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TAXATION OF MINES.

THE Hon. the Minister of Mines, who has been officially touring the Kootenays, is to be congratulated upon the means he has adopted of gaining first-hand a knowledge of existing conditions in those districts, and of ascertaining from the men most directly interested and presumably best informed, the grounds upon which the present imposition of the 2 per cent. tax on productive mines is considered inequitable and unfair. But if the honourable gentleman does not return to his duties at the Capital with an adequate idea of the feeling of the mining community, it will not be for lack of moderation on the part of those who profess to express public opinion. Thus a Rossland contemporary remarks that:

"The two per cent. mineral tax is iniquitous. It throttles the development of the Rossland and other camps possessing resources of a similar nature. Further and permanent prosperity can only be attained upon the abolition of the tax. The Rossland camp will then forge ahead on a scale hitherto without precedent. Facts and figures are forthcoming to support these contentions." And it gives this as a fair sum-

mary of the views expressed by leading mining engineers and others at a banquet given the other day at Rossland to the Minister. Mr. Kirby, general manager of the War Eagle and Centre Star Companies, is reported to have said on this occasion:

"We all know that the great cause of the depression now coming over the British Columbia mining industry is excessive and overwhelming taxation. . . . The two per cent. tax stands like a stone wall before us."

The last expression referred to the operations of the mines of which he is manager. He also described the tax as "an enormous government rake off." Mr Kirby's remarks fairly represent the views expressed by other speakers.

The mine owners cannot be accused of wishing to evade contributing their due share to the revenue of the Province. Neither do they claim that the aggregate amount of the mineral tax is unduly large in proportion to the magnitude of the industry. Their complaint is that the incidence of the tax is such that it prevents the profitable operation of low grade ores. For example:

Mr. William Thompson, manager of the Rossland Great Western allied mining properties, is of the opinion that the two per cent. tax alone prevented the establishment of many Treadwell mines in British Columbia, the Treadwell mine in Alaska being, as is well known, a very low grade but very extensive deposit. Estimating upon the basis of ore worth \$8.50 a ton, the Rossland *Miner* shows that the so-called two per cent. tax is really about 12 1-2 per cent. of the net profits, which would certainly be regarded as an unduly heavy burden if imposed on any other industry. A two per cent. tax upon the net income of the mine would be exceedingly reasonable, but surely to be compelled to pay one-eighth of the profit to the Government is excessive. The question has been before the public for some time, and we see no reason for amending the opinions expressed in the *MINING RECORD* several months ago, when demonstrating that the present tax is highly burdensome to low-grade mines.

Mr. J. B. McKilligan, Surveyor of Taxes, in his report to the Minister of Finance, makes a painstaking effort to analyze the subject of mine taxation. He admits that the difficulties presented are great and thinks the question calls for very close investigation. Mr. McKilligan does not, however, believe that the

incidence of the tax would be made perfectly equitable by deducting the cost of mining, as well as that of treatment and transportation, because, as he points out, the cost of mining is rarely the same in any two mines. The basis of the tax is, he says, the value of the material removed from the mine, and that value does not in any way depend on the cost of mining. This is clear enough. A ton of ore containing 12 per cent. copper and costing a certain sum to mine, is not worth any more than a ton of ore containing 12 per cent. copper and costing only half as much to mine. The market value of the copper in the ore is regulated by the market price of copper bullion and not by what it costs to take the ore out of the mine. An absolutely fair basis would be to tax the value of the ore in the mine, if there were any way or arriving at correct conclusions, for then all operations would be put upon an equitable basis. A ton of copper in ore in a mine is worth the value of a ton of blister copper less the cost of refining, treatment, transportation and mining, and this, of course, is true whether the ore is high grade or low grade. If that value could be ascertained, and the ore mined could be taxed upon that basis, the incidence would be perfectly equitable. Mr. McKilligan foresees great difficulties in the way of any effort to arrive at the actual cost of mining, and very slight consideration will show that these must arise. They are probably not insurmountable, but yet no one has come forward with a plan which has met with general acceptance for overcoming them. An arbitrary scale has been suggested to represent the cost of mining, a low rate being allowed on low grade ore and higher rates on higher grades. It is possible that some such plan or some modification of it might prove satisfactory. If each mine were notified that the allowance for mining would be a certain sum, and were permitted to appeal from the classification and produce its books to show what the cost really is, it is altogether probable that in the course of a few years a fairly equitable basis would be reached. Mine owners object to being compelled to disclose their business, and perhaps it is not unreasonable that they should be unwilling to allow the examination of their affairs for purposes of taxation. No other business is compelled to take the assessor into complete confidence. We do not require a merchant to make a sworn statement of his business and permit his books to be overhauled. We reserve the right to tax him at what seems fair and give him the right to appeal if he thinks he is taxed too much. Let it be supposed, therefore, that the law shall say that in fixing the amount of taxation upon any mine, the law shall fix an arbitrary amount as the cost of mining, the amount being regulated by the value of the ore. This sum, together with the cost of transportation and treatment, being deducted from the smelter returns, would give the arbitrary value of the ore in the mine. If in the opinion of the owner it was

too much, he would be at liberty to appeal against it and show what the cost actually was. This plan might not ensure perfectly equitable taxation, but it would remove the complaint made against the present system on the ground that it taxes the cost of labour and management, and it would certainly enable the mine owner to have the actual value of his ore made the basis of taxation, if he so desired. Possibly this suggestion may be of some small service towards the settlement of an exceedingly difficult problem and may indicate a direction in which relief may be found for the mining industry.

In regard to the aggregate volume of taxation not much requires to be said. The total is not great compared with the metal output, but hardly any room exists for doubt as to the statement that if the low grade ores were placed on a fair basis as regards taxation, the increased output would far more than compensate for any falling off in the revenue. The question is not, as yet, a political one, which is fortunate. It may easily become political, and therefore the interests of the Province demand that, all preconceived ideas being dismissed as far as possible, a determined effort should be made to place the mineral tax upon such a basis as will satisfy the mine owner and be just to the Province at large.

MINING ON VANCOUVER ISLAND.

ONLY a few years ago there were comparatively few possessed of the belief that Vancouver Island would become an important metalliferous mining area. What was claimed at that time to be the best opinion was adverse to the value of such deposits of economic ore as were known to occur on the Island. Many shared this opinion. The change in this respect is almost revolutionary and the disposition now manifest is rather to fly to the other extreme. For this change there is a very substantial basis; there are undoubtedly substantial grounds for most sanguine anticipations. It may, in fact, be confidently asserted that the mines of the Island are about to become an important factor in the industry of the Province, and that their permanency and increased output is no longer a matter of speculation. Unfortunate mistakes were made during the early days of metalliferous mining on the Island, such, for example, as the employment in the supervision of a large expenditure of money of a person whose only qualification appeared to be that he was not doing anything else at the time. Another error was in failing to recognize that the geological problems peculiar to Vancouver Island could not be solved by reference to those presented by some other locality. Perhaps there is no place of similar area where the "experts," generally self-styled, have made more mistakes. But while individuals have suffered in

pocket through errors of what may be called amateur effort, the general public has perhaps benefited, and prospecting and developing are now conducted on Vancouver Island with a better appreciation of local conditions, and hence with a far more satisfactory outcome than heretofore. Moreover, the results which have followed systematic and intelligent operations of mines on Mount Sicker are a great encouragement to persons having mining properties there and elsewhere. It is impossible to regard what is now in progress at Mount Sicker without feelings of the liveliest satisfaction and without indulging in strong hopes that what is being accomplished there will be repeated in other portions of the Island. Competent observers do not hesitate to say that the Mount Sicker District at the present time is one of the most promising metalliferous fields in British Columbia. The deposits of ore are numerous and extensive, the grade is high and the conditions under which work is carried on are eminently favourable. There is no longer any reason for scepticism on these points, and but for the circumstance that in the past the mines of this district have been in the hands chiefly of private individuals, and the public have not been invited to subscribe to stock, the field would long ere this have passed through the not very desirable experience, now imminent, of a boom period. Any doubt that may have existed of the permanence and value of the Mount Sicker mines was removed with the decision of such shrewd operators and skilled metallurgists as Messrs. Breen, Bellinger & Fotheringham to establish, at an outlay of over a quarter million dollars a smelting plant, for the treatment of the ores of the district, at Crofton, followed later by the commencement of construction work of a second smelter by the Tye Copper Co. at Ladysmith. The Crofton smelter is now about to be blown in and it may be confidently asserted that although the present capacity of the works of 500 tons daily is relatively small, there are few, if any, smelters on the North American continent better equipped or more economically designed and arranged.

Quatsino Sound has for some years been regarded as a promising field for mining operations, although some persons who invested there met with disappointments. The experience of the owners of the Comstock mine favours the conclusion that the fault was not in the locality but in those who were responsible for the development work attempted. Numerous other discoveries of a promising nature have also of late been made in the Quatsino District. Activity prevails at several points along the West Coast, and the assumption is reasonable that those who continue to invest capital in undertakings here would not do so unless the prospects of profitable returns were reasonably encouraging. The erection of smelters on the Island will greatly stimulate min-

ing by lessening the cost of the transportation of ores.

It may therefore be fairly claimed that the period of mineralogical development on Vancouver Island has set in, and as of the 16,000 square miles contained in Vancouver Island probably two-thirds of that area have not been explored for mineral-bearing rocks, there is ample scope and opportunity for the prospector. It should, however, be remarked that the difficulties to exploitation in this region are not inconsiderable, the interior of the Island being as yet not very readily accessible, and, too, the luxuriant growth of vegetation is a further drawback to successful prospecting. The conditions are, however, certainly not worse than those encountered by prospectors in the Kootenays in the early nineties, while the milder coast climate is an advantageous circumstance of importance. The gold-copper ores so far discovered have been without exception of generally higher grade value than those of other localities of British Columbia, and the excellent facilities for transportation and treatment of ores, the abundance of timber for fuel and mining purposes and the number of streams from which cheap power may be obtained, are all points which should appeal favourably to prospectors.

THE FUTURE OF THE YUKON.

THE falling off in the output of the Klondike placers has very naturally provoked some discussion in the press as to the future of mining in the Yukon Territory. In some quarters rather discouraging views obtain, but on the whole the weight of opinion seems to be that the outlook is far from discouraging. Much stress is laid upon a statement made by a Mr. Hees, agent of the Manufacturers' Association, who lately visited the country, and who has made the statement that "since 1897 hundreds and thousands of prospectors have been exploring every creek and mountain in that country, and no discovery of importance has been made for more than a year." In making that observation Mr. Hees lays himself open to the same charge of exaggeration as he brings against Mr. F. C. Wade, who in a recent lecture remarked that "only fifty miles have been worked, and there are seven thousand miles of creeks in the Yukon, almost all of which are unprospected." Neither statement is of much value, even if true. The fact that gold has not been found in large deposits anywhere in the Yukon during the last year is only proof that prospectors have been unsuccessful, and does not afford a convincing reason for the belief that it will not be found. The Klondike itself was prospected and condemned years before it came into prominence as a produc-

tive field. For any person to pretend to be able to form from a cursory visit to the Yukon an adequate conception of its future is absurd. Equally so is an attempt to reach a definite conclusion from newspaper reports. A better guide is the conduct of those having large commercial interests in the country.

