantly provided with fuel, in fact, we can say the supply of coal is practically unlimited. Enterprising capitalists, year after year, extend railways between the coal fields and the consumers, so that no producing or promising mining district has long to wait for an unlimited supply of this fuel. The mines at Rossland are exceptionally favoured in this respect, all the leading mines having access to two lines of railways, and through them, the coal fields of both British Columbia and the State of Washington.

Rossland is also favoured by having the immense water power at Bonnington Falls, less than 40 miles distant, immediately available. The enterprise of Sir Charles Ross and associates in the West Kootenay Power and Light Co. has rendered this available for any service at each mine, as a competitor of the steam power, which mine managers would otherwise be compelled to adopt.

The question of the selection of power supply to be made by mine managers at Rossland is almost entirely removed from chance, and may be based on ascertained facts. Railways being at hand for the transportation of any kind of machinery, reasonably cheap fuel in quantities required is assured, and electric power for any size machinery or service is available. Therefore the problem simply resolves itself into "Which of these powers will give the best service in operating the machinery used in connection with mining operations?"

The same privilege applies to nearly every other mining district in Southern British Columbia; therefore, the writer feels that the results obtained in the air compressing plants at Rossland will be of special interest to the members of the British Columbia section of the Canadian Mining Institute, and mining engineers.

The steam and electric plants described below were modelled on the design and erected under the personal supervision of Mr. Bernard Macdonald, then general manager of the Le Roi and Nickel Plate mines, assisted by the writer. The steam plant was erected for the Le Roi Mining Company, Limited, and consists of the following, viz.:

**Boiler Plants.**—Two 250 horse-power Heine safety water tube boilers, arranged to burn coal as fuel. These were intended to generate steam to run the air compressors, and were set so as to work, if desirable, in connection with the nine 125 horse-power steel shell return tubular boilers, designed to operate the hoisting and surface plants. These boilers are arranged to be interchangeable to either service. A general description of this plant will be found in volume V, page 309, of the Journal of the Canadian Mining Institute.

During the test, the water-tube boilers were used at a gauge pressure of 150 pounds per square inch, using Crow's Nest coal as fuel, which cost, laid down in front of the boilers, \$5.50 per ton of 200 pounds.

**Air Compressing Plant.**—The steam driven plant consisted of two compound condensing Corliss valve engines, direct connected to two stage air cylinders, equipped with intermediate cooling devices, each machine having a rated capacity of 4,000 cubic feet of free air per minute, or a combined capacity of 8,000 cubic feet of free air per minute at sea level.

\*From a paper read before the Canadian Mining Institute, Nelson meeting



A more detailed description of these engines would be as follows:

|  | No. 1<br>Engine.<br>Inches. | No. 2<br>Engine.<br>Inches. |
|--|-----------------------------|-----------------------------|
| Diameter, high pressure steam cylinder..   | 22                          | 22                          |
| Diameter, low pressure steam cylinder ..   | 36                          | 36                          |
| Diameter, high pressure air cylinder ..... | 22                          | 22                          |
| Diameter, low pressure air cylinder .....  | 36                          | 38                          |
| Length of stroke .....                     | 48                          | 48                          |

The Electrically Driven Air Compressing Plant.—This plant was erected by the Rossland Great Western Mines, Limited, and was originally intended to be operated in connection with the steam plant previously described, the intention being to supply power from a central station to four mines, owned by different companies. The arrangement would have given each mine power at the lowest possible cost, and have ensured continuous operations by reason of the compressing plant being arranged in separate units. Each company would pay its share of operation, maintenance, of plant, pro rata to its consumption of air.

When it was found necessary to erect the third unit to the compressing plant, unforeseen difficulties presented themselves in the shape of shortage of water for condensing and cooling purposes. On examination it was found that a satisfactory supply could not be secured without heavy capital expenditures for erection of flumes, etc., to convey the water to where it was required for use.

It was, however, found that a supply of water, barely sufficient for the intercoolers and waterjackets, was available about three-fourths of a mile distant from the steam plant. This supply was so located at this distance away from the main steam plant. By conserving this water supply, cooling and re-using, it was decided a sufficient supply of water for the air cylinder jackets and intercoolers could be secured.

The results obtained from the steam plant had proven so satisfactory, that it was considered questionable if any electric plant could be installed that could successfully compete with steam, even when running non-condensing, unless very favourable rates for power could be secured. After negotiations with the Power Company, it was decided to erect an electrically driven plant, a short description of which is as follows:

Electrical Equipment.—Three phase, S.K.C., synchronous motor, designed for 2,200 volts, with rated capacity of 660 kilo watts, equivalent to about 825 horse-power. The motor is provided with a separate starting motor, mounted on the main frame, exciter and Italian marble switch-board, on which all operating switches and instruments are mounted.

There is a 50-inch Frisbee clutch set intermediate between the driving pulley and the motor. The motor is of a four bearing type, fitted with self-aligning and self-oiling sleeves. The entire machine is mounted upon a solid cast iron base set upon massive concrete foundations. The driving pulley is 60 inches in diameter, grooved for 22 1/2 in. ropes, and runs at 270 revolutions per minute.

The three compressors were built by the Canadian Rand Drill Company, of Sherbrooke, Quebec, and are especially designed for constant service.

The electrical equipment is also entirely of Canadian manufacture, the entire apparatus being manu-

factured by the Royal Electric Company, of Montreal, who are the Canadian manufacturers of the S.K.C. apparatus.

All tests were conducted under the personal supervision of the writer, and extreme care was taken to arrive at actual facts. Indicator diagrams were taken off both the steam and air cylinders every half-hour, and the results tabulated. Coal consumed was weighed, and all other supplies, such as waste, oil, etc., charged as used.

Readings were also taken and recorded by means of a delicately adjusted kilo watt metre, connected to the primary mains, of the amount of electric power used. The test extended over a period of thirty days, without interruption, both plants being run under exactly similar conditions as to air pressure.

Each of the plants tested being modern and representative of their respective types, gave an opportunity for a comparative test that rarely falls to the lot of an individual engineer under such favourable conditions, as to work being performed, and for this reason is the more valuable as data for basing calculations as to problems of power.

The average results of the thirty days' test is recorded in Tables I, II, III, IV, and V following:—

TABLE I.

## Work Performed by Steam Plant.

|   |             |           |
|---|-------------|-----------|
| Average indicated horse power at steam cylinders of the combined machines .....                                       | (h. p.)     | 730       |
| Free air compressed per minute from atmospheric pressure to 95 lbs. per square inch.....                              | (cubic ft.) | 5.432     |
| Free air compressed per hour.....   | "           | 325.920   |
| Average horse-power required at steam cylinders to compress 100 cubic feet of air per minute, to gauge pressure ..... | (h. p.)     | 13.4      |
| Pounds of coal consumed during test .....   | (lbs.)      | 1,038,000 |
| Pounds of coal consumed per day of 24 hours ..  | "           | 36,400    |
| Average pounds of coal consumed per horse-power per hour during test .....  | (lbs.)      | 1.9       |

TABLE II.

## Work Performed by Electric Plant.

|  |                   |
|--|-------------------|
| Average horsepower registered at switchboard (h.p.)  | 540               |
| Free air compressed per minute from atmospheric pressure to 95 pounds gauge pressure.....                              | (cubic ft.) 3.319 |
| Free air compressed per hour .....   | 199.140           |
| Average horsepower required at motor to compress 100 cubic feet of free air per minute to 95 lbs. gauge pressure ..... | (h. p.) 16.3      |

TABLE III.

## Cost of Operating Steam Plant.

|  |            |
|--|------------|
| Total cost of fuel consumed during test ..                       | \$2,880 45 |
| " " wages for employees .....                                    | 710 00     |
| " " oils, waste, etc.....  | 147 30     |
| " " for 30 days, exclusive of maintenance and depreciation ..... | \$3,737 75 |
| Cost per horse-power per month for fuel..                        | 3 96       |
| " " " oil, etc.  | 0 20       |
| " " " wages..  | 0 97       |
|  | \$5 15     |
| Cost per horse-power per annum ..                                | \$61 56    |
| Cost for each 100,000 cu. ft. of free air compressed             | 1 56       |
| Cost per drill shift.....  | 1 25       |

Note—80,000 cubic feet taken as the average consumption per shift of one 3/4 inch drill.



TABLE IV.

Cost of Operating Electric Plant.

|   |            |
|---|------------|
| Cost of current for thirty days .....                                   | \$1,744 26 |
| " employees' wages .....  | 270 00     |
| " oils, waste, etc .....  | 73 00      |
| <hr/>   |            |
| Total cost for 30 days, exclusive of maintenance and depreciation ..... | \$2,087 86 |
| Average cost per horse-power per month .....                            | 3 87       |
| Average cost per horse-power per annum .....                            | 46 44      |
| Cost for each 100,000 cubic feet of air compressed .....                | 1 40       |
| Cost per drill shift .....  | 1 17       |

Note—80,000 cubic feet taken as the average consumption per shift of one 3/4 inch drill.