From evidence available in this direction one may feel justified in anticipating that the Yukon Territory will long remain a productive field. An element of doubt is undoubtedly present. Until extensive ore deposits have been discovered, the future of every mining camp is problematical, for the richest placers have only a limited life, and there is very little wisdom in banking on the discovery of new ones. But the men who have large interests in the country and have enjoyed the best opportunities of forming trustworthy opinions are reasonably safe guides. Therefore when we see the large commercial houses laying their plans for a permanent trade, and capitalists ready to put money into railway construction, we are not far astray in believing that the future of the Yukon is not as shadowy as some hasty observers may conclude.

The railway construction above referred to includes the building of a line from Dawson to the mines, to be continued in a general southwesterly direction for an undetermined distance, and of a line from Valdez to Circle City, with a branch to Dawson. The latter enterprise has not yet reached the construction stage, although it is well advanced in that direction. The announcement is made that the former has been floated and that a large shipment of rails is about to be sent forward. We may feel very sure that the men behind these undertakings have satisfied themselves that there is some permanency about Yukon mining.

It is a mistake to suppose that the value of the gold output of a mining camp is the sole test of its prosperity. A fortunate miner may strike a rich placer deposit and for a few thousand dollars' outlay take in a competency. These are the operations which advertise a district and create excitement. But the production of one quarter of the amount of value may be due to the expenditure of four times as much money, in labor and, if so, the smaller production begets the greater degree of prosperity, although the owner of the mine may have to be content with smaller net returns. So far as a community is concerned, the smaller the margin of profit, that is, as long as there is a sufficient margin to encourage enterprise, the greater the general benefit. Ten millions of gold won from the Klondike placers in the future, or five millions from quartz deposits might mean a more general and genuine period of prosperity than twenty millions under such circumstances as have prevailed there two and more years ago. There might be less excitement, fewer hangers

on in the camp, rarer instances of the rapid accumulation of wealth; but the general volume of business, the number of men given remunerative employment and the actual, as opposed to the speculative, value of property of all kinds might be greater. The same principle has been illustrated in nearly every metalliferous mining camp in the world. When the shipments of ore were confined to small quantities of high grade, the relative profit was higher and the mining outlook more speculative, but experience has shown that the solid foundation of the mining industry and of such other lines of industry as depend upon its prosperity, is in the steady production of large quantities of ore at a sufficient margin of profit to attract investment, without returning fabulous results.

Therefore, while the spectacular output of Klondike placers no longer keeps the world in a fever of excitement and the instances of fortunes being amassed in a single season are rare, while phenomenal rates of wages no longer prevail and the contingent of miners laden with "dust" is not as numerous as last year, it is quite too soon for any one to write "Ichabod" on the gateway to the Yukon, and proclaim to the world that the glory of the Golden North has departed. On the contrary, a sober survey of conditions as they now exist warrants the belief that the Yukon country will continue for an indefinite period to be a producer of gold, with a reasonable prospect that as the years pass and the country is better known, there will be a steady increase in the number of men who will find remunerative employment there and be consumers of merchandise produced in other parts of Canada.

Inseparably connected with the future development of the Yukon is the question of transportation. Extremely rich placers can stand extraordinary high transportation rates. This has been shown by other localities as well as by the Klondike. But with the reduction in the amount of gold that can be taken out per man, the wages problem becomes vital, and everywhere, and especially in a country which produces as yet only comparatively few of the necessities of life, the cost of transportation has a controlling influence upon the question of wages. The existing transportation facilities in the Yukon are favorable, whether designedly so or not is immaterial, to the centralization of business in the hands of a few large corporations, and at the present rate of progress it will not be very long before the country is controlled by a few combinations, to the great disappointment of individual effort. Yet it is upon individual effort that the expansion of the mining industry in the North will depend. The Klondike was not discovered by a great corporation, but by hardy adventurers animated by the belief that what they found was there to have and to hold. The supremacy of the corporation and the decline of the

individual is a greater menace to the future prosperity of the Yukon than the lack of the recent discovery of rich placers.

WE have the greatest respect for our excellent contemporary the *Canadian Mining Review*. But is it altogether fair for its editor, our friend Mr. Be'l, who is also secretary to the Canadian Mining Institute, to appropriate as he does, without acknowledging the source, papers, contributed to the Institute by its members, to the use of that periodical? Thus in recent issues several interesting papers written by members of the Institute and intended for the special edification of that body have been published by Mr. Be'l in the *Mining Review* before they could be read at the meetings of the Society, and there has been, moreover, nothing to indicate that these papers were not directly contributed to the periodical in question. If ever there was one, here is a case of a man using his official position to further his private ends, and we enter a vigorous protest. We, however, admit that the temptation is great, so difficult is it in these days to fill one's columns with interesting and original material—without paying for it.

Although in some sections of Cariboo, the gold yield this season promises to be exceptionally heavy, it is to be feared that the production from the most important mine of the district, the Consolidated Cariboo, will again be disappointing. The result of a first clean-up from a run of 24 days was sent to Vancouver this month in the form of an ingot valued at \$43,000, and as the season is now well advanced, it is unlikely, though of course possible, that the total yield from the mine will much exceed that of 1901.

The explanation given is that gold washing operations were delayed in consequence of a big slide which had to be removed and in the performance of other non-productive work necessary in obtaining a grade for washing the rich bed-rock gravel and in making the turn in the old channel. Nevertheless shareholders are hardly to be blamed for expressing some impatience at the constant delay ere they begin to realize the profitable return on their investment so long promised by the management. There is, however, we think, not the slightest cause for uneasiness as to the intrinsic merit of the property.

Whittaker Wright, the London & Globe Finance Corporation, and its allied companies, are again occupying attention in London. They have got into the House of Commons, where the Attorney General said

in reply to a question that he did not intend to instruct the Director of Prosecutions to take proceedings. The Official Receiver says in his report that he has been advised by eminent counsel not to begin any prosecutions at the present time; but the persons petitioning for a prosecution declare that they are not content to have proceedings of this nature indefinitely postponed. There is a very marked revival of interest in the treatment to be accorded to the men responsible for the gross wrong done the investing public in connection with these companies, and the opinion is freely expressed that if they are allowed to get off scot-free the effect will be exceedingly bad and have a tendency to discredit the London investment market.

Conditions at Rossland have of late shown very considerable improvement, and a new wave of prosperity has to all appearance set in for that district. The resumption of mining operations at the War Eagle and Centre Star mines, means a great deal for the district, while the Velvet is now also producing regularly.

This, together with the fact that both the Le Roi and Le Roi No. 2 are making far better showings has done much of late to restore confidence and to cause a revival of interest in Rossland mines on the part of investors. Production from the camp of late has averaged between five and seven thousand tons weekly, but for the rest of the year this weekly output should be increased to between ten and eleven thousand tons—a difference which will necessarily have a marked effect upon the 1902 returns. Meanwhile the Great Northern Railway has supplied seventy specially designed steel cars for service between Rossland and Northport, while the Canadian Pacific has also prepared for heavy shipments over the branch line from Rossland to Trail.

The settlement of the coal miners' strike at Fernie reflects credit on all concerned, and the conduct of the miners during the period of idleness was exemplary and in marked contrast with that of the striking employees of coal mines in the United States. The agreement reached provides that a day's work shall consist of one shift of eight and one-half hours, allowance being for a part of the time occupied in going to and returning from work, and a half-hour's intermission at noon being provided for, the miners not to leave their places during this period. If after two months' trial a majority of the miners working underground are dissatisfied with the arrangement, the company agree to abolish the half-hour's intermission and thereafter eight hours shall constitute a day's shift, the time to begin when the miners are at the fire stations and fire bosses' rooms going in, and end at the same places coming out.

We have previously commented on the discovery of platinum in place in the Similkameen. It is now reported that similar discoveries have been made in the Burnt Basin. This, if true, and there is every reason to believe in the authenticity of the report, would not only be important, regarded commercially, but from a metallurgical standpoint the finding of platinum in place possesses decided interest. It is understood meanwhile that the ore has been tested with very satisfactory results by Messrs. Baker & Co., the well-known firm of platinum refiners of Newark, N. J. The Burnt Basin is situated in the Grand Forks Mining Division, and apart from the present discovery, many exceedingly promising outcrops of copper ores are to be found there. Few, if any, of the claims, however, in this section have as yet been systematically developed.

The Maple Leaf Mining & Development Company, incorporated in this Province with a capital of \$1,000,000 and having its head office in San Francisco, is issuing circulars offering its stock for sale. This is to all appearance a wild-cat of the most flagrant type and we shall have more to say about it later.

A movement has been started in Phoenix having for its object the establishment by the Government of a home for permanently disabled and indigent miners. Nothing can be more timely and it may be taken for granted that the miners themselves will cheerfully bear a share of the cost of such an institution.

THE REPRESENTATIONS OF THE OLLALA COMPANY.

MR. W. M. Brewer, special correspondent of the *Engineering and Mining Journal* (New York) has handed us the following letter addressed to the editor of that periodical replying to a communication published in the same paper from Mr. A. A. Watson, of Vernon, who examined and reported on the company's properties and now questions the fairness of a previous criticism made by Mr. Brewer:

Victoria, B.C., August 19th, 1902.

Dear Sir:—When, because of the representations made to me by prominent citizens of British Columbia, many of them leading mining men, I, last winter, not because of any personal reasons but acting in the capacity as the representative in British Columbia of the *Engineering and Mining Journal*, sounded a note of warning to the public advising them to thoroughly investigate the merits of the proposition of the Olalla Copper Mining and Smelting Company, previous to investing, I fully intended not to be drawn into any controversy relative to the question, principally be-

cause I considered that from the statements made by the company themselves and the reports they published they would hesitate a long while before replying to my criticism. But, from the fact that Mr. Watson, of Vernon, who reported on the properties, and Mr. W. C. McDougal, the general manager of the company have, after waiting several months, challenged my criticisms through the correspondence columns of the *Engineering and Mining Journal*, I am constrained to reply to these gentlemen and shall make that reply as brief as possible and also directly to the point.

The great objection Mr. Watson found to my criticism was, that it was unfair because I had not personally visited the property. I stated in my letter that I had the best authority for making the criticism, although I had not examined the properties myself. A portion of that authority was Mr. Watson's own report published by the company, in pamphlet form, in which he states that at the time of his examination the surface was so covered with snow that stovelling had to be resorted to, to uncover outcroppings of mineral and that all the development work performed on sixty-three claims, only amounted to some one thousand feet, of which about six hundred was a crosscut tunnel run in barren material. Now for a man to assert that under such conditions he felt justified in stating that the property possessed sufficient value to warrant the flotation of a company capitalized at \$3,000,000, even though a railroad charter authorizing the construction of a line through a very sparsely settled country, a townsite in that sparsely settled country, water rights and a smelting site are included in the proposition is the most arrant nonsense, and no reputable mining engineer would make such a statement, but as Mr. Watson claims to be only an assayer I presume the public will deal leniently with his statements, notwithstanding that the company appear to place such great importance on his reports that they are willing to attempt to secure capital from the public.