TABLE V.

Showing Comparative Results between the Two Types of Compressors, based on each 100,000 cubic feet of air compressed from Atmospheric Pressure to 95 pounds Receiver Pressure.

|   |               |
|---|---------------|
| Cost for each 100,000 cubic ft. of free air compressed by steam plant (see Table III) .....   | \$1 56        |
| Cost for each 100,000 cubic ft. of free air compressed by electric plant (see Table IV) ..... | 1 46          |
| Result, saving by electricity over steam .....  | 6.4 per cent. |

The saving shown in Table V would be affected adversely if the electric plant was operated singly and the entire air compressed was not used. For the reason that electrically driven compressors must be operated at constant speed, and loss of air at safety valve would be considerably increased over the same loss at steam plant, which could be run at the speed required to compress the amount of air actually required. This loss would, however, be slightly offset by the increased cost per horsepower by working the steam compressors on underload.

I wish to draw special attention to the noteworthy results obtained from the system of intercooling used on the compressors tested.

In Table I, it is shown that the steam plant required 13.4 horse-power to compress 100 cubic feet of air to 85 pounds gauge pressure per minute. The best power factor recorded that has come under the writer's notice, for doing the same amount of work by a two-stage compressor, is 14.5 horse-power, which shows a saving of 8 per cent. resulting from the use of specially designated intercoolers, for which the manufacturers are entitled to receive the credit.

How this result is obtained can be best understood by reproducing the average of a number of tests made on the efficiency of the intercooler during the progress of the power test. The results of the tests are shown in Table VI.

TABLE VI.

|  |         |
|--|---------|
| Temperature of cooling water at inlet of intercooler ..  | 42° F.  |
| Temperature of cooling water at outlet of intercooler ..   | 50° F.  |
| Rise in temperature of cooling water while passing through intercooler .....                       | 8° F.   |
| Temperature of air at outlet of low pressure cylinder and before passing through intercooler ..... | 196° F. |
| Temperature of air at inlet of high pressure cylinder after passing through intercooler .....      | 54° F.  |
| Reduction in temperature of air after passing through intercooler .....                            | 142° F. |

In conclusion, permit me to state that this paper has not been prepared with the idea of recording the performance of these two plants, except, in so far as comparisons can be drawn between the relative efficiency of the two systems, so that engineers, knowing local conditions, can have some record of actual performance before them.

PATENT OFFICE REPORT.

**W**E are indebted to Mr. Rowland Brittain, of Vancouver, for the following list of patents issued to British Columbia inventors during the past month:—

E. A. Marshall, Vancouver, a United States patent on his improved jar seal, which has now received a lengthy trial of shipment to the Eastern States, Great Britain and Australia, and in every case his specialty of potted fish and meats has been reported on as having been received and kept in good condition. A Canadian patent has just been issued to G. A. Roedde, the well-known bookbinder of Vancouver, on an improved loose leaf binder, which is designed to be applicable to books of special form or size. Heretofore such have had to be specially made at the factory when required, while Mr. Roedde's securing clasp can be applied by any practical bookbinder. George Cassady, Vancouver, a Canadian patent on a sash lifter designed to overcome the difficulty commonly experienced in opening and closing the top sash of an ordinary window. The device, which is entirely supplementary to the ordinary sash weights, consists of a small reel secured to the centre of the sash frame and having wound on it a cord, the off end of which is secured to the top rail of the upper sash and continued down to afford a means for pulling the upper sash open. The reel is provided with a spring, the tendency of which is to pull the sash shut, and is controlled by a gravity pawl of that class that will only fall into engagement while the reel is at rest or rotating slowly, and will fall out of engagement when the sash is pulled down. H. Condren, Vancouver, a Canadian patent on a body indicating buoy. This consists of an inflated chamber forming part of an ordinary hat or cap, and connected by a light line to the person of the wearer, the line being coiled within the cap. It is intended to be worn by anyone exposed to the risk of drowning, while either boating, bathing or skating and on the person being submerged the cap will float and the line being attached to the body, will afford a ready means of rescue. If help should not be forthcoming and the wearer drowns, the cap indicates the locality of the body and enables it to be quickly recovered.

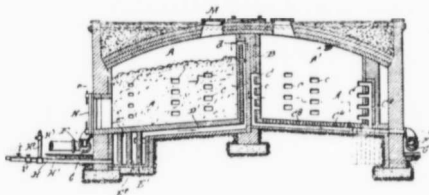
MINING PATENTS.

A Canadian patent on a method of desulphurising coal, granted to Oscar Daube, of New York. Patent No. 78,080. Claim: The method of carbonizing organic material or material of organic origin, which consists in subjecting the material to be carbonized to a preliminary fusing blast, and then to a carbonizing blast as described and for the purpose set forth. This patent is covered by nine claims, which can be obtained by application to the Patent Office.

To John Morrisett, Vancouver, on an ingenious improvement on a steam engine piston, whereby the weight of a heavy piston is centrally sustained in the

bore of the cylinder, and undue wear of piston and glands thereby avoided.

Apparatus for separating mercury from amalgam, granted to T. H. Hicks, of Fort Wayne, Ind. Claim: In a rotatable vessel, a cylindrical chamber and an annular chamber, each adapted to contain mercury and both arranged concentrically to the axis of said vessel's revolution and connected only by one or more joints so closely fitted as to prevent the passage of mercury therethrough, except under pressure.



Gold recovering process.—T. H. Hicks, Fort Wayne. Claim: The process of recovering gold as amalgam from pulverized sulphides (commonly called concentrates) which consists in subjecting such sulphides when dry to the action of heat and of hot mercury vapour as shown in the specification, and then collecting the freed gold whether in particles of amalgam or not by any effective liquid mercury amalgamating or mercury massing apparatus.

#### MINING PROGRESS AT ROSSLAND.

(From our own Correspondent.)

THE situation in Rossland remains unchanged from last month. The LeRoi is still shipping the usual quantity of ore, but arrangements are being made to bring up the output of 18,000 to 20,000 tons monthly, the increase being rendered possible by the larger amount of coke said to be available at the Northport smelter. The more furnaces that are running the cheaper the ore can be treated and, indeed, the manager, Mr. Mackenzie, is responsible for the statement that with all six furnaces going in the spring, upon the completion of the coke ovens at Morrissey, smelting can be accomplished at \$3 per ton, rendering \$8 ore profitable. This will mean a large augmentation of output. Mr. Mackenzie is leaving the mine at the end of the current month, and it will in future have no general manager, but one of the directors, Mr. Anthony J. McMillan, who is appointed managing director, will reside here and will conduct the affairs of the mine with a superintendent here and another at Northport. How this experiment will work yet remains to be seen. The present Superintendent, Mr. Roscoe R. Leslie, is said to be a capable mining man though young in years and necessarily so in experience. With smelting as cheap as is anticipated it is unlikely that the mine will immediately go in for concentration until the perfection of the experiments now being carried on in Rossland shows that not too large a percentage of the values is lost in the process. It is also likely that if concentration is carried out later on that the mill will be erected outside of Rossland if proper arrangements can be made with the rail-

ways. The most likely site to be selected is on Sheep Creek, over the boundary line, on the way to Northport, where below the falls there are some ideal sites where operations can be carried on by gravity. The question of concentration in Rossland itself is rendered difficult by the apparent lack of water, which, by the way, is more apparent than real if the city could be persuaded to undertake the bringing of it in on a large scale.

The War Eagle and Centre Star are shipping as usual and as yet no move has been made with regard to the erection of the concentrator. The experiments are perfected and the erection of a plant will probably come with the settlement of the water suits which are now pending at the Coast before the Supreme Court between the city and these mines. The disposition of the tailings is also another matter which needs some arrangement with the city if the mill be built close at hand.

In this connection it may be stated that the Elmore Process Company, which has been conducting a series of experiments on what is practically a laboratory basis, have made up their minds to erect a custom plant in the camp and treat ores given to them on a commercial scale. Most of the big mines on the hill have had samples of their ore treated locally by these people. The mill of the Centre Star and War Eagle is understood to be the usual water concentration type ending up with cyanidization. It is not improbable, however, that the tailings will be treated by the Elmore process.

The LeRoi No. 2 is now again on the shipping list after a close down which lasted for over a couple of months. The mine is reported to be in good shape. It is not likely, however, that the present management is anything else but temporary.

The Kootenay has commenced shipping in small quantities to Trail, which is inaugurating a series of experiments in treating this heavy iron ore on a pyritic basis and it is likely that the reduction works will be able to take some 300 tons daily and treat the same at about \$2.50 per ton, direct charges. If the indirect charges do not amount to much it is probable that the management will not proceed to erect a pyritic smelter of their own, at all events for the immediate present. The general manager of the mine is at present in London conferring with the shareholders as to the best method of putting the property on the active shipping list. He is expected back towards the end of February and it is more than probable that he will start shipping on a much larger scale on his return. The mine is being actively set in order in the preparation of stopes, etc., with a view to this policy.

Nothing much is being done upon the Giant. Events are waiting upon the action taken in London by the shareholders, which, if favourable to the further development of this promising property will probably result in the compressor of the California, an adjacent mine now lying idle, being utilized for more expeditious and economical work than is at present possible with the inadequate machinery at command.

The Homestake is working along well and some shipments of ore have been made to the Trail smelter which are reputed to have given favourable results. The management is particularly reticent in the dissemination of any information at the present stage of the mine's exploitation.

The Velvet is looking in excellent shape and is shipping first-class ore to the Northport works. Mr. Gray, the manager, is jubilant over the results obtained and is confident of ultimate success, and is entirely warranted by the development work which has been done, especially in the upper levels, where some bodies of high grade ore, previously unsuspected, have been located and shipped at a good profit. Samples running well over \$30 in gold and as high as seven per cent. in copper have been obtained. These bodies are not large in extent but there are several within a few feet of each other so they are easily worked. Prospecting done in levels immediately above and below have demonstrated their continuity. There is a concentrator partly finished upon this property, but no work will be done through it for some little time to come, until a welcome capital account is placed to the credit of the mine through its profits. The management is now contemplating the opening up of the Portland, a contiguous property, also belonging to the Velvet and situated within 300 feet of the present workings at the main shaft.

#### PROPOSED AMENDMENTS TO THE PLACER MINING ACT.

**T**O THE EDITOR: A meeting was held on the 10th of January, 1903, by the miners of Black Bear and Spanish Creeks at the Moore Company's cabin on Spanish Creek, to consider the proposed suggested amendments to the Placer Mining Act, suggested by the Placer Mining Committee appointed at the *Ledger* office in Vancouver on December 18, of which James Reid was chairman, to draft proposed amendments to Part VII of the Placer Mining Act.

The meeting was unanimous in indorsing Crown Grants for deep placer mines, and suggest the following amendments:

Amend Section 2, Chapter 136, Placer Mining Act of 1899, to read as follows:

"Placer mines shall be divided into two classes, as follows:

"Shallow placers and deep placers.

"Shallow placer mines shall include all claims located on creek diggings, bar diggings, bench diggings, dry, diggings and hill diggings in newly discovered shallow placer mining districts.

"Deep placer mines shall include all claims located on deep alluvial or other deposits of earth, gravel and gravel conglomerate, containing gold, platinum, osmiridium, or other valuable metals or precious stones that shall be worked by the hydraulic, hydraulic elevator, or milling process."

Part VII of the Placer Mining Act, so far as it refers to leases, shall be repealed and amended to read as follows:

"Sec. 1. That practically no changes be made in the present Act from Sec. 1 to Sec. 89, inclusive, except in so far as is necessary to prevent conflict with the changes to be made in Part VII."

This will protect the individual miner.

"Sec. 2. Every free miner will be entitled to locate and apply for a Crown Mineral Grant for a deep placer mining claim on any creek, bar, hill, bench, or

plateau on any unoccupied and unreserved Crown land, but no more than two claims in the same locality, one of which shall be a creek claim. He shall be allowed any number of placer mineral claims by purchase, and every free miner may sell, mortgage, or dispose of his claim or part thereof, but in no case shall any free miner be permitted to locate and record a deep placer mining claim in a newly discovered shallow placer mining district without first obtaining the consent of the Gold Commissioner, with the sanction of the Lieutenant-Governor in Council.

"Sec. 3. The dimensions of the deep placer mining claim shall be as follows: In creek diggings, one-half mile in length.

"Sec. 4. In other deep placer mining ground, 80 acres; but in no case shall any deep placer mining claim extend along any creek or river more than 500 yards, creek diggings excepted.

"Sec. 5. Every deep placer mining claim shall be as nearly as possible rectangular in form and marked by four legal posts at the corners thereof, firmly fixed in the ground. One of such posts shall be marked as the initial post, and on that post shall be placed a legible notice in writing, stating the name of the claim, its length and breadth in feet, and a general description of its boundaries, commencing at the the initial post marked No. 1, stating distance and general direction and a line blazed therefrom to each of the other corner posts, which shall be marked No. 2, 3 and 4.

"Sec. 6. Any lawful holder of a deep placer claim shall be entitled to a Crown Mineral Grant, for the exclusive right to mine and extract the precious metals and minerals from said mining claim until the same shall have been worked out or abandoned on payment to the Government of British Columbia the sum of one dollar per acre of land conveyed by grant, in lieu of the two per cent. tax on the gross output of placer mines. The intending purchaser of said right to mine shall comply with all the provisions of Sec. 36 of the Mineral Act, and the amendments concerning the application for Crown Grants, so far as they may be applicable to deep placer mines.

"Sec. 7. The holder of a Mineral Grant for a deep placer mining claim, or a consolidation of deep placer mining claims, shall expend annually on each claim or mine containing 80 acres or less at least \$200 for exploratory work. Such work shall consist of manual labour, permanent improvements made on the mine, in building roads, shafts, tunnels, machinery, dams, canals, ditches, flumes, pipe line or any mining work necessary for equipment or operation of mine.

"Sec. 8. The holder of a Crown Mineral Grant for a deep placer mining claim, or placer mine, or a consolidation of deep placer mining claims or placer mines, shall pay annually the deep placer mining tax of \$1 for each and every acre of mining claim or mine so held.

"Sec. 9. The failure of the holder or holders of Crown Mineral Grants for deep placer claims or mines to comply with the provisions of Sections 6, 7, and 8 of this Act, shall be deemed an abandonment, and such mine shall be declared open for re-location by the Gold Commissioner or Mining Recorder in such district, who shall post notices to that effect on the bulletin board of his office.

"Sec. 10. It shall be lawful for the Gold Commissioner, with the sanction of the Lieutenant-Governor

in Council, to grant the right to lawful holders of leases of placer mining ground for hydraulic or deep placer mining purposes to avail themselves of the provisions of this Act without in any way prejudicing the rights or privileges appurtenant thereto. The lawful holder of a lease for placer mining ground and water rights appurtenant thereto shall be entitled to a record for the same dating back to the date of original lease and water grant, so held as appurtenant thereto, but in no case shall the holder of a lease be entitled to such record until he shall have fully paid up all leasehold rents due on said leases."

JAMES MOORE,  
Secretary of Meeting.

#### AN ELECTRIC DRILL.

**A**S electric drills have recently been installed in one or two mines in British Columbia, a brief description of the Durkee Lightning Drill, manufactured by the Mine and Smelter Supply Co. of Denver, Colorado, may prove of interest. This drill follows along the lines shown by experience with the air drill to be most satisfactory. No departure has been made from standard air drill practice except where necessitated by the difference in the power. The standard form of air drill column, arm, clamp, guide shell, feeding devices and chuck for holding the steel are retained. The column rifle bar, rifle nut, ratchet and pawls are also used, although the arrangement of the parts are changed to meet the requirements of the machine.



The Durkee Lightning Drill is driven by a small electric motor, provided with speed controlling devices, through which the speed of the drill is controlled as readily as by the throttle valve of the air drill. The power of the motor is conveyed to the drill through a short, flexible shaft, which allows the motor to be placed in any convenient position close to the drill. The piston of the drill, through a simple mechanical device, is given a rapid forward stroke and a much slower return. This rapid forward stroke concentrates the power upon the rock, while the comparatively slow return stroke gives a powerful pull to release a drill from a fissured hole. In regular mining work in bad ground it is found that the Durkee drill runs steadily, while an air drill will make but a few strokes without sticking in the hole. To prevent shocks on the mechanism of the drill, buffer springs are used, through which the power is transmitted to the piston. An incidental result of the use of the buffer springs is that as the springs are compressed by the

inertia of the piston on the back stroke, and by their expansion add to the work delivered through the piston. The drill is run at such speed as to take full advantage of this action.

Comparing the power plant of the electric drill with that of the air drill, it will be noted that the electric drill plant is very small and compact and needs no expensive foundations. The power transmission line of the electric is also lighter and cheaper to put in place and can be removed to other working places without damage to the wires and with a minimum of labour. With electric power it is also a very simple matter to place a light where required and also to put a small motor-driven fan where it will do the most good with the minimum of power.

The electric distribution of power is steadily increasing throughout the world. On account of its economy it is used to drive all classes of machinery. In modern machine shops electricity is especially useful because of the ease with which small units of power can be installed where required. In mining, where large amounts of power are used and where, underground, a large number of small units of power are required, it is being slowly but surely adopted. Electric coal mining machines have been in use for some years, but only during the last year has a successful electrically driven machine been built for drilling hard rock. The Durkee drill is the most satisfactory rock drill in the market on account of its economical electric drive and because of its adherence to the principles developed by air drills.