Another authority was the report of the Provincial Mineralogist, who made a personal examination in 1901, which has since been published and from which I quote the following, from pages 1156-7-8 and 9 of the latest report of the Minister of Mines, submitted at the last session of the local legislature in 1902:

The Bullion mineral claim is one of the claims in the neighbourhood of Olalla held by the Keremeos Mining Syndicate, the manager of which is Mr. Morris. The property is situated to the east of and directly above the Olalla townsite, at an altitude of 3,200 feet, or about 2,000 feet above the level of the valley. The country rock here is a fine-grained igneous variety, which seems to be considerably altered along a joint plane, and in the immediate neighbourhood of the ore body, is granular, having the appearance of a garnetite, in places showing well-defined crystals of garnet. The mineralisation appears to have occurred along a belt or zone, in which the alteration referred to is most apparent and which runs about N. and S., with a dip nearly vertical. On the surface this mineralised belt is indicated by a considerable iron cap, below which sulphides of iron and copper are apparent, associated with crystals of magnetite and garnet.

The development work done consists of various surface strippings, the most important of which was about 50 feet square, along the face of the bluff, where some blasting has been done. A slip joint in the country rock comes to the surface here, and is supposed to form one boundary of the mineralised belt.

Some 400 feet to the S. E. of this exposure a tunnel had been started, and was then in about 15 feet, in addition to

some to feet of open cut preceding it. This tunnel is in a fine-grained, igneous rock, which appears to be generally mineralised more or less as indicated but with patches of copper pyrites extending over a width of two or three feet. In this width the copper pyrites were estimated as forming about 5 per cent. of the whole, which would represent a copper assay value of about from 1.5 to 2 per cent. The manager reported that no gold or silver values of importance had been obtained, which seemed to be confirmed by subsequent assays.

The work done exhibited an extensive mineralisation but failed to discover a sufficient concentration of values to entitle the property to be classed as workable in the absence of gold and silver values. The claim has been worked from Olalla, and no buildings have been erected in connection with the property.

The Opulence mineral claim, owned by the same syndicate, is situated near the summit of the hill directly to the east of Keremeos post-office. It is approached by a trail ascending from Richter's, up the flank of the hill. The claim is at an altitude of 4,200 feet, on a grass-covered knoll, through which the rock crops out in places, appearing to be a dark-coloured hornblende, probably considerably altered and impregnated with iron and copper sulphides.

The surface rock presents the appearance of having been cindered, looking like a black iron slag, and is probably an altered hornblende, in which occurs a certain amount of copper oxide and probably some silicate of copper. Selected samples of this material, showing pronounced mineralisation, were taken for assay and gave 10.9 per cent. copper and 1 oz. silver. The claim is supposed to contain native copper, but no samples could be found carrying such.

The principal work done on the property consists of a couple of shafts. The deepest of these was reported to be down 45 feet, with a 15-foot drift to the south at 20 feet depth, while the other shaft was down about 30 feet. These workings were partly filled with water and, consequently, could not be inspected, but, judging from the dump and from report, the shaft had continued down for some 30 feet through the surface rock with its oxidised ores, and had here struck into what appeared to be a diorite impregnated with sulphides of copper.

On the Eldorado mineral claim, a continuation down the hill, somewhat similar mineralisation was observable, but not seemingly so strong.

On the Surprise mineral claim, also held by the Keremeos Mining Syndicate, a tunnel had been driven in for some 110 feet, showing a lead from 2 ft. to 2 ft. 6 in. wide with an ore streak from 4 to 8 inches, reported as carrying good values in gold.

On the Searchlight a 45-ft. tunnel followed in a dyke of hornblende material impregnated with small quantities of copper pyrites.

On the Magdala mineral claim, situated on the mountain above Richter's and owned by R. W. Northey *et al.*, an open pit some to feet deep shows the diorite country rock to be mineralised with pyrrhotite and a little copper, while the weathering of the face white denoted the presence of considerable arsenical pyrites. The work done did not show what the deposit might be, nor enough of its occurrence to form an opinion as to its origin or probable value. A sample of the pyrrhotite taken for assay gave only traces of gold and silver and half per cent. of copper.

FLAGSTAFF MINERAL CLAIM.

This claim, also owned by the Keremeos Mining Syndicate, lies above and adjoining the Searchlight. There appears to be here a zone in the country rock, of which no limiting boundaries could be noted, but which was observed over a width of from 100 to 200 feet, and consisted of hornblende, black mica, and a cementing material of a light green colour, probably felsitic. This zone has a trend N. W. and S. E. In certain places the hornblende seemed to be replaced by magnetite, which occasionally occurred in solid masses, showing in places evidences of copper.

This zone was noted at an elevation of 2,700 feet, and at 2,000, or 200 feet higher up the hill, a tunnel had been driven easterly for 15 feet into the hillside at the base of a steep rocky bluff. A carefully taken average sample from the sides, roof and face of this tunnel, which was supposed to be in the ore body, failed to give upon assay any values in gold, silver or copper, while an average sample of the ore pile on the dump gave an assay of three-quarters per cent. copper and traces of gold and silver.

The most important of these properties, certainly as far as development goes, is the Apex group, owned by McMillan *et al.*, and consisting of the Keystone, Australian, Alpha, Apex and Standard mineral claims. Here there have been several surface cuts made, showing in fissures in the limestone a replacement of the lime by pyrites, arsenical pyrites and chalcocopyrite, which certainly gives considerable promise for the amount of work done. A picked sample of the ore herein exposed was taken for assay and gave 7.7 per cent. copper, \$12 in gold and 2.8 oz. in silver per ton.

DIVIDEND GROUP.

This group consists of the following six mineral claims, which are adjoining, viz., Dividend, Dividend Nos. 1, 2 and 3, Juno and Diana, and is held by the Keremeos Mining Syndicate. The property is situated on the summit of Dividend mountain and extends down the east slope of the hill for some distance. The country rock here is, generally speaking, a fine-grained igneous variety, probably a diorite and would appear from the indications found on the previously mentioned claims to be in all likelihood underlain, at no great depth, by a band of limestone, although such could not be found on the property. Much of the surface of this group is covered, under a light surface wash with an iron capping which is seemingly the result of oxidation of pyrrhotite, the extent of which has not been determined. The development consists of the West workings, where a pit, 6 to 8 feet deep, has been sunk, in which, along a dip in the country rock, there is apparently a replacement lead about 6 feet wide, striking S. W. and dipping 60 degrees to west. The lead matter consists of garnet rock, fine-grained and coarse and associated with fairly solid pyrrhotite and white iron, the garnets, in places, being perfect crystals of three-quarters of an inch in diameter. In another place on this part of the claim an open cut 30 feet by 8 feet by 2 to 3 feet deep has been made, exposing a mass of the same class of mineral. In this cut a 6 by 8-foot shaft had been sunk for about 10 feet and had cut through the surface deposit of mineral and into the diorite country rock. The distance between these two openings is about 150 feet and the surface between them indicates the mineral as shown in each to be continuous, but it has not been broken into at any point.

Some 500 feet distant from these prospect holes a pit has been sunk for 18 feet. This, at the surface, was in pyrrhotite, said by the management to have assayed \$4 per ton, gradually passing into bands of quartz carrying copper pyrites. The bottom of the shaft appeared to be in the diorite country rock, here mineralised with copper pyrites. The showing of mineralisation on the surface is certainly very large, but the fact of its not being overlaid by rock, combined with the fact that two shafts cut through it in a very short distance, leads to the belief that the deposit is, here at least, an over-flow surface sheet, the origin of which has still to be found. A sample of the pyrrhotite taken for assay did not show any values of commercial importance.

Still another authority was the ridiculous and extravagant statements made by the company in their advertisements in some of the New York daily papers. In fact these statements were so thoroughly ridiculous that when I was spoken to on the subject I at first considered it entirely unnecessary to sound any note of warning because to my mind it hardly seemed reasonable that any investor would be sufficiently green and glibble to purchase stock after even a casual perusal of the advertisement. But as they say "a sucker is born every minute" on second thoughts I concluded to send the communication to the *Engineering and Mining Journal*.

I did not visit the properties myself during the winter because I would have encountered the same insurmountable difficulties with regard to examining the surface as Mr. Watson very frankly states in his report, he found. I have not visited the property since, for one reason because although Mr. McDougal was in Victoria during the spring and had ample opportunity to interview me on the subject, yet did not do so, I considered the whole matter one of past history, and another reason, because I have not since had the time to spare from my own business to make the trip,

which includes a full day's travel by railroad and lake steamer from Sicamous Junction on the Canadian Pacific Railroad to Pentiction and a long stage ride from that point to Ollala. For this latter reason, and especially lack of time, I do not expect to visit the property now, but maintain, without fear of contradiction, that my first criticisms were perfectly justifiable and fully warranted. In the interests of legitimate mining in British Columbia I make the above statement and would repeat here my first criticisms did space permit.

Only recently I have received a communication from a quite prominent mining man in which the following sentence occurs: "A little while ago Thomas Smitheran, a very experienced miner, mine foreman, went to work for the Ollala Company as foreman and on July 21st, he wrote me 'I have thrown up my job; it was a wild cat outfit.'"

I do not wish to occupy more of your valuable space, as I consider that the foregoing fully replies to both Mr. Watson's and Mr. McDougal's communication. In fact with the exception that Mr. McDougal very adroitly inserts an advertisement in the closing paragraphs of his communication, the balance of his communication cuts no figure because any mining investor who has had reasonable experience can readily see that as a matter of fact he sets forth no claims which would justify the floatation of a company with the enormous capital to which this company has had the audacity to ask the public to subscribe.

An analysis of the statement made by Mr. McDougal shows such a condition with regard to the whole proposition that it is entirely unnecessary for the writer or any one else to visit the properties to condemn it. He fails to show any reasonable necessity for the building of a railroad for which he has a charter. He fails to show that it is a feasible engineering scheme to construct the road, he fails to show that there is at least reason to imagine there will be any business for the road if it is constructed. Pentiction, the Eastern terminus, is a small village at the Southern extremity of the Okanagan Lake; the Western terminus, Princeton, is a small village on the Similkameen River which in the future may be in direct connection with a railroad from the Canadian Pacific, or possibly from the Coast or Great Northern system. The charter Mr. McDougal has, is for a short line which would connect these two points and be absolutely at the mercy of both systems of railroads referred to unless Mr. McDougal's charter was sold to one or the other of these companies.

He is frank enough to state that from the present showing it is difficult to measure up ore in sight. Of course it is, for the simple reason that there is absolutely no ore blocked out, the development work, from his own statement being of such a character that it would be impossible to estimate any given quantity of ore and it is merely conjectural whether a cross-cut tunnel he refers to will ever intersect the ore body as he hopes. As a matter of fact, cross-cut tunnelling in British Columbia has been found in very many cases to be very disappointing although such a system is advantageous to enable companies to sell stock while a tunnel is being run. In a large number of cases which have come under the writer's notice, the purchasers of such stock have had reasons to curse the men who started the tunnel and inveigled them

into buying stock. Mr. McDougal also neglects a very important point which the Provincial Mineralogist, in his report has supplied, viz., the values of the ore. Mr. Robertson says in one paragraph of his report, "In this width the copper pyrites were estimated as forming about 5 per cent. of the whole, which would represent a copper assay value of about 1.5 to 2 per cent. The Manager reported that no gold or silver values of importance had been obtained, which seems to be confirmed by subsequent assays." In another place "selected samples of this material showing pronounced mineralization were taken for assay and gave 10.9 per cent copper and 1 oz. silver." Note that in this connection that this assay was from selected samples. In another place "showing a lead from 2 ft. to 2 ft. 6 in. wide, with an ore streak from four to eight inches, reported as carrying good values in gold." Another: "In a sample of the pyrrhotite taken for assay giving only trace of gold and silver and one-half per cent. copper and in a carefully taken average sample from the sides, roof and face of this tunnel, which was supposed to be in the ore body, failed to give, upon assaying, any values in gold, silver or copper, while the average sample of the ore pile on the dump gave an assay of three-quarter per cent. copper and trace of gold and silver." In another place "a picked sample of ore herein exposed was taken for assay and gave 7.7 per cent copper, \$12 in gold and 2.8 oz. in silver, per ton." Note this was a picked sample.