#### COMPANY NOTES.

##### RAMBLER-CARIBOO (MCGUIGAN.)

**T**HE annual report of the Rambler-Cariboo just issued states that the mine has about 75,000 tons of ore available on the dump and in the present workings, 25 per cent of which is mined and ready to hoist. Since the financial statement issued in June, \$20,000 has been expended in new machinery, which, it is estimated, will increase the profits by \$20,000 per month. The present work includes sinking a shaft from No. 8 to No. 9 tunnel, and it is expected to open level No. 9 by March 1st.

**RECO (Sandon):** The balance sheet for the year 1902 values the assets at \$1,003,933.74, made up as follows: Mines, etc., \$958,200, treasury stock \$41,800, cash in bank \$3,933.74; and the liabilities: Capital stock, paid up, \$1,000,000, accounts payable, \$2,293.48, profit and loss \$1,640.26. The net proceeds from ore sales, 536 tons were \$61,077.75.

**PAYNE (Sandon):** Two Willey tables for the purpose of saving the zinc contents of the ore are being installed. The Payne is exporting a considerable tonnage of ore carrying zinc values to Iola, Kansas, and the zinc concentrates will be added to these shipments in future.

**FISHER MAIDEN (Silverton)—**The superintendent reports that sufficient ore has been blocked out, averaging 150 oz. of silver to the ton, to keep the present mine-force engaged for a year. Seven carloads of ore have recently been shipped to the Trail smelter, and production is being maintained at the rate of a carload every four days.

**ARLINGTON (Slocan)—**An experimental plant for treating the lower grade products of the mine is being set up in Spokane. The principle of the system is the making of slimes by sending finely crushed ores over the Willey tables or Frue vanners, and subsequent electrical treatment.

**ENTERPRISE (Slocan)—**At the general meeting held in London last month, the chairman reported that last year's operations resulted in a loss of \$2,585. New machinery has been installed with a view to economizing costs, but the directors contemplate a temporary suspension of operations until metal market prices and conditions generally improve.

**EVA (Fish Creek)—**A ten stamp mill is to be installed immediately on this property, while a mill of like capacity is being set up on the Oyster-Criterion group at Camborne.

**LE ROI (Rossland)—**At a meeting of the company held in London on January 17th, the announcement was made that the profits of the last eight months amounted to \$578,000. Sir Henry Tyler was re-elected chairman, and Mr. Antony J. McMillan was appointed managing director of the company. The statement of shipments and profits for the period is given as follows:



| Months.                   | Tons.  | Profits.     |
|---------------------------|--------|--------------|
| May.....                  | 13,047 | \$ 66,932 53 |
| June.....                 | 11,475 | 72,640 24    |
| July.....                 | 14,492 | 92,898 42    |
| August.....               | 17,009 | 71,270 53    |
| September.....            | 13,667 | 61,091 49    |
| October.....              | 15,204 | 84,232 49    |
| November.....             | 15,576 | 76,482 63    |
| December (estimated)..... | 13,500 | 45,000 00    |
| Total.....                |        | \$579,548 33 |

VELVET (Rossland)—Two baby Rand drills have recently been added to the equipment of this mine. The manager is reported to have stated that he can secure better results with these one-man machines than with the larger drills. The Velvet now has ten of these machines in use.

JOSIE (Rossland)—It is reported that very satisfactory discoveries of rich ore bodies have been recently made in the lower levels, and it is said that in the present lower workings of the Josie, where work has been under way for some weeks, the face is eleven feet in width and the ore assays in the neighborhood of \$100 per ton.

GRANBY CONSOLIDATED (Boundary)—A meeting of the shareholders of the Granby Consolidated Mining Company was held on January 15th. The president, Mr. Miner, announced that by the sale of 125,000 shares of Treasury stock at \$4 per share, the Company had been practically freed from debt, and unless something out of the ordinary occurs a dividend will be paid during the present year. He furthermore stated that two new furnaces would be established by August, and full equipment by March or April following. The week before last the four furnaces had treated 10,115 tons of ore at a cost, including freight and commission, of \$2 65, a figure which he believed in the near future would be reduced to \$2.50.

The new directors are: Messrs. John Stanton, Copper Statistician; William H. Nicholls, President of the Nicholls Chemical Company; Jacob Langeloth, President of the American Metal Company, of New York, and Clement S. Houghton, financial agent, of Boston.

VMIR.

The Secretary of the Company's Board in London, recently sent the following advice to the Press: "The upraise from the 1,000-foot level has now been connected with the bottom of the shaft. The completion of this important work enables the development of the lower levels to be more vigorously and economically carried on, and also facilitates the driving of No. 10 level eastwards so strongly recommended by Mr. Hooper and Mr. Fowler. It is gratifying to learn by the latest reports from the mine that developments at No. 5 level in an easterly direction are described by the Mine Superintendent as follows: 'The prospects in this direction are certainly very favorable and highly encouraging.' The significance of this cannot fail to be appreciated when it is explained that this development occurs in entirely new ground—considerably further east than any point at which values have been found in the upper workings. The re-construction scheme has been successfully carried through, and the whole of the new capital taken up."

The last returns from the Ymir mine indicate a profit for December of \$10,000, which is the highest since last May. The London price of the shares has advanced within the last two months, and lately stood about \$3.00.

UNION JACK (VMIR.)

The Manager of the Union Jack Mine, Ymir, states that a good payshoot of galena has been met, 165 feet in on the lower tunnel. He adds that this averages \$42 a ton. However, previously to this strike the vein faulted considerably and more remains to be done to prove the permanence and continuity of the deposit.

WILCOX (VMIR.)

The first gold brick from the Wilcox mill at Ymir, has been taken to Nelson by John F. Burne, the Secretary of the Broken Hill Company. This brick, which weighed seven pounds, is, however, only the product of a partial clean-up, after a run of 16 days. The gold is found to be much freer than was estimated, necessitating a few slight alterations in the plates. Most of the gold is being retained in mortars, from which no clean-up has been made yet.

SULLIVAN (E. KOOTENAY.)

It is said that arrangements have been made to provide the necessary capital to complete the building of the Sullivan

smelter at Marysville. It was first estimated that about \$50,000 should be raised, of which \$40,000 would need be spent in construction. It is now planned to raise \$100,000 and give a working capital of \$60,000. The money will probably be raised on the security of mortgage bonds issued by the company. The plant has a nominal capacity of 100 tons, but its actual capacity is expected to be nearer 150 tons a day.

FAIRVIEW CORPORATION (FAIRVIEW.)

The Manager writes, January 21st: We now have half of the vats up and are getting into shape to erect the others immediately. During the past month we have been sinking on the vein to the 400 foot level and are now down 80 feet below the 3rd level.

We are also breaking down the ore from the other levels in order to have a large quantity stored by the time we get started. The ore is a good average in quality and the quantity is very great so there is no doubt of the future.

VAN ANDA.

The English Syndicate, the past year operating this property, have, it is reported, decided finally to consummate a purchase.

MINING RETURNS AND STATISTICS

ROSSLAND.

SHIPMENTS from the Rossland camp for the three weeks ending January 24th were as follows:—

|                   | Tons.  |
|-------------------|--------|
| Le Roi.....       | 11,361 |
| Centre Star.....  | 5,720  |
| War Eagle.....    | 3,425  |
| Giant.....        | 170    |
| Velvet.....       | 390    |
| Kootenay.....     | 225    |
| Le Roi No. 2..... | 400    |
| Homestake.....    | 60     |
| Total.....        | 21,741 |

SLOCAN.

From January 1st to January 17th, exports from the Slocan were:—

|                    | Tons |
|--------------------|------|
| American Boy.....  | 123  |
| Antoine.....       | 16   |
| Arlington.....     | 40   |
| Black Prince.....  | 18   |
| Bondholder.....    | 1    |
| Enterprise.....    | 95   |
| Fisher Maiden..... | 60   |
| Ivanhoe.....       | 90   |
| Ottawa.....        | 20   |
| Payne.....         | 246  |
| Rambler.....       | 60   |
| Reco.....          | 20   |
| Slocan Star.....   | 21   |
| Total.....         | 859  |

The following table shows the Slocan ore shipments for the year 1902 with average value per ton:

Payne Mine, 1,976 tons, average value \$100; Ivanhoe, 637 tons, \$75; Sunset, 827 tons, \$125; Reco, 490 tons, \$250; American Boy, 1,134 tons, \$50; Arlington, 3,560 tons, \$150; Hewett, 805 tons, \$40; Boson, 2,040 tons, \$65; Last Chance, 168 tons, \$75; Wonderful, 181 tons, \$90; Enterprise, 2,220 tons, \$50; Lavina, 85 tons, \$55; Bismark, 62 tons, \$40; Queen Bess, 180 tons, \$75; Silver Glance, 257 tons, \$250; Whitewater, 2,902 tons, \$40; Ottawa, 48 tons, \$150; Capella, 60 tons, \$50; Florence 1 ton, \$55; Trade Dollar, 20 tons, \$125; Slocan Boy, 158 tons, \$80; Neepawa, 123 tons, \$40; Hartney, 25 tons, \$50; Marion, 80 tons, \$50; May, 5 tons, \$55; Paystreak, 7 tons, \$55; Surprise, 22 tons, \$55; Monitor, 1,306 tons, \$80; Slocan Star, 714 tons, \$90; Duplex, 7 tons, \$55; Emily Edith, 20 tons, \$55; Wakefield, 220 tons, \$50; Prescott, 4 tons, \$55; Rambler, 4,187 tons, \$75; Molly Gibson, 2,100 tons, \$60; Washington, 187 tons, \$80; Folliot, 2 tons, \$55; C.O.D., 2 tons, \$55; London Hill, 115 tons, \$100; Ruth, 846 tons, \$100; Antoine, 207 tons, \$100; R.E. Lee, 144 tons, \$80; Spectator, 4 tons, \$55; Red Fox,

63 tons, \$50; Hampton, 13 tons, \$250; Mercury, 21 tons, \$200; Dardanelles, 21 tons, \$50; Porcupine, 2 tons, \$50; Charleston, 11 tons, \$250; Pinto, 15 tons, \$85; Noble Five, 21 tons, \$65; Soho, 64 tons, \$55; or in round numbers 28,000 tons.

Shipments from the Slovan City Division aggregate 6,529 tons from fourteen mines.

## BOUNDARY DISTRICT.

The Phoenix pioneer publishes the following table of 1902 shipments:—

|                        | Tons.   |
|------------------------|---------|
| Granby Mines, Phoenix  | 309,858 |
| Snowshoe,              | 20,800  |
| Mother Lode, Deadwood  | 141,326 |
| Sunset                 | 7,455   |
| B. C. Mine, Summit     | 15,024  |
| Emma,                  | 8,530   |
| Winnipeg, Wellington   | 785     |
| Golden Crown,          | 625     |
| Jewel, Long Lake       | 2,175   |
| Providence, Providence | 172     |
| Miscellaneous          | 325     |

Total, tons..... 507,758

Granby Smelter treatment, tons..... 312,340

## LARDEAU.

The Nettie L shipped 400 tons of ore in December valued about \$40,000 and the Silver Cup shipped 205 tons valued at \$25,625. The total shipments for the year 1902 for these two principal mines of the Lardeau is valued at \$217,000.

The shipments from other properties including the Guinea Gold, Triune and Ethel are expected to increase the value of the district's output for the year, to a quarter of a million dollars.

## VANCOUVER ISLAND.

Last year the Yreka mines at Quatsino, on the west coast, shipped 190 tons of ore. From Alberni canal were sent 400 tons. The Marble Bay mines, Texada, shipped 9,000. From Mount Sicker the Lenora shipped 3,000 tons to the Crofton and Tacoma smelters, and the Tye about 3,000 tons. From Princess Island and other places on the coast about 300 tons additional were shipped to the smelters, while about 1,000 tons of iron were sent from Texada Island to the Irondale smelter.

## COAL EXPORTATIONS AND TRADE.

THE output of the Crow's Nest Pass Coal Company's collieries for the month of December shows a marked increase over any month since last spring. The following are the figures for the past three months, for the three collieries:

|          |             |
|----------|-------------|
| October  | 42,577 tons |
| November | 34,410 tons |
| December | 43,631 tons |

November output was curtailed by the Michel strike.

The following shows the amount contributed by each camp for the month of December:

|            |             |
|------------|-------------|
| Coal Creek | 19,336 tons |
| Michel     | 13,927 tons |
| Morrissey  | 10,369 tons |

It is expected that the output for 1903 will reach the grand total of 1,000,000 tons.

Production from the Vancouver Island collieries last year was divided as follows:—New Vancouver Coal Company, Nanaimo, 490,000 tons coal; Wellington Colliery Company, 800,000 tons of coal and 15,800 tons coke.

The mines in the Crow's Nest produced during the year 441,000 tons of coal and 112,000 tons of coke.

In these amounts the coke production in each case is included in the coal mined. While therefore 1,731,000 tons of coal were mined in the Province during the year, there was, roughly estimated, about 200,000 tons, making 127,800 tons of this latter product.

Last year's total production was 1,703,827 tons coal and 127,533 tons coke.

## TRADE NOTES, CIRCULARS AND CATALOGUES.

## CRUSHING ROLLS.

THE Allis-Chalmers Company send us a copy of a new edition (the seventh) of Catalogue No. 8, which is devoted exclusively to the description of crushing rolls. The company's standard make of crushing rolls consists of three styles, the Style A, formerly known as the Gates High Grade Roll, Style B, formerly known as the Fraser & Chalmers Standard Roll, and Style C, formerly known as Fraser & Chalmers' Old Style Belt Roll. In this catalogue these rolls are fully described and illustrated. Tables of the standard and special sizes are also given. It addition the company manufacture an auxiliary line of crushing rolls.

## WIRE ROPE TRAMWAYS.

The Trenton Iron Company's new book on Wire Rope Tramways, directs special attention to the merits of the Patent Locked-Coil Track Cable and Webber Patent Compression Grip, with Patent Automatic Attacher, (used only on Bleichert tramways). The little volume contains a vast deal of useful information and contains numerous illustrations of an interesting order. A diagram showing the details of the Bleichert system of wire rope tramways is also included.

## A CHICAGO SCHOOL OF ASSAYING.

From the prospectus of the Chicago School of Assaying we gather that ten different courses of instruction are here given. These include a prospector's course; a short course in fire assaying, advanced courses in assaying, and course in geology, practical and theoretical chemistry, quantitative analysis and sanitary and domestic chemistry.

## THE LESCHEN WIRE ROPE SYSTEM

The A. Leschen & Sons Rope Co. issue a new catalogue, plentifully illustrated and well printed, descriptive of the Leschen automatic system of aerial wire rope tramways as well as of the Leschen friction grip system, single line tramways, two-bucket tramways, etc.

## ALLIS-CHALMERS QUARTERLY DIVIDEND.

At meeting of Board of Directors of the Allis-Chalmers Company, held January 15th, 1903, regular quarterly dividend on preferred stock was declared.

## THE CANTON STEEL COMPANY'S NEW OFFICES.

The Canton Steel Company have opened new offices at 1621 to 1639 Seventeenth Street, Denver, Colorado.

## YUKON OFFICIAL RETURNS.

A STATEMENT of the output of gold by the Klondike has been compiled by the Department of the Interior. The figures were obtained from Government records from 1897 to the 1st of January, 1903; from statements furnished by the Northwest Mounted Police for 1896, and from trading companies from 1885 to 1895, inclusive. The output year by year was as follows:

|       |               |
|-------|---------------|
| 1885  | \$ 50,000     |
| 1886  | 50,000        |
| 1887  | 70,000        |
| 1888  | 40,000        |
| 1889  | 175,000       |
| 1890  | 175,000       |
| 1891  | 40,000        |
| 1892  | 87,000        |
| 1893  | 176,000       |
| 1894  | 125,000       |
| 1895  | 250,000       |
| 1896  | 300,000       |
| 1897  | 2,500,000     |
| 1898  | 10,000,000    |
| 1899  | 16,000,000    |
| 1900  | 22,275,000    |
| 1901  | 16,304,682    |
| 1902  | 11,930,264    |
| Total | \$ 80,930,956 |

## RECENT PUBLICATIONS.

THE Songs of an English Esau, (Printer, Elder & Co., London,) collection of Mr. Phillips-Wolley's poems including The Kootenay Prospector, The Sea Queen Wakes, The Strathcona Cavaliers, &c., is now on sale. Orders received at the Mining Record Office. Attention is called to the reviews of this work in such papers as The London Times, Scotsman, &c.

## COAL EXPORTATIONS.

**E**XPORTATIONS from Vancouver Island collieries during the month of January were as follows :

|                                | Tons   |
|--------------------------------|--------|
| Western Fuel Co., Nanaimo..... | 21,582 |
| Wellington Coal Company.....   | 25,390 |
| Total.....                     | 46,972 |

The condition of the San Francisco coal market is showing improvement.

The placing of all foreign coals on the free list should induce further shipments of colonial, as the reduced cost to consumers should increase sales. This concession has been granted nominally since January 15 for one year, but the writer believes that coal will never again be on the dutiable list.

A further advantage in favour of increased sales of coal, is a marked improvement in the price of oil, with an assurance of its being marked up still higher; hence the values of coal and oil as economic fuels are approximating very closely.

The amount of coal from the Crow's Nest Pass fields arriving in the United States through the port of Gateway, over the Great Northern's branch from Jennings, is 300 cars, of 20 tons each, a day, an increase of 50 cars since the repeal of the duty on foreign coals by Congress two weeks ago, says the *Seattle Post-Intelligencer*. All this fuel is for use along the line of the G. N. R. and it is expected, within a short time the imports of this coal will be at least 500 cars per day, or 10,000 tons. At the time the duty was taken off coal, the G. N. was paying a duty of 67 cents a ton. On the amount of coal imported at the present time a saving of \$4,020 a day is made, and with the imports increased to 500 cars a day, the saving in duty to the road, by the Act of Congress, will be \$6,700 a day.