The smelter site, town site and water rights which Mr. McDougal claims as valuable assets owned by the company, would be such in a camp where there are ores susceptible and accessible for profitable treatment, but should not be considered such in the case of the Ollala Company, the writer maintains; because if the reports made by Mr. Watson are carefully read they show that there is very little, if any, ore of such character as would warrant even the staking out of a smelter site, town site or paying the fee for acquiring water rights.

The writer regrets having occupied so much space in this reply to Mr. Watson and Mr. McDougal, but is firmly convinced that in the interests of legitimate mining, and in the interests of the Province of British Columbia and the interests of the *Engineering and Mining Journal*, that he, as the representative of that Journal, is fully justified.

WM. M. BREWER.

We agree entirely with Mr. Brewer's remarks as contained in the foregoing letters, with the sole exception of the reference to Mr. Watson and his report on the claims. Mr. Watson is quite qualified, as we have on a former occasion stated, to examine and report on mineral prospects, and his report on the Ollala Company's property is most conservatively worded. Mr. Watson, however, has, we fear, made a mistake in endeavouring to champion the company in print, as by so doing he practically endorses the company's absurd assertions as to the value of the property in order to justify the excessive capitalization. It is these exaggerations to which Mr. Brewer takes exception.

A NEW AND PROMISING FREE-MILLING QUARTZ TERRITORY.

THE FISH RIVER CAMP.

By J. F. Musselman.

THE mining activity in that part of the Lardeau mining division now known as the Fish River Camp, properly commenced with the discovery of gold and the subsequent location on July 8, 1899, of the Eva and adjoining claims, although more or less desultory prospecting had been done prior to that date, a considerable number of claims having been located, and to some extent worked, while from

knew the need of a horn-spoon nor free gold ore when they saw it. The large quartz croppings with which the camp abounds and which constitute its distinctive feature, while full of golden promise, were not highly regarded, consequently were treated with scant attention by more intent only on the discovery of galena, and it is noteworthy that the locators of the Eva were searching for galena when they incidentally or rather accidentally made the discovery in question. These were two enterprising farmer prospectors from an eastern Province, James Tweedie and E. B. Hutchinson, and appeared to differ from their contemporaries, only in that they did not realize the improbability of finding galena in paying quantities in the prominent white croppings on which they went to work; they were also, perhaps, more energetic than the average of their co-workers,



Pool Creek.

one property, the Beatrice, a small shipment of high grade galena ore was made. Notwithstanding, however that a number of promising galena veins were thus discovered, and have been discovered since, the camp is pre-eminently one of free milling gold ore, and it is to this characteristic that its present prominence is due, and to which it will owe by far the greater measure of its ultimate success and prosperity.

It is not recorded that any one of the many prospectors who exploited the camp prior to the date above named, expected to find gold ore, nor that any one of them would have recognized it as such if it had been brought to his attention with the gold plainly visible. Indeed, in the light of subsequent developments, it may fairly be assumed that none of them

so that, by the time they came to recognize their exceedingly good fortune, they had shot a goodly number of tons of very rich ore down the mountain side. The matter of determining what the peculiar yellow metal which they could hammer flat on the anvil could be was one that vexed them much; the possibility that it might be gold being entirely too inspiring to merit consideration. However, they decided to show it to a friend in whom they had confidence, which resulted in the immediate location of the Eva and other claims, and their subsequent retirement from active prospecting on an assured income.

When the news of what these two "tenderfeet" had compassed got abroad, there was an influx of fresh forces, and the "old-timers" suddenly became quite diligent; to-day the camp fairly bristles with

good prospects inviting development, and possesses at least one developed mine, the premier free-milling gold property of the district.

Nearly the whole of the area under consideration is occupied by a broad belt of mica schists, much altered in structure, particularly in the vicinity of and within the zones of fracture, where it is frequently found to be heavily impregnated with iron pyrites



Fish Creek.

carrying low values in gold. This series is bounded on the east by a granitic formation and on the west by one of gneiss, extending from thence as far, at least, as the Columbia. To the south and east of Pool Creek, and within our territory, there is an apparent irregular intrusion of limestone and slate, bearing some very good silver-lead prospects. The known auriferous veins are thus far confined within the schists, which also contain galena bearing veins, and veins carrying copper sulphide, while zinc blende in small quantities is not infrequently encountered.

The fissuring was prolonged, extensive and apparently profound, resulting in a large number of intricate vein systems, the veins having varying dips and strikes, representing different formative periods, carrying different kinds of ore, and, as in the case of the Eva, showing some interesting vagaries in structure.

Here we have a well defined fissure, with a width so far as explored, varying from 90 feet to 175 feet, with nearly perpendicular walls, and a strike N. 55 W. The filling consists primarily and mainly of a mineralized schist intermingled with brecciated quartz stringers, and secondarily of a continuous vein of solid quartz, varying in width, on either wall, and a series of connecting cross-courses of quartz, which may fill regular fissures or may have been formed by replacement. These cross veins vary from 10° to 40° in width, are sometimes broken and mixed with schist, are irregular in outline and divergent in pitch, and are not known to extend beyond either wall of the large fissure. On the other hand, they are displaced at points of intersection with the veins on either wall, thus showing the latter to have been formed last. The whole of the matter contained in the fissure carries values in gold, the more valuable ore occurring in the form of shoots in the veins of

quartz, both in those following the walls and in the cross courses, the richest ore being found at intersecting points.

The fissure has been definitely traced on the Eva for a distance of 2,000 feet, but that it is of much greater extent is indicated by the developments on other properties located on the line of its strike.

The large croppings, which are a distinctive feature of this property, and of the belt in which it is located, were left in their present exposed condition by the erosion of the surrounding rocks, which are of a less durable nature.

The section of country with which this article has to do is one rectangular in shape, some 25 miles long by 20 miles wide, beginning some three or four miles up Fish River from its mouth, and from the head of navigation on Arrow Lake; being divided into two nearly equal parts by this river by which it is drained, extending latterly to the summit of the water shed on either side, and in its length slightly W. of N. The most important creeks dropping into Fish River within its area on the east side, beginning at the northern extremity, are as follows: Battle, Cacer, Kellie, Boyd, Ruby, Silver, Lexington and Pool; those on the west: McDougal, Bullar, McRae, Sable, Scott and Menhinick. The waters of the opposite slopes fall, those on the east into Duncan River and so into Kootenay Lake, and those on the west into the Columbia River.

In confirmation, the country is decidedly brusque and rugged. From the Fish River flats the mountains rise abruptly, sometimes precipitously; irregular in outline, furrowed and seamed with clefts and gorges, attaining to great heights, many of them bearing on their crests a perpetual burden of ice and snow, and chaotic in arrangement, they encompass the sublime in their massive proportions and start-line features.

From the head of navigation on Upper Arrow



Fish River Bridge, at Goldfields.

Lake, the camp is easily reached by either of two pas alle wagon roads, the one beginning at Beaton on the east side of the N.E. arm of Arrow Lake and the other at Comaplix on the west side, following up opposite sides of Fish River they both end at Camborne, about seven miles distant, where a quasi-sub-

stantial bridge has been built across the river. From Camborne the country is well served with trails in every direction. Camborne is a bustling, thriving little town, and is the present centre of activity for the entire district, though she has a young but promising rival in the field some three miles further up the river. Comaplix and Beaton have a twice daily steamer service from Arrowhead, nine miles distant.



Camborne Mountain, Showing Camborne Group in the Foreground.

Arrowhead is the terminal of a branch line of the C.P.R., which leaves the main line at Revelstoke, 28 miles to the north, and is reached from all points south by daily steamer on Arrow Lake. Comaplix appears to have a decided advantage over Beaton in her superior landing and wharfage facilities.

A line of railroad connecting Trout Lake with Arrowhead has been surveyed through Camborne, and, sooner or later, will undoubtedly be built. This will give an all-rail communication with points east and west via the main line C.P.R., as well as more direct communication with all points south.

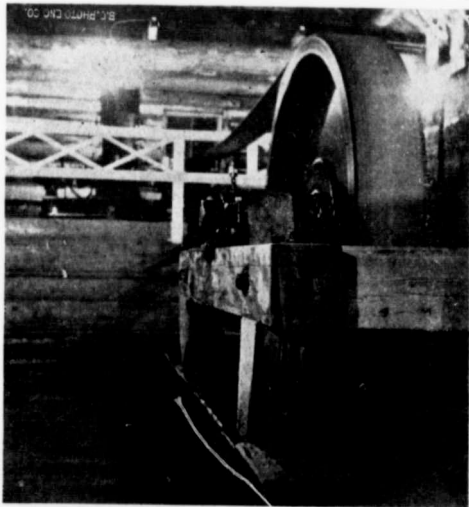
The different creeks flowing into Fish River are taken to form the most practical basis for a classification and brief mention of the different properties in the camp that have gained some repute.

POOL CREEK.

In point of location and amount of work done, the Eva is the premier free-milling gold property of the camp and district. Other properties there may be, and undoubtedly are, that have as good showings as had the Eva at the same stage of development, but the Eva, with 2,000 feet of underground work done, with one ore shoot 200 feet long, and from 1 foot to 6 feet wide of \$30 ore, developed to a depth of nearly 300 feet, and another ore shoot 200 feet long and from 10 feet to 15 feet wide of \$6 to \$8 ore, developed to a depth of over 100 feet, with immense bodies of lower grade ore developed to greater or lesser depth by other underground workings, and with several fine surface showings exposed by open cuts and strip-pings, but not yet under cut, needs only the installation of a reduction plant to qualify as a profitable producer.

The Eva has had its periods of elation and depression, as have most mining properties in the earlier stages of their development, but, though it has been owned or controlled by different parties at different times, development work has been steadily prosecuted since its location. Except for a brief period of time, when it was under bond to other parties, it has been in the possession of the Imperial Development Syndicate, Ltd., of Nelson, since October 17, 1900, and, under the management of Mr. A. H. Gracey, development work has been carried forward with commendable zeal and intelligence.

The Eva is located on Lexington Mountain, on the north side of Pool Creek, about $1\frac{1}{2}$ miles from its junction with Fish River, and has adjoining it a goodly number of most promising properties. The Cho'la Group to the south and west of the Eva, and owned by the same company, has a $4\frac{1}{2}$ -foot vein of free-milling ore running from \$5 to \$10 per ton; besides several open cuts, a 70-foot tunnel has been driven on this vein. The Oyster-Criterion and the Imperial Groups, south and east of the Eva, have at least two well defined free-milling gold veins and one galena vein; the latter cutting across the former and carrying good values in gold, silver and lead. Considerable surface work has been done on the auriferous veins, one of which is from 8 feet to 25 feet in width and the other from 4 feet to 17 feet. The latter has been traced on the surface a distance of 700 feet, and a shaft 60 feet in depth has been sunk on it to the bottom of which specimen ore is found. Both these groups have recently been purchased by the Ophir-Lake Syndicate, W. B. Pool, manager. The Lucky Jack Group, adjoining the Oyster-Criterion, and owned by Messrs. Butler, Rowland and Deroze,



Interior Power Plant, Camborne Group.

also has a fine showing of free-gold ore in a vein 15 feet wide, as well as a promising galena bearing vein.

On and crossing Pool Creek, just above its mouth, are the Eulie and Sir Wilfrid Groups, with several fine veins of quartz showing, in different places, en-

couraging values in gold. Just above the Sir Wilfred is the Harvey Group with an 150 foot tunnel on a well defined vein of quartz and iron carrying values in gold. Above the Harvey and 1 1/4 miles from the mouth of the creek, the Eclipse has a good showing of copper, lead and iron sulphides. The vein has been cross cut at the end of an 190 foot tunnel, where it is found to be 20 feet wide. At the mouth of Mo-



Power House and Office, Camborne Group.

hawk Creek, a south tributary to Pool Creek, are the Moscow and Mohawk Groups. Considerable work has been done and the prospects appear to justify considerably more. A little further up Pool Creek are located the Pontiac, Shakespeare and Rio Tinto Groups, all having good veins inviting development. On Camp Creek, another south tributary to Pool, a lot of new locations, said to cover good veins of quartz, have been made.

About five miles up Pool Creek, we come to the lime and slate formation, referred to under a preceding topic. In this belt are found the finest galena showings in the camp. The Alma Group, owned by Toronto parties, has 4 feet of clean ore, in a lime and slate contact, running \$50 per ton in gold, silver and lead. The Western Star Group, on the opposite side of the creek, has just been purchased by a party of Elwood, Ind., capitalists. The ore is similar in character to that of the Alma.

The Black Bear Group on a creek of the same name, one of the headwaters of Pool, is well equipped with cabins and mine furniture, and has considerable work done on good showings of galena ore. The Wide West Group has three veins in sight, two of which are opened by a cross-cut tunnel now in over

500 feet; the third should be cut in a short distance. The ore carries values in gold, silver and lead. The Hunter and Trapper Group, near the Wide West, can produce some high grade ore, but little work has as yet been done.

On Mohawk Creek is situated one of the best known properties of the camp, the Beatrice, which has made several shipments of \$100 ore, and which, it is believed, will again be placed on the shipping list by the completion of a long tunnel, now being driven. One hundred and twenty-five feet from the portal of this tunnel, a 4-foot "blind" lead of free-milling gold ore was struck, but has not been developed. Other properties, with apparently fine prospects, in the vicinity of the Beatrice, are the Silver Crown and Mountain Boy Groups, owned by Magee and Girard; the Silver Dollar-Carbonye Hill Group, owned by Joe Best, and the Smith Group, the latter having 4 feet of iron sulphide running \$40 per ton in gold. The Strutt-McKay Group at the mouth of Mohawk Creek, boasts, at the present writing, the latest rich strike in camp; specimen ore from a vein in place is freely exhibited.

MENHINICK CREEK.

The Camborne Group of nine claims, covering a mile and a half of the course of this creek, is owned



Ore Dump, No. 6 Tunnel Eva Mine.

by the Northwestern Development Syndicate, Ltd., of Nelson, B. C., and Hancock, Mich., with head office at Nelson. This property is believed to be located on the Eva lode, to which considerable attention has been given in this article, and possesses the finest surface showings of free gold ore to be

seen in the camp. No work at depth has been done, but under the efficient and energetic management of Mr. H. Z. Brock, of Hancock, Mich., this defect is in a fair way of being overcome. Since the first of April, roads and trails have been made, several substantial and commodious camp buildings have been erected, a 100 H.P. electrical power plant has been



Ore Dump, No. 3 Tunnel, Eva Mine.

installed, and three electric drills are now in successful operation driving their respective pieces of work ahead, in obstinate ground, at the rate of 4 feet per shift of 8 hours. The camp is lighted by electric tv, and has other handy conveniences which its excellent water power makes possible at small cost. The company has secured a half interest in the Goldfields townsite at the foot of the claims, and in 12,000 acres of splendid timber land bordering Fish River. A 10-stamp mill and a saw mill have been ordered and are probably now in transit.

Adjoining the uppermost claim of the Camborne Group on the northwest is the Independence, with a large showing of free-milling and concentrating ore on which a tunnel is now being driven.

Of the other numerous claims located on every side of the Camborne, the Canada-Strathcona and the Cedar Grove and Trust Groups may be selected as being most worthy of mention. Each of these have good veins of quartz.

SCOTT CREEK.

On this creek, a few miles north of Menhinick, the Lost Cup has a good vein of likely looking quartz and iron, and above are the DeBeers and Swamp Angel Groups, with large showings of quartz and galena.

The Sunset Group at the head of the creek, has some very high grade silver-lead ore. It is under bond to parties who are driving a tunnel, now in 50 feet. The Golden Cache, near the mouth of the creek, has a well defined vein of good looking material in place on which a tunnel is now being driven. A large number of new locations have recently been made.

RUBY SILVER AND BOYD CREEKS.

Traceable on the surface from Ruby Silver Creek across Goat Mountain to Boyd Creek is a vein of galena ore some 25 feet in width. The vein is well mineralized throughout, and while there has been but little work done, it is known to contain payable shoots of ore. The Goldsmith Group is the principal property on this vein.

Two galena prospects of good repute are the Glen-gary and Kootenay Chief at head of Boyd Creek.



Menhenick Creek Falls, Camborne Group.

FISH RIVER SLOPE.

Between Pool Creek and Lexington Creek are several properties with good showings of free gold

ore of which the Kingston, Brunswick and Copper Dollar are perhaps the best.

For information concerning a number of the properties mentioned, of which I have no personal knowledge, I am much indebted to Mr. Cory Menhinick, of Camborne.

It being manifestly impossible to give all of the hundreds of claims in a few lines, even the briefest notice, attention has been directed to those that, by their showings and work done, at present appear most worthy of consideration; in this, my purpose has been honest, and if any claims have been made unduly prominent, while others of greater merit have been overlooked, I hereby ask absolution for such sins of commission and omission.

With sufficient timber of excellent quality immediately at hand for every possible local requirement for a long term of years, and some, besides, for export; with a number of perpetually rolling and tumbling mountain streams ready to furnish the cheapest power at places needed, and in any required amount; with large bodies of ore, developed and apparent, of a character, in the main, permitting the cheapest form of extraction; with a temperate climate, and a large acreage of fertile soil, bordering Fish River, suitable to the growth of all kinds of grains, fruits and vegetables known to such climate; with very good transportation facilities now available, and with better still in prospect; with all these incomparable resources and advantages, active and latent, the future of the Fish River Camp not only looks very bright, but is practically assured.

A FEW NOTES UPON GOLD DREDGING.*

By F. Satchell Clarke.

A GREAT deal of attention has been paid of late years to gold dredging upon the rivers and placers of the Pacific Coast and North-West Territories down to Lower California, and, generally, a quantity of literature has been published by various papers and authors upon this subject, but, with one or two exceptions, little has been written by those having a direct and intimate knowledge of this form of mining.

This is really what is to be expected in any class of tentative work, for that is what it really has amounted to in British Columbia. Any work in which the experts are few will always cause to arise a host of empirics willing to learn at the expense of others.

Gold dredging in British Columbia, instead of being the leading mining industry owing to its enormous extent of auriferous gravels, has been so marred by such empiricism and marked with many failures by reasons so palpable to the writer, that it has often occurred to him to ask with amazement "what kind of business men are these who invest their money without having a consulting engineer in dredging to advise them?" A consulting engineer is always necessary with other mining, yet in this instance, in work that above all requires a specialist to advise, matters are left to run with the promoter, or quondam manager who may be appointed.

In New Zealand, the home of this industry, the work of recommending the claim and the actual details

and construction of the dredge with its design is left to the consulting engineer, who is necessarily an expert in designing and actually operating gold dredges, and stands between the owner of the claim, or rather, to speak more correctly, the intending buyer of the claim and all other parties, and is merely paid a salary for a specified time, or a fee to cover the intending operations until the plant is completed.

This proceeding saves both the buyer getting a claim sold principally by the silver tongue of an interested party, and in another case building a faultily designed plant, foisted upon the first party by some of the would-be experts connected therewith.

The chief and prime cause of these failures which form the subject matter of this article has been the appointment of managers who, prior to holding their position, were without the slightest knowledge of this class of work, simply because in most cases he is, or becomes, a stockholder, or had possibly sold the claim to the investor, and according to the old and obsolete custom still retained in placer mining, "who so able to manage a claim as the large shareholder, as he is looking after his own interests as well as ours." Never was a greater fallacy more exemplified than in dredge mining history in British Columbia. A little desultory reading in the mining papers and reports gathered of what other dredges are doing and the manager blossoms forth into the dredge expert.

After the appointment follows the usual trip to New Zealand, California, or other places, to investigate the best type of dredge suitable for the claim. It appears to the writer equivalent to appointing a manager to quartz mine and then sending him round to other mines to find out the best way to work the mine. He may, of course, return with the right ideas, but in the confusion of different opinions and dredges he has seen, it would be a matter of chance than otherwise, and his advice to his principals would be merely "the blind leading the blind." In some cases he returns with exaggerated ideas that he is getting the right machine and no other, and of course probably has been talked into it by the ready-tongued agent of some manufacturing company, or taken by the advertisements of some concern. Now, no matter how excellent the work of the manufacturing engineers is, he is unable to tell from his inexperience whether they are right or wrong in the details of general design. Then another class of managers are the persistent billet-hunters, who must be included among the causes of these failures, as these men are ready to take any job, provided there is a salary attached, no matter how ill their qualifications may fit in to the work.

Now to turn to the different types of dredges used. There are many engineers and persons still in existence who cling persistently to the centrifugal pump as a means of dealing with auriferous gravels. This process has been exploded years ago in the great dredging centres. As a rule, with rare exceptions, gold gravels are composed of rough boulders averaging anywhere from 10 in. in diameter, and mixed up with a compound of sand, fine gravel and clay, forming what is known in mining parlance as "a tight wash." It is almost impossible to work this by a pump, owing to the almost cemented qualities of this wash, and the throat of no pump has yet been made strong enough to stand the impact of the gravels, should the pump strike an occasional body of loose

*From a paper read before the Canadian Mining Institute.

gravel, and then it is superfluous work, as loose gravel seldom carries any gold.

In spite of the repeated failures in New Zealand, California, the Snake River, and many other places, even to the Mawdach Gold Dredging Co., in gallant little Wales, where an attempt was made to dredge for gold at Barmouth; an enormous amount of money was wasted at Ruby Creek, upon the Fraser River, in trying to make a centrifugal pump dredge for gold. Interluding a little foreign news, after having seen the Barmouth gold dredging claims, I will undertake to say that with a properly constructed dredge there should have been a handsome investment for the stockholders. This may seem news to some, but there is quite a large extent of auriferous country in Wales.