## PERSONAL.

It is reported that Mr. S. F. Parrish, of the B. C. mine Eholt has been selected to succeed Mr. John H. MacKenzie as general manager of LeRoi mine and of the Northport smelter. Mr. Parrish is widely known throughout the Western mining States, and in the Kootenays, where he has resided for the past three or four years. The appointment, if made, would be an exceedingly popular one.

The Western Fuel Co. have appointed Mr. Thomas Russell to the position of superintendent, vacated after twenty years by Mr. Samuel M. Robins.

## COMPANY MEETINGS AND REPORTS.

## CARIBOO CONSOLIDATED.

**A**T the Annual General Meeting the chairman gave the following brief account of the undertaking: The company was brought out in 1899 to work nineteen mining properties in the Cariboo district of British Columbia. These properties were of three descriptions, hydraulic, drifting, and dredging, distributed over a considerable area, several of them difficult to get at for want of roads, and to some not even a trail through the forest had been cut. We took in hand and developed three hydraulic properties near Barkerville, viz., Lowhee, San Juan, and Ah Quay on Lightning Creek. The result of working these has not so far been satisfactory. A large amount of development work has been done, but it was found difficult to obtain a sufficient supply of water. One of these properties, the Lowhee is known to be rich, and it has considerable possibilities, and as a larger supply of water will be obtainable next season through an additional ditch which

has lately been completed, the board anticipates that next season's working will give much more satisfactory results. It, however, soon became apparent to the board that small hydraulic properties, which can only be worked for a few months in the summer, would not give results sufficient to ensure the success of a company with a considerable capital. There were three other properties near Barkerville—Eureka Gulch, French Creek, and Cariboo Creek—which we did not feel justified in incurring the cost of developing immediately. Eureka Gulch is an hydraulic proposition; has little or no water. French Creek, a drifting claim, would require a large expenditure in boring to locate the old tunnel, and may be left until we have our own boring plant. Cariboo Creek was prospected by Mr. Thompson with unsatisfactory results.

The other properties of the company are the leases on Cunningham Creek, Cariboo Lake, Cayeuse Creek, Fraser River, and Lightning Creek. The claims on Cunningham Creek are considered to have great possibilities as drifting and hydraulic propositions, but as they are 20 miles from Barkerville, and at present difficult to get at, we would not undertake their development until the roads are completed. At present we could not get machinery there. The different leases about Cariboo Lake are very extensive dredging leases, but here again we did not feel justified in going to the great expense of placing dredges on Cariboo Lake until the country was further opened up. The same may be said of the leases in Cayeuse Creek and Fraser River, which are also dredging leases. Lightning Creek, as many of you doubtless know, is one of the most famous of the Cariboo creeks. It produced in its early history over £2,000,000 of gold from two miles of its channel, a short distance above the Eleven of England claims. In other words, the channel produced gold at the average rate of £200 for each foot in length. This was in the early seventies, but even this year gold is being recovered in large quantities in these old claims, and as recently as last month 56½ ozs. of gold were taken from a single pan. In 1900 Mr. Thompson put before the board a scheme for working these claims, but as it necessitated the construction of a drainage tunnel, to drain the bottom of the channel—which would have been over three miles in length, and was then estimated by Mr. Thompson to cost £30,000, and take three or four years to construct—the Board did not see its way to embark on such an undertaking. The tunnel, however, would not only have drained our claims but all those in the creek above, which would then have become of considerable value, as they could have been easily and inexpensively worked by their owners; and if we wished to acquire any of these leases we should have had to pay a large price for them. It was quite clear that less than ¾ of a mile of Lightning Creek would not justify any large expenditure for its development, and that the only course left to the board was to acquire the adjacent claims on Lightning Creek to the Eleven of England so as to enlarge our property to an extent which would not only justify the cost of its development, but give us satisfactory returns for our outlay.

Such a property we have now obtained by the acquisition of eight leases below our present claims, and also several additional leases above them, so that we now own nearly the whole of Lightning Creek from Beaver Creek to the Van Winkle mine, a distance of seven miles. We have decided to abandon the scheme for a tunnel as beyond our resources, to say nothing of the time it would take to carry out, and to proceed with the development of these leases by means of bed-rock shafts and tunnels under the old channel, handling the water by means of adequate pumps. The estimated cost for the first of these is £16,000, and if it should be found necessary to largely increase our pumping power—which, however, is not anticipated by our local manager—the additional cost will be as nothing compared with the cost of a drainage

tunnel. When the first shaft and tunnel reaches the bottom of the channel, then it is proposed to immediately sink a second shaft.

Mr. Bailey's estimate of the time required to sink this shaft and drive the tunnel is as follows:—Under ordinary conditions he says you should be able to commence making these borings (to locate the best position for the shaft) about the 1st April, 1903, and they should be completed about the 1st July. He estimates it will take three months to construct the shaft-house and instal the machinery, i.e., to the 1st October. Estimating the depth of the shaft at 200 feet it will take till the 15th January, 1904, to complete and drive the tunnel, which he estimates will be 600 feet long—four months—so that by the 15th May, 1904, we should be into the channel. These are our local engineer's estimates, and we believe he will be able to carry it out.

#### NEW VANCOUVER COAL CO.

At a meeting held in London at the end of last month the following resolutions were carried: "That the provisional agreement dated December 15, 1902, made between the New Vancouver Coal Mining and Land Company (Limited) of the one part, and the Western Fuel Company of the other part, which agreement is, or short particulars thereof are, now produced to this meeting, being an agreement for the sale of all the real and personal property in British Columbia of this company excepting coal stored, balance of purchase money for property heretofore sold, cash on hand and in bank, securities, correspondence, books of record and account, be and it is hereby adopted and confirmed, and that the directors be and they are hereby authorized to carry the said agreement into effect with modifications, if any, as the directors may in their discretion think necessary."

"That the directors be and they are hereby authorized to pay to Samuel Matthew Robins, as soon as the property comprised in the agreement of December 15, 1902, adopted by this meeting, shall have been conveyed and transferred according to that agreement, the sum of £10,000 sterling agreed compensation and satisfaction of his claim for, and in respect of, his uncompleted contract as superintendent of this company."

"That the directors be and they are hereby authorized to enter into an agreement on behalf of the company with Messrs. John Rosenfeld's Sons, of San Francisco, under which this company (a) shall pay the said Messrs. John Rosenfeld's Sons the sum of \$10,000 (United States currency) in consideration of their subscribing the full \$50,000 in the purchasing company in relief of the obligation imposed by that company; (b) shall pay to the said Messrs. John Rosenfeld's Sons a further remuneration in consideration of their guaranteeing the due payment of the promissory notes referred to in Section 2 of the agreement of December 15, 1902, adopted by this meeting." The chairman explained that one of the conditions made by the representatives of the purchasing company was that the Vancouver Company should take \$50,000 in the new company. The directors, however, preferred another course, so Messrs. Rosenfeld undertook to put their own money in to that amount, if the company would pay them \$10,000 in consideration of their doing this, and that was acceded to by the directors. With regard to Section B of the resolution, the extra remuneration would be 8 per cent. on the £30,000 that ran for one year, and 10 per cent. on the £20,000 that ran for two years. This was not 10 per cent. per annum, but was for the whole period.

"That so soon as the property comprised in the agreement of December 15, 1902, adopted by this meeting shall have been conveyed and transferred under that agreement the sum of £5000 be paid out of the funds of the company to the directors as compensation for loss of office, and that likewise the sum of £3000 be paid to Joseph Ramsden, secretary of the company, and £1000 to Arthur Billett Mayes, an employee of the company, and that the directors be, and they are hereby authorised to make any such further payments as they may think fit by way of bonus or compensation to other officers or employees of the company."

#### THE SNOWSHOE MINES.

The second ordinary general meeting of the Snowshoe Gold and Copper Mines, Limited, was held on December 31 in London, the Earl of Chesterfield, chairman, presiding.

The Chairman, in moving the adoption of the report and accounts, said that development work had been vigorously prosecuted since the formation of the company in June of last year, and large bodies of ore had been opened up during development. At the present time the mine was shipping from

200 to 250 tons of ore per day, and when certain equipment, in hand, was completed, it would be able to ship from 500 to 700 ton of ore per day. This ore was being mined very cheaply, a great deal of it being quarried by blasting on and near the surface. At present the ore was being sent to customs smelters in the neighborhood, where it was treated at a comparatively low rate. The Canadian Pacific Railway had put in additional side tracks for the accommodation of the company, and arrangements had been made with an electric company to furnish power and light. The directors had under consideration the question of erecting their own smelter, as by doing this it would be possible to treat ore at a considerably larger profit. With reference to the two per cent. tax levied on the gross output of the mines, after deducting freight and treatment rates, he urged strongly that the British Columbia Government should abolish this tax as it was undoubtedly retarding the investment of capital and the progress of mining. Up to the present the work at the mine had been mainly in connection with development. The Snowshoe was one of the largest mines in British Columbia, and it took long to open up and develop such big properties as this. The fact that they were now shipping between 200 and 250 tons of ore per day showed that they had done remarkably well. They were commencing to put money back into the mine from the proceeds of ore shipments, and the receipts from this source would be considerably increased before long, so much so that he hoped the time was not far distant when the shareholders would receive a return.