Next to the centrifugal pump came a giant clam-shell dredge, which was built some years ago at Lytton, upon the Fraser River. This was the old mud dredger system applied by a pair of semi-circular steel plate self-shutting shells, very like its patronymic in appearance, and lowered to the bottom of the river by means of chains. On lowering these into the river, two almost insurmountable difficulties were met with; in the first instance, the strong current carried the clams under the bottom of the scow upon which the machinery was placed, and rendered it nearly impossible to bring it up full. The next trouble was that when the clams did bite into the gravels, a boulder or large stone would be held between the jaws, and by keeping them that distance apart would allow the whole of the finer gravels and gold to escape back into the river. This experiment cost the unfortunate shareholders \$50,000 before knowing it was a failure.

After this came an attempt to exploit the gravels by means of a caisson or air-lock, by which men went down to the bottom of the river and by hand labour passed the gravel into an air-lock, and from there to the deck, where it was treated by means of an ordinary rocker. Owing to the writer being brought into a controversy over this machine by the promoters, the project was killed by the caustic remarks made about the enormous cost in labour and steam to bring up a yard of gravel yielding probably 25 to 30 cents from the bed of the Fraser.

The writer was working a ladder dredge upon ground over which a pneumatic dredge had passed and thoroughly prospected according to its ability and found too poor to work, which turned in to the shareholders for some years over 100 per cent. per annum clear of all working expenses.

Later upon the scene of dredging operations came the dipper dredge. This, as far as working a hole in the gravel, is moderately effective, and many of this type have been built and launched upon the Fraser and the Saskatchewan rivers. Yet there are great stumbling blocks to the use of this type as a gold dredger. Chief among these are the want of mobility in handling it in a rapid river, the great cost in working them (they require at the least 5 men per shift under favourable circumstances, as against 2 men of the bucket and ladder type), the intermittent discharge, the comparatively small cubic measurement of gravel actually worked in a week's run, and, worse than all, the inability to make a direct side-cut across a river or bar, thereby enabling the ground to be worked upon a face, and thus systematically clean up the bed-rock, or depth it is found necessary to go

with the dredger. These points will always militate against it as a dividend-producing machine, except under very and exceptionally favourable circumstances.

All of this class of dredge which were built upon the Fraser and other places near, have been started with a great flourish of trumpets (one was started last year), only to end disastrously. One manager of these dredges told the writer that his ground averaged 25 cents to the yard, and in the lower depths considerably more, yet he could not pay dividends owing to his intermittent digging. I understand that at 20 feet the gravel ran to as much as \$3.00 per yard, but he was unable to keep his cut open long enough to take more than an occasional bite at it, for the reasons mentioned above.

The first plant to work the Fraser River in its rapid current and heavy gravels successfully was one of the bucket and ladder type, built in 1899 in England under the writer's supervision upon New Zealand plans, altered slightly to suit the conditions met with in this country.

This is known as the Cobbledick dredge, and is now under another name, "The Fraser River Dredging Co." This plant failed dismally the first year to pay anything, although quite an amount of gold was won, owing to the want of experience of the then manager—who was also a large stockholder—made by selling the investors the claim. He was a clever man with extravagant ideas, and threw the old company into debt. It was reorganized, and under the present management is paying moderately well, and the writer has no doubt but that when those at the head of affairs have gained more experience, the company will pay handsome dividends upon its present capital.

Some Eastern capital, after seeing this plant work, decided to place a similar type, but of more powerful design, upon the North Thompson River, 15 miles north of Kamloops, and the writer was instructed to prepare plans for the same.

The whole of this machinery was built in Canada by the Wm. Hamilton Manufacturing Co., of Peterborough, who, to their credit, made a vast improvement upon the New Zealand and British work.

This dredge is capable of lifting from a depth of 40 feet below water, washing, treating, and stacking the coarse stones and boulders to a height of 30 feet astern of the dredge, a guaranteed capacity of 2,000 cubic yards of gravel per day, and cutting its channel through a flat of 20 feet in height. The girder, or ladder as it is known, for carrying the continuous bucket chain, is of the box type, built of $\frac{1}{2}$ in. by 3 ft. 9 in. steel plate, tapering from the centre to a depth of 3 ft. at each end.

The lower, or digging end, carries a five-faced cast steel tumbler, which weighs over 6,000 lbs. (also cast in Canada). This ladder runs in a fore-and-aft line from a radius point 60 feet back from the forward end of the scow, and extends forward and outside of the nose of the scow a distance of 10 feet; this latter fact enables the dredge to cut its own way when necessary, and keeps a channel open for the boat.

The bucket chain, or belt, consists of 35 heavy built-up steel plate buckets, with their necessary connecting links, each having an approximate capacity of slightly less than 6 cubic feet. There are also at mid-

distances upon this belt two large powerful rock picks, for tearing up bed-rock.

The belt travels along the ladder upon rollers fitted upon the ladder itself. The buckets have hard steel links rivetted to the bottoms, which are bushed with manganese steel bushes to prevent abrasion, these bushes take the manganese steel coupling pins which connect the buckets to the connecting links between each pair of buckets. Manganese is the only metal so far known to be able to stand the enormous wear and tear that takes place in the couplings of the buckets. At the mouth of each bucket there is rivetted a heavy steel reinforcement or cutting lip, which is detachable and renewable when worn out, thus retaining the life of the bucket.

The upper tumbler, which is the driving sprocket, is square and also is a steel casting; this is driven by a heavy, half-shrouded, square-gear wheel of 4 in. pitch keyed upon the tumbler shaft, and then by means of pinion gear and belting from the main engine. The speed of the top tumbler is $6\frac{1}{2}$ revolutions per minute, which gives a bucket speed of 13 per minute, or a theoretical delivery of 172 yards of gravel per hour. In practice it is found best to deliver about 120 yards per hour, to enable the tables to clear themselves.

The gear is driven by a 22-inch belt from a tandem compound surface condensing engine, 10 in. and 20 in. cylinders by 16 in. stroke, running 150 revolutions per minute.

The gravel drops into a heavy, steel-lined shoot, and falls by gravitation into the revolving screen 5 feet in diameter by 24 long, and perforated with graduated holes from 5-16 in. to 7-16 in. At the upper end of the screen is rivetted a steel gear for driving it the necessary revolutions, and this in turn is driven by a steel pinion keyed upon an intermediate shaft running from the main gear shafting. The screen is held in position by 4 rollers 24 in. in diameter, which revolve against a steel wearing band rivetted round the screen.

After the gravel has been sifted through this screen, the refuse is delivered into the stacker buckets by gravitation, and is conveyed by the stacker to the distance of 20 feet astern of the dredge, and clear of any trouble the plant may experience by sitting upon its tailings.

The length of this stacker is 50 feet, and as it is little more than an ordinary elevator made much stronger for the large stones, etc., there need be no description given.

The water for washing the gravel, both in the screen and on the tables, is supplied by a 12 in. centrifugal pump, driven by a belt direct from the compound engine, and throws a body of water at the rate of 2,600 gals. per minute through the surface condenser, which has the effect of slightly warming the water to about 45 deg., thereby preventing it from freezing upon the tables in cold weather, thence through a perforated pipe leading down the whole length of the screen. The water and fine gravel carrying the gold then falls through the screen into a cast-iron distributing box with shut-off gates each side, and through these gates evenly distributed to the tables set each side of the screen, and at right angles to its length.

The tables for catching the gold are arranged in steps or drops similar to the deposition of a battery

table, towards the sides of the pontoons, and the dirt is carried thence astern by a common launder. These tables have a width equal to the perforations of the screen, in this particular case 19 feet wide by 19 feet long, each respective table making a total superficial area of 361 feet, exclusive of the launders and other catch-alls.

They are of wood, and in operation are first covered by calico, then cocoa-nut matting, overlain by expanded metal. This latter is found by long experience to be unexcelled for catching fine gold, in fact the percentage of gold which is lost upon dredges equipped in this way is very small.

That these tables are capable of saving gold extremely fine has been shewn by accurate measurements taken by trial from dredges actually in operation, by Mr. J. B. Jacquet, Government Geologist to New South Wales. A sample of gold from similar tables was weighed, and found to be about two grains in weight, which had been sifted through a sieve of 3,600 holes to the inch, was again sifted through one of 4,900 holes, and the gold which passed through sorted under powerful lens. One hundred of the smallest of these pieces were thus selected and examined under a microscope. Measured with a micrometer, their dimensions in fractions varied between 0.009 by 0.006 and 0.003 by 0.002, the mean of twenty measurements being 0.0065 by 0.0042. The hundred particles were then carefully weighed, and found to have a mass of 0.097 of a grain. The mean weight of the pieces was therefore 0.00097 of a grain, or a little under one-thousandth of a grain. Several experiments also gave similar results.

As the life and working capabilities of a gold dredger depend upon the ease and rapidity with which it can be handled, especially in a rapid current, a careful design was shewn in the manouversing winch. This is of most powerful design and construction, consisting of six barrels, self-contained, within one frame. The first barrel is a double-gear drum to carry the 1,500 feet of $1\frac{1}{4}$ in. steel cable for the headline, which keeps the dredge up to her position in the face of the dirt which it is working. The second drum carries the ladder hoisting line, and lifts or lowers the buckets into the gravel, being used extensively by the winch operator. The other four drums are in pairs, and are used for bow and stern lines respectively. The whole are driven by a pair of vertical 8 by 10 engines with reversing gear, whose main shaft is coupled direct upon a 6 in. worm shaft running the whole length of the frame carrying the drums. The worm shaft has three Hindley patent worms cut out of the solid shaft opposite each pair of barrels, and these worms revolve a 48 in. tangent wheel keyed upon the shaft of the drums. Each drum has patent friction clutches with powerful brakes attached also, and is therefore controlled independently of the others by the single operating winchman working a set of levers in a quadrant by the side of the frame.

The hull of this dredge is built of fir, and the frame is strengthened by heavy 10 in. by 16 in. chime logs running fore and aft, and braced by a semi-Howe truss of 6 in. by 8 in. timbers. The planking is 3 in. by 12 in., 4 in. by 12 in., and 6 in. by 12. The framing for carrying the top tumbler and gearing is brought up to a height of 40 feet above deck, and forms a main hogmast to both hold up the stacker and prevent the hogging of the pontoons, a frequent source of trouble with ladder dredges.

The total weight of the ladder, buckets, tumblers, and links is 43 tons, whilst the total weight of machinery is 150 tons.

After this description it would not be amiss to follow up a little of her career.

The plant worked well, but, alas! in this case, it was not the management that was in fault, as latterly they had a first-class dredge operator from the Snake River, but the paucity of the claim in gold. As far as the writer's knowledge goes, the claim was bought principally upon the reports made by the sellers, and whether these were good or bad is not within the writer's province to discuss. It suffices to say that beyond a thin layer of sand and gravel of about an inch in depth upon the surface, no gold was found below that, neither disseminated through the gravel underneath this layer nor upon the clay bottom met with at a depth of from 15 to 20 feet. A further fact was brought to light during the operations of this dredger, viz.: that there was, with a few exceptions, no gravel met with in the middle of the river, nothing but a bare clay bottom into which the dredger dug for a depth of 8 feet to see if there was gravel underneath this strata.

Yet, showing how a dredger may fail with a fortune in sight, within a few miles was a mass of gravel which certainly carried a minimum of 25 cents per cubic yard, and the working expenses under careful management should not amount to over 3 cents per cubic yard. However, so disgusted were the owners with the financial results, that as soon as winter came on they shut down without a further effort to look elsewhere.

As would be natural in this instance, the claim sellers around blamed everything and everybody except the paucity of gold in the claim. One quondam claim seller and expert went so far as to state that a large quantity of "invisible gold" (!) was being lost in the tailings. Another, after showing all and sundry visitors (before the dredge commenced operations) the brilliant showing there was upon the surface, stated all that was necessary to make the claim a success was a cyanide plant (!) to treat the gravel and black sands.

It shows how careful one should be in investigating the values of a claim, and not to rely upon the general remarks of those particularly interested.

As a rule, with rare exceptions, one certain sign of good payable dredging ground is the immediate vicinity of sluicing or rocking operations, other dredging conditions being present. This, at any rate, determines the fact that payable gold is near, and there is a strong probability that a proposition may be looked into for dredging.

Upon the North Thompson River these operations were conspicuous by their absence. Upon the upper reaches of this river called the Clearwater, I understand there are claims worth looking into, and as to the Lower and South Thompsons no person can dispute their richness, but the gold seems to have been cut out from this river by the dividing range. As a matter of fact, there is no class of mining so profitable and so certain of financial results as gold dredging, provided the conditions given of gold present, workable ground, and a good machine. These points can only be determined by the expert, and not by the average engineer, as is generally imagined. The

business then really comes within the realm of an industrial proposition, producing large dividends for many years, being merely a question of value of ground in gold, with a constant factor of cost in production. The average figure for handling gravels with a bucket and ladder dredge should not at the outside limit exceed $3\frac{1}{2}$ cents per cubic yard, including labour, fuel, etc.

The writer some years ago dredged gold gravels for over twelve months at the rate of 2 cents per yard.

Given, then, the actual value of gravels by expert prospecting and drill holes in any number, it becomes merely the every-day industry of machine mining.

New Zealand has been quoted and referred to so often that one is almost afraid to mention that country in connection with dredging, but the Government returns of gold won and dividends paid by the whole of the dredges working there show an average of 30 per cent. profit. Some, in fact, of their dredges produce something like 600 per cent. per annum upon their capital. Members can judge what this means to the investor.

A DESCRIPTION OF THE MINING OPERATIONS, PUMPING AND HAULING PLANT, ETC., AT THE COMOX COLLIERY.

By Jno. Matthews.

THESE coal measures belong to the Cretaceous formation. The strike of the coal usually lies east and west. The direction of the dip is N. E., but varies in places owing to the number of anticlinals and synclinals which occur. The dip varies from 1 in 5 to 1 in 15.

The coal is of a very compact nature, and contains 62% fixed carbon. It is an excellent coking coal, and is recognized as the best steam coal mined on the Pacific coast. It is used by the British and American navies.

Coal was discovered here about thirty years ago, but active operations were not begun until 1885, when the late Hon. Robt. Dunsmuir with his co-partners, i.e., Southern Pacific Railway Company, began the development of the discovery.

The mines are located near the town of Cumberland, distant about twelve miles from the shipping wharf, Union Bay, Baynes Sound, and connected by a standard gauge railroad. The different units of the plant are located at Union Bay and at the several mines.

There are three mines in active operation, viz., No. 4 slope, Nos. 5 and 6 pits, the two latter of which are worked by shafts. No. 4 slope is situated at the edge of the Comox Lake, and about two miles distant from Cumberland. It is the largest mine here, and one of the most extensive coal mines in the Province. It is worked by three slopes, Nos. 1, 2 and 3. No. 2 slope branches off No. 1 at an angle of 45°, and at a distance of seventy-five yards from its mouth. No. 3 slope branching off No. 2, also at an angle of 45°, about five hundred feet from its junction with No. 1 slope. No. 1 slope is down 7,500 feet, with an average pitch of 7° 30'. No. 2 slope has been driven

to a distance of 6,500 feet, with an average dip of 14°, and No. 3 slope is down about one mile, having the same grade as No. 1 slope.

This mine is worked by the pillar and stall system, the coal having an average thickness of four feet. This mine also produces commercial fire-clay, which is made into fire-brick at Union Bay.

The plant of this mine consists of twelve double return flue steel shell boilers of about 50 nominal H. P., set in three batteries. One battery of four boilers is used to supply steam to the haulage-engine. One of four boilers to supply motive power to drive the electric plant, and two steam pumps placed near the mouth of the slope for the purpose of pumping the surface water. The plant has an aggregate of about 600 nominal H.P.

Haulage Plant.—This is installed some distance from the mouth of the slope. It is a duplex first motion engine, having cylinders 24x36, four drums 6 feet in diameter, two tail ropes and two haulage drums. This engine has a massive foundation of concrete and stone work. The tail rope drums are placed directly in front or tandem of the haulage drums. The engine has a hauling capacity of 16,000 tons per day (two shifts) from the great distances above mentioned. It was built by the Danville Foundry Co., of Danville, Ill.

Steel cables (1 inch in diameter) are used, and haul eleven cars of coal at a "trip," each car of which contains one and a half tons of coal. The cars are hauled up a trestle from the mouth of the slope onto the pit-head and run into a Phillips automatic cross-over car tip, then dumped onto a screen which divides the coal into two sizes, the small size falling directly into the twenty-ton railway cars, and the large size or round coal falls onto an endless conveying belt, where all the rock is picked out before the belt delivers the coal into the cars.

Electricity is the power used for pumping and lighting purposes. This plant consists of a 100 H.P. Edison generator, driven by an Armington & Sims engine—an 80 H.P. dynamo built by the United Electric Lighting Co., of Springfield, Ill., being coupled by belt to an Ideal engine and a 100 H.P. generator built by the Westinghouse Manufacturing Co., driven by a Ball engine.

There are seven electric motive driven pumps placed in different parts of the mine, two of 50 H.P. and five of 25 H.P.

It was necessary to flood the lower part of this mine last summer in order to extinguish a mine fire, which originated at No. 9 pumping station, about two-thirds of a mile down No. 1 slope. The water is now being rapidly taken out. Work will be resumed in the upper portion of the flooded area in about three month's time.

Fortunately for the company and the men engaged working in this mine, there was a large section of unworked ground above the flooded district. The exploitation of this area has enabled the company to keep about two-thirds of the miners formally employed at work. There are about two hundred and seventy-five men employed under ground in this mine, which produces from 800 to 900 tons per day.

Ventilating Plant.—This consists of a Guibal fan, 30x11, driven by a pair of 14-inch coupled engines, which causes 110,000 cubic feet of air per minute to flow through the mine, which carries away the powder

smoke, noxious gases, etc. The machine and electric repair shops are located here.

No. 5 Pit.—Worked by a shaft, which is 600 feet deep, and is located about three-quarters of a mile in a northerly direction from the town of Cumberland. This mine is worked by the long-wall method, having been in operation about six years. The coal averages 3½ to 4 feet thick, being very compact and of a superior quality. There are about two hundred men employed in this mine.

Plant.—There is a battery of six two-return flue boilers of 50 H.P. each. A coupled hoisting engine 30x60 (Corliss valves), with a drum 15 inches in diameter, built by the Albion Iron Works, Victoria, B.C., a 1¼-inch steel cable is used to hoist the coal and the men from the mine. The underground plant consists of a duplex Prescott pump, 20x7x18, which pumps the water to the surface at one lift; a hauling engine which hauls coal out of the slope.

The Pit-Head.—This is built of Douglas fir, and is 70 feet from collar of shaft to bearings of pulleys. The coal is dumped into the chute and treated in the same manner as at No. 4 slope. This mine is joined to the main road by a branch line of about three-quarters of a mile long.

Ventilating Plant.—This is a Guibal fan, 15x5, driven by a single engine. It produces about 75,000 cubic feet per minute, running at 102 revolutions per minute, which keeps the mine in a sanitary condition.

No. 6 Pit.—This pit lies adjacent to the city of Cumberland, and is of the same depth as No. 5 pit (600 feet). The hoisting and pit-head arrangements are similar to those at No. 5 pit. There is a battery of 450-H.P. boilers, of the same pattern and size as those described above. They were built by the Albion Iron Works, Victoria, B.C.

This mine is not so extensive as the others, having been working for about two years only. There are about 150 men employed in this mine. A Worthington pump 20x7x10, stationed at the bottom of the shaft keeps the mine clear of water. This mine is also worked by the long-wall method.

There is a blacksmith's shop and carpenter's shop here, where all the railroad cars are built and repaired.

This mine is connected with No. 5 pit by a pair of drifts of about a mile in length. A Guibal fan 15x5 feet is the ventilating agent.

Preparations are being made to open up another mine (No. 8). It is situated about two miles in a westerly direction from No. 4 slope, and on the same strike. The out-crop being traceable (with few breaks) from No. 4 slope in an almost direct line past No. 8 to Brown's River, a distance of four miles. This mine will be joined to the branch line at No. 5 pit by a road of four miles in length., three of which have already been built.

Union Bay.—The shipping wharf, coke ovens, coal washer and brick yard are located here. There are one hundred coke ovens, seventy being in actual operation. The slack coal is elevated into a Luhrig washer, having a capacity of five hundred tons for ten hours, is washed and dumped into a large bunker, from there into cars and conveyed by different branch lines over the coke ovens, where they empty their contents as desired.

The ovens are of the bee-hive style, and contain each about five tons to a charge, which produces about three tons of coke.

There is a battery of three egg-end boilers, which furnish motive power for washer and brick yard. Both fire-brick and common brick are made here.

There is also a large coal bunker having a capacity of four thousand tons, in which the coal is stored during the absence of shipping.

City of Cumberland.—It is the residential town for the miners and others engaged in and about the mines, having a population of twenty-five hundred. Its situation is admirable, being on rather high ground, having a gentle slope to the south and east. A splendid system of water works supplies the town with water. It is taken from Hamilton Lake, situated about three miles from the town, at an elevation of about 500 feet above the city, giving over 200 pounds pressure per square inch.

A private company is now engaged installing an electric lighting and telephone system.

THE LITHARGE PROCESS OF ASSAYING COPPER-BEARING ORES AND PRODUCTS AND THE METHOD OF CALCULATING CHARGES.*

By Walter G. Perkins, Grand Forks, B. C.

IN the assay of copper-bearing material for gold and silver, the elimination of copper before the final cupellation is of course essential, because any copper left in the lead-button will carry gold into the cupel; and a method which will effectively remove the copper with the smallest amount of manipulation is desirable. The scorification method is often rendered long and tedious by the necessity of repeatedly re-scorifying the button—to say nothing of the risk of losing Au-Ag thereby incurred. An ore carrying, for instance, 10 per cent. of copper and only 0.1 or 0.2 oz. gold per ton, cannot be scorified with accurate results, because so many portions would have to be taken in order to get enough gold for weighing. On the other hand, the crucible method, with potassic nitrate and nails, would not do at all in such a case, because all the copper would be reduced by the nails, and (if the charge were 0.5 A.T.) this would defeat cupellation, by causing cupel-absorption of gold.