The accounts were set out so clearly as to require little explanation. Whilst the directors might have claimed to capitalize the whole of the first year's expenditure, they thought it better to start with a profit and loss account, so that the shareholders would be better able to follow from the commencement the working expenses of the mine. The following cable had been received that day from Mr. J. W. Astley, the resident superintendent of the mine:

"Shipments this year to date 20,000 tons; electric hoist arrived; ore bins nearing completion; contract with Cascade Power Company signed; smelter expected to be ready not later than 1st February for increased tonnage."

During last autumn three directors had visited the property and come back well pleased. In conclusion, His Lordship said: "I am perfectly well aware that owing to circumstances which have occurred within the last year or two in connection with certain mines in that country, the confidence of the British mining investor in British Columbia mines has to a great measure been shaken, and I am not surprised. To restore that confidence will be the aim of your Board. Before long we will be able to prove to the investing public of this country that by honest, judicious and sound management there are mining enterprises in British Columbia well worthy the attention of the investor, and that there are in that country capabilities hitherto little realised, which must in time on their merits force themselves on the notice of the English capitalist."

#### A LARGE AMOUNT OF ORE IN SIGHT.

Mr. George S. Waterlow, in seconding the adoption of the report and accounts, said that having spent some time last autumn at the Snowshoe mine, he believed that the methods of mining there and at the adjoining properties were the most economical possible, and possibly the cheapest mining, as well as the cheapest smelting, in the world was at the present time being carried on in that district. He had visited the Snowshoe mine in 1900, when it was comparatively undeveloped and he could not but notice vast changes since his former visit. The ore was being extracted by blasting in open quarries. Owing to the conservative manner in which the affairs of the Company were managed matters had generally turned out better than anticipated, and the large amount of ore in sight was gratifying. They were shipping 1,200 to 1,500 tons per week, and it would soon be possible to double or treble that quantity. The ore, of which about 100,000 tons was in sight, contained considerable bodies of gold and copper, the gold values predominating, and in addition there was also a small amount of silver. The next mine to the Snowshoe, which had been in course of development much longer than this Company's property, was shipping 1,500 tons of ore to the smelter, and had erected its own smelting works capable of dealing with this output, to which it was proposed to make early additions. The railway communication afforded by the Canadian Pacific Railway, which crossed the Snowshoe mine, was very good, and on account of the great development in mining it was proposed by other companies to build railways into that part of the country at an early date. With reference to freight rates on ore to the smelters, which had already been considerably reduced, he had received a telegram from Sir Thomas Shaugh-



nessy, President of the Canadian Pacific Railway, stating that when the ore output was increased further reductions might be expected. He urged the desirability of the Provincial Government paying more attention to the mining industry and would also suggest that the Dominion Government could help matters by reducing or abolishing the duty on mining machinery and explosives. In the Boundary District—in the centre of which the Snowshoe mine is situated—mining only commenced on a commercial scale in the year 1900, and during that year less than 100,000 tons were sent to the smelters. This year the output was about 500,000 tons, and up to date nearly 1,000,000 tons of ore had been treated, and there was every reason to believe that 1903 would witness a much greater output. The Snowshoe had already sent to the smelters about 20,000 tons of ore, much of which had been in the nature of experimental shipments to test values, and its output in the near future would be much greater.

#### SEVERAL OFFERS RECEIVED FOR THE MINE.

As a very large shareholder he was quite satisfied with the position, as stated in the cable he sent from the mine in September. An offer had just been received from certain well known mining men in America, who wished to purchase the Snowshoe mine, and several offers had been received within the last few months. It had been the practice in connection with this Company for one or more of the directors to visit the property every year, and under present conditions of honest and economical management, the mine, which was a very good one, would undoubtedly last for years and turn out a sound and profitable undertaking.

Dr. H. Lewis Jones, one of the directors, in supporting the motion, said he spent some weeks in British Columbia during last autumn and lost no opportunity of satisfying himself as to the position of the mine. They had abundance of ore which had been developed in a very economical manner. The great question for them to consider was the best and cheapest means of smelting or otherwise dealing with this ore. In the neighborhood of the Snowshoe the cheapest mining and smelting in the world was being done. While there he had looked carefully into the whole question and was satisfied that the Company could make a considerable addition to their profits by owning their own smelter. Owing to the self-fluxing nature of the Snowshoe ore it could be smelted cheaply, and in all probability if they owned their own reduction works they could make an additional profit of 75c. or \$1 a ton on their output. It was desirable that any large mine, such as the Snowshoe, should own or control its own smelting works, thus operating the mines and the smelter as a whole, and secure all the profits there were in handling these enormous bodies of ore.

The resolution for the adoption of the report and accounts was unanimously carried.

Mr. Philip Waterlow moved and Colonel Satterthwaite seconded the re-appointment of the retiring director, the Earl of Chesterfield.

The retiring auditor, Mr. John Cooper, was re-appointed, on motion of General Berkeley, seconded by Mr. Lefroy.

Mr. C. Guy Pym, M.P., moved a vote of thanks to the chairman. This was seconded by Mr. A. J. McMillan, managing director, who stated that just before he left British Columbia, in November, the Dominion Government had removed the obstacles in the way of the Great Northern Railway building through Southern British Columbia, and officials of that company had assured him of their intention to build to the Snowshoe mine at an early date.

The resolution was carried and the proceedings closed.

#### SUPERINTENDENT'S REPORT.

Mr. J. W. Astley, Superintendent of the mine, reported as follows:—

PHOENIX, B.C., Nov. 10, 1902.

GENTLEMEN:—

I herewith beg to submit my report of operations on the Snowshoe mine from June 30th, 1901, to September 30th, 1902.

The number of lineal feet of underground development, composed of drifts, crosscuts, raises and winzes, to the 30th of September, was 5,766 feet, and including the three compartment shaft, 295 feet, brings the total to 6,062 feet. Of this amount 1737 feet have been driven in the fifteen months under consideration. This does not include any of the surface cuts, etc., which extend over a large area.

Nine thousand and sixty-six (9,066) tons of ore have been shipped to the smelters, and of this amount 3,237 tons were shipped in September. In September, 1901, a large area of ground was stripped, leaving the ore exposed and ready for

extraction. It is from this part that most of the ore has been shipped and is being quarried at the present time.

In addition to the old buildings, the following have been erected and put into use. Bunkhouse, a two story frame building, well ventilated and fitted with wash and bath tubs; boarding house, with spacious dining room and mess room for staff; superintendent's house, foreman's house, office building, compressor house, boiler house, ore bin. The timber has been ordered for the following. Ore bins on new railway spur, with capacity for 2,500 tons; headworks over new shaft, and hoist building.

In December last the order was given for the new compressor, but it was not delivered till June, and was installed and put into use on August 11th. It is the high pressure half of a Rand Corliss Cross compound, condensing steam and compound air compressor, and is so constructed that it can be operated by either steam or electricity. The half at present in use is driven by steam, and is guaranteed to supply power for ten 3¼ inch drills at an altitude of 5,000 feet above sea level. A five inch air main was put down from the compressor to a second air receiver, situated at a central point, and from there the air is conveyed through smaller pipes to the different workings.

Two 80 h.p. boilers, of the return type, set in brick, were installed with the compressor. These boilers are built of steel plate, having a tensile strength of 60,000 pounds per square inch, and are designed to carry a working pressure of 150 pounds per square inch.

The new shaft is a three compartment shaft, each compartment being 4½ feet by 5 feet in the clear of timbers. Two compartments will be used for hoisting purposes, and the third for air and water pipe lines, manway, etc. The location of the shaft was finally determined upon as being the best position for handling the ore bodies, at present developed, and for exploring below the present workings. The shaft is down 296 feet, and as soon as the necessary pocket arrangements are made for loading the skips, prospecting the ore body below No. 2 level will be resumed.

Three sidetracks have been graded and rails laid on the property. The first ore put in was to the present ore bin, and will accommodate eight ore dump cars, and is also used for unloading supplies, such as timbers, machinery, etc. The second is a short siding to the compressor for the delivery of fuel. The third is a spur from the main line to the site of the new ore bin; it is graded, and rails laid most of the distance; it is 1,800 feet long.

The small electric light plant, rated at 80 16 c.p. lamps, was at first rented, it being understood that the Cascade Power Co. would furnish us with light. However, the completion of their plant was postponed from time to time, and it became necessary to purchase a small plant sufficient for present requirements.

During the directors' visit here it was decided to operate the hoist for the shaft by electric power, to be supplied by the Cascade Power Co. A 150 h.p. double conical drum electric hoist has been secured, and will be ready to place in position as soon as the building is sufficiently completed to house it. The concrete foundation is now completed.