In matte-assays, more concentrated value permits the determination of gold from smaller portions and thus diminishes the difficulty experienced with ores.

The method here described has been severely tested, during use for more than a year, and has never failed hitherto, in the assay of any ore or product to which it has been applied.

It is not proposed as perfect for every variety of ore or matte—probably no method would be that; but it is believed that, intelligently used, with the modifications dictated by practice, it will give better results, with less expenditure of time and labor, than any other known to the writer.

This method is based on the fact that PbO can be so used in a crucible, together with the subsidiary fluxes, such as Na₂CO₃, K₂CO₃, SiO₂KNO₃, and flour, as to give, in the determination of gold and sil-

ver ultimate results, at least equal, and in most cases superior, in accuracy to those of scorification. If the analysis of the ore be approximately known, the charge can be so calculated as to give for all ores and mattes a uniform slag, and a clean lead-button containing only small quantities of copper or other interfering elements, thus doing away with the tedious operations and repeated manipulations of the scorification-method.

According to experiments in control-assays of ores and mattes, the slag that gives the best results is one of which the section, showing by breaking the cone after cooling, exhibits a silicate of lead, copper and iron on the outside edge, gradually passing to crystalline litharge towards the centre. At the proper temperature this slag pours very fluid, without including small shots of lead, and gives a clean, bright button, with little or no slag adhering to it.

The temperature of the furnace must be carefully regulated, if the calculated flux is to do its work properly. There is danger in both directions, above and below the proper point. If the furnace be too cold, the slag will be wholly crystalline and will not pour well; and probably some small shots of lead, not collected with the button, will remain in the crucible. On the other hand, if the furnace be too hot, the charge will take up silica from the crucible, leaving it in cavities in which lead may be deposited, and overlooked. Excessive temperature, moreover, increases loss by volatilization.

The best results have been secured by starting with the muffle fairly red, and a rising fire, which should in 30 minutes increase the color of the muffle to bright-red, with the charge all reduced and fusing quietly. The furnace is held at this heat for 10 minutes, and then the charge is poured. The danger of boiling over is eliminated by the fact that the bulk of the charge is lead oxide, without excess of silica or potassic nitrate to bring about any violent action. Such action is invariably encountered in using the nails or nitrate method, where the fluxes are not well balanced, and everything is added or left out, on the cut-and-try-again principle.

CALCULATIONS OF CHARGES.

In order to calculate the proportion of ore and flux, the analysis of the ore must be known as regards Cu, SiO₂, Fe and S. The reducing-effect of the sulphur and the oxidizing-effect of the nitrate must be known, not from theory, but from the results of practice with a variety of ores, such as a smelter receives, from which an average standard has been deduced. The following table was thus constructed from such experiments, made upon the same charges of ore as were used in the final assay. It was thus found as a practical rule that, upon a charge of 0.5 A. T. of ore:

1 gramme of flour will reduce.....	10	grammes Pb from PbO
4 per cent. of sulphur will reduce... 16	"	" " "
4 per cent. of antimony will reduce... 3	"	" " "
4 per cent. of arsenic will reduce... 6	"	" " "
1 gramme of KNO ₃ will oxidize.... 4	"	" to "

The amount of PbO to be used will depend on the impurities to be fluxed off, the principal of these being copper, which must be taken out in order to reduce the loss by cupel-absorption. From low-grade ores (2 to 4 per cent. copper), 5 A. T. of PbO to 0.5 A. T. of ore, and from matte (48 to 60 per cent.

*From a paper read before the American Institute of Mining Engineers.

copper), 8 A. T. of PbO to 0.1 A. T. of matte, will remove nearly all the copper.

To get a slag of the composition described, SiO₂ must be added, if necessary (after calculating the percentage of SiO₂ in the ore), to make up the ratio of 1 part SiO₂ to 16 parts PbO. The percentage of S should also be calculated, and oxidizing or reducing agents added, to obtain a button of the required weight, which should be about 16 grammes. The buttons will vary to the extent of a few grammes either way, by reason of difference in the temperature of the furnace; but with care and practice this difficulty can be largely avoided.

On ore containing, for example, 5.4 Cu, 29.4 SiO₂, 28.2 Fe, 13.1 CaO, and 15.8 S, the charge is calculated as follows. This ore contains a good deal of Cu, and also a high percentage of S, which would necessitate the use of a considerable amount of KNO₃. It is, therefore, advisable to take as a charge only 0.25 A. T. of ore, to which should be added 8 A. T. of PbO, 0.5 A. T. of Na₂CO₃, K₂CO₃, and 18.3 grammes of SiO₂. Since 4 per cent. of sulphur, as stated, would reduce 16 grammes of lead from 0.5 A.T. of PbO, this charge containing nearly 16 per cent. of sulphur, but being only half the weight, would give a button of about 32 grammes. To obtain a button of 16 grammes, therefore, enough KNO₃ must be added to oxidize 16 grammes of Pb back to PbO. This amount will be, according to the figures given above, 4 grammes of KNO₃. The charge is to be thoroughly mixed and shaken down in the crucible, which is then filled up with NaCl. With careful melting, a button of about 16 grammes will be obtained.

COVERS.

As regards the efficiency of different covers, it may be observed that, with the same ore and flux, and under circumstances otherwise the same, two crucible-assays of a high-grade gold-ore gave the following results: With salt as a cover, 20.16; with borax, 19.00; while by scorification, 19.90 ozs. per ton of gold were obtained.

This tends to show that there is less volatilization with salt than with borax. For all-round use, salt is certainly the safest cover. Moreover, when salt is used as cover, the buttons are more uniform, because the sulphur does not volatilize; whereas, borax gives buttons of variable size, because variations in the furnace temperature offset the sulphur directly, and may prevent it from exercising its full reducing-effect.

THE EFFECT OF ARSENIC AND ANTIMONY.

Arsenic and antimony interfere with this method only when present in proportions exceeding 4 per cent., which is rarely the case in any other sulphide-ores than arsenopyrite or stibnite. The following experiments were made to determine the effect of these elements.

Experiment No. 1 comprised 4 crucible-meltings, each crucible containing 0.5 A.T. of the ore (a clean sulphide, containing 4 per cent. of S), to which, in the first crucible, no arsenic or antimony was added; in the second, 0.291 gramme (2 per cent. of the ore-charge) of antimony; in the third, the same amount of arsenic; and in the fourth, 0.291 gramme of each, making together 4 per cent. of the ore-charge.

The reducing effect of Sb and As is seen in the following figures:

In Crucible No. 1,	the button was	16 grammes Pb.
" " " 2,	" " "	17.5 " "
" " " 3,	" " "	19.0 " "
" " " 4,	" " "	20.0 " "

Experiment No. 2 was made with ore containing SiO₂, 29.0; Fe, 29.55; S, 25.4; and Sb, 4 per cent. Two charges were run, side by side. Each consisted of 0.25 A. T. of ore; 0.5 A.T. of Na₂O₃, K₂CO₃; 8 A. T. of PbO; and 18 grammes of SiO₂, to which in the second charge, 8.7 grammes KNO₃ were added. Salt was used as cover in both.

The first charge gave an actual button of 49.5, the calculated button being 50.8 grammes. The second gave an actual button of 17.4 grammes, as against an actual button of 16 grammes. Both buttons were soft and clean, and showed none of the characteristics of As or Sb.

CONCLUSION.

This method may not be universally applicable; but it is useful in a smelter, where the analysis of the ore to be assayed, or, at least, of the last lot thereof, can always be obtained on the premises. Under such circumstances it is, beyond comparison, better than the haphazard KNO₃-and-nails method. Moreover, in a smelter where there are always stock-ores, assay-fluxes can be mixed in large quantities and kept on hand. For matte, a single standard flux can always be used, since that product is, within 1 or 2 per cent. constant in composition.

METALLURGICAL PRACTICE AT THE GREENWOOD SMELTER.*

By Paul Johnson, E.M.

THE B. C. Copper Co.'s smelter commenced operations on the 18th February, 1901, with one blast furnace, 42 by 150 inches at tuyeres. This was kept in blast till the 22nd of August, when it was shut down nine days for repairs, and started up again on the 31st August, since when it has been continuously in blast. During the time from February 18th to December 31st, 1901, in this one furnace, 117,077 tons of ore were smelted and 3,714 tons of matte, assaying from 45% to 60% in copper, from 2 to 6 oz. in gold, and from 10 to 30 oz. in silver were produced. Besides Mother Lode and Boundary ores, there have been smelted some gold quartz ores of 80% to 90% silica, utilising the basic character of the Mother Lode ore. The largest tonnage was put through during the month of December, when 13,098 tons of ore were smelted, thus averaging for the entire month, for every 24 hours, 422½ tons of ore. The largest tonnage smelted in one single day was on January 10th, 1902, when the furnace put through 459 tons of ore. To handle this amount of material, and to break up and pile the matte produced (the work of the blast furnace department proper) in 24 hours, 29 men were employed, viz.: 6 charge wheelers, 4 coke wheelers, 9 feeders (on 8-hour shifts), 2 charge weighers, 2 furnace men, 2 matte tappers, 2 roustabouts and 2 foremen; thus, during December

*Minister of Mines Report.

14½ tons of ore were handled per man per day. Counting the total force of the smelter, the sample mill requires 10 men for unloading and crushing ore, sampling and distributing same into ore mixtures, and loading the shipping matte, engineers, foremen, 1 blacksmith with a helper, 1 carpenter, besides 8 more men, making the total number of men employed, including foremen, 47, which at 422.5 tons of ore put through daily, makes 9 tons of ore handled and smelted for every man employed, which I believe is a record.

As for the character of the Mother Lode ore, it may be classified into limy, irony and sulphur ores, and it is desirable for the smelting to have reserves of these different kinds to help out at times, when in the daily tonnage from the mine too much of one or the other sort is on hand. I give below the assay and analysis of three large lots of these different ores:

- Sample of Irony ore from 1,000 tons lot.
- Sample of Limy ore from 1,600 tons lot.
- Sample of Sulphur ore from 120 tons lot.

	a. Irony	b. Limy	c. Sulphur.
Copper	2.8 %	2.2 %	2.7 %
Gold	0.11 ozs.	0.09 ozs.	0.15 ozs.
Silver	0.58 ozs.	0.43 ozs.	0.15 ozs.
Insoluble	28.7%	35.2%	29.8%
Fused silica	16.9%	29.2%	24.5%
Iron	32.7%	14.7%	17.5%
Lime	5.6%	19.8%	16.0%
Sulphur	3.7%	5.3%	13.7%

The character of these ores is not only self-fluxing but at times rather basic. I have therefore sometimes smelted to advantage as much as 5% to 6% of straight quartz ores with them.

Before starting up the furnace, I had my doubts whether I could make higher grade matte than 30 to 35% copper, without resorting to roasting the ore, but I found by actual practice, what I had hoped, that the irony variety, which is magnetic oxide of iron (Fe^3O^4), in smelting and reducing its iron to Fe^2O^3 for the slag, gives off 1 atom of oxygen for every molecule of Fe^3O^4 , and this oxygen acts as a powerful desulphurizer, so that I have, in fact, burned off as much as 85% to 90% of the sulphur in the charge at times. I have aimed at making a 45% to 50 copper matte, but sometimes it has come out as high as over 60% copper, through having had rather much of the irony ore in the charge. I