Skips of two ton capacity each will be used in the shaft and operate in balance. A head frame has been designed for the automatic dumping of these skips, and will be constructed with head room sufficient for a rock crusher if found necessary at any time.

The new ore bins and railway spur to them will be situated at a point 52 feet lower in elevation than the present tunnel, (known as the railway tunnel.) If found necessary, a rock crusher can be installed, and all rock crushed before delivery to the ore bins.

The low price of copper, together with the closing down of the smelters during part of the summer, on account of the Fernie coal strike, had a very depressing effect on the Boundary district. However, the coke difficulty has been settled. The smelters have all resumed operations and are making active preparations for increasing their output. Freight charges on ore have been reduced, with the probability of a still further reduction when the Great Northern railway system is built into Phoenix.

The price of copper has undoubtedly reached the lowest point, and is recovering. In short, everything points to the successful operation of these large ore deposits of the Boundary district.

In conclusion I wish to express my appreciation of the willing assistance I have received from Mr. Trevorrow, Mr. Tomlinson and Mr. Bannantyne.

Yours faithfully,

J. W. ASTLEY, Supt.

LOCAL STOCK MARKET FOR THE MONTH OF JANUARY, 1903.

Prepared by the Stuart Robertson Co., Ltd., Stock Brokers, Victoria, B.C.

| COMPANIES.        | Week Ending Saturday, 10th January. |        |         |        | Week Ending Saturday, 17th January. |           |         |       | Week Ending Saturday 24th January. |        |         |           | Part Week Ending 31st January. |        |           |        | REMARKS. |
|-------------------|-------------------------------------|--------|---------|--------|-------------------------------------|-----------|---------|-------|------------------------------------|--------|---------|-----------|--------------------------------|--------|-----------|--------|----------|
|                   | Highest.                            |        | Lowest. |        | Highest.                            |           | Lowest. |       | Highest.                           |        | Lowest. |           | Highest.                       |        | Lowest.   |        |          |
|                   | Asked.                              | Bid.   | Asked.  | Bid.   | Asked.                              | Bid.      | Asked.  | Bid.  | Asked.                             | Bid.   | Asked.  | Bid.      | Asked.                         | Bid.   | Asked.    | Bid.   |          |
| Cariboo McKin'y.  | \$ 19                               | \$ 18  | \$ 0 18 | 17     | \$ 18                               | \$ 16 1/2 | \$ 18   | \$ 16 | \$ 18 1/2                          | \$ 17  | \$ 18   | \$ 16 1/2 | \$ 18 1/2                      | \$ 17  | \$ 18 1/2 | \$ 17  |          |
| Cariboo Hydraulic | 75                                  | 75     | 75      | 75     | 75                                  | 75        | 75      | 75    | 75                                 | 75     | 75      | 75        | 75                             | 75     | 75        | 75     |          |
| Centre Star       | 38                                  | 36 1/2 | 30      | 34 1/2 | 30                                  | 34 1/2    | 35 1/2  | 34    | 30                                 | 34     | 35      | 34        | 35 1/2                         | 34 1/2 | 35 1/2    | 34 1/2 |          |
| Crow's Nest F. C. | 100 00                              | 75 00  | 100 00  | 75 00  | 100 00                              | 75 00     | 100 00  | 75 00 | 100 00                             | 75 00  | 100 00  | 75 00     | 100 00                         | 75 00  | 100 00    | 75 00  |          |
| Dardanelles       | 3 1/2                               | 2 1/2  | 3       | 2      | 3 1/2                               | 2 1/2     | 3       | 2     | 3                                  | 2 1/2  | 3       | 2         | 3                              | 2 1/2  | 3         | 2      |          |
| Fairview Corp'n.  | 5 1/2                               | 4 1/2  | 5       | 4 1/2  | 5 1/2                               | 4 1/2     | 5 1/2   | 4 1/2 | 5 1/2                              | 4 1/2  | 5 1/2   | 4 1/2     | 5 1/2                          | 4 1/2  | 5 1/2     | 4 1/2  |          |
| Iron Mask         | 5                                   | 3      | 4       | 2 1/2  | 5                                   | 4         | 4       | 4     | 5                                  | 4      | 4       | 4         | 5                              | 4      | 4         | 4      |          |
| North Star        | 10                                  | 9 1/4  | 8       | 7      | 10                                  | 9 1/2     | 10      | 9     | 12                                 | 10     | 12      | 10        | 11                             | 10     | 10        | 9      |          |
| Payne             | 10                                  | 8      | 8       | 7      | 10                                  | 8         | 9       | 8     | 9                                  | 8      | 9       | 8         | 9                              | 8      | 9         | 8      |          |
| Rambler           | 35                                  | 31     | 34      | 30     | 35                                  | 31 1/2    | 33      | 30    | 34                                 | 32 1/2 | 33 1/2  | 31        | 33 1/2                         | 32 1/2 | 33 1/2    | 32 1/2 |          |
| Siocan Star       | 1 00                                |        | 1 00    |        | 1 00                                |           | 1 00    |       | 1 00                               |        | 90      |           | 1 00                           |        | 90        |        |          |
| Sullivan          | 4 1/2                               | 3 1/2  | 4       | 3 1/2  | 4 1/2                               | 4         | 4 1/2   | 3 1/2 | 5                                  | 4      | 5       | 4         | 5                              | 4      | 4 1/2     | 3 1/2  |          |
| War Eagle         | 19                                  | 18     | 19      | 15     | 19                                  | 18        | 19      | 15    | 19                                 | 18     | 18      | 17 1/2    | 18                             | 17 1/2 | 18        | 17 1/2 |          |
| Waterloo          | 6 1/2                               | 6      | 6       | 5      | 6 1/2                               | 5 1/2     | 6 1/2   | 5 1/2 | 6 1/2                              | 5 1/2  | 5 1/2   | 5 1/2     | 5 1/2                          | 5      | 5 1/2     | 5      |          |
| Winnipeg          | 4                                   |        | 3       |        | 4                                   |           | 3       |       | 4                                  |        | 3       |           | 4                              |        | 3         |        |          |
| St. Eugene        | 27                                  | 21     | 22      | 15     | 28                                  | 21        | 26      | 21    | 25                                 | 20     | 30      | 21        | 4                              | 35     | 35        | 27     |          |
| Granby            | 3 50                                | 3 25   | 3 50    | 3 20   | 3 50                                | 3 20      | 3 50    | 3 25  | 3 90                               | 3 70   | 3 50    | 3 20      | 4 50                           | 3 80   | 3 90      | 3 70   |          |

THE LOCAL MINING STOCK MARKET.

The market this month has been quiet, although in several cases prices have advanced. Thus Granby is now quoted at 4.50 asked, 3.80 bid, as against 3.75, 3.25, and St Eugene has advanced from 22 to 40. Both North Star and Payne are firmer at higher prices. Centre Star remains stationary at 35 to 36; Cariboo-McKinney at 18 to 18 1/2, and Waterloo 5 1/2 to 6. Fairview is nominally quoted at 5, but few shares are obtainable at this figure. On the whole the outlook is decidedly brighter and an improvement all round may be looked for this year.



COAL MINES REGULATION ACT.

BOARD OF EXAMINERS.

NOTICE is hereby given that the following constitute the Board of Examiners for the Wellington (Extension) Mine during the year 1903:—

Appointed by the Owners—(1) James Sharp; (2) Alex. Bryden.

Alternates—(1) Alex. Shaw; (2) John John.

Appointed by the Lieut.-Governor in Council—William G. Simpson.

Elected by the Miners—(1) Benjamin Berto; (2) Samuel K Mottishaw.

Alternates—(1) Wm. Anderson; (2) Martin Dunsmuir.

NOTE—Alternates act as Members of the Board in the absence of those regularly appointed or elected to act thereon.

All persons interested may obtain full information by applying to the Secretary to the Board, Mr. Wm. G. Simpson, of Ladysmith, B.C.

Dated this 14th day of January, 1903.

R. F. TOLMIE,  
Deputy Minister of Mines.



COAL MINES REGULATION ACT.

BOARD OF EXAMINERS.

NOTICE is hereby given that the following constitute the Board of Examiners for the Nanaimo Mine during the year 1903:

Appointed by the Owners—(1) Thomas Budge; (2) John Newton.

Alternates—(1) James Malpas; (2) James Dudley.

Appointed by the Lieut.-Governor in Council—J. P. Planta.

Elected by the Miners—(1) George Johnson; (2) William Neave.

Alternates—(1) James Frame; (2) Arthur Spencer.

NOTE—Alternates act as Members of the Board in the absence of those regularly appointed or elected to act thereon.

All persons interested may obtain full information by applying to the Secretary to the Board, Mr. J. P. Planta, of Nanaimo, B. C.

Dated this 14th day of January, 1903.

R. F. TOLMIE,  
Deputy Minister of Mines.

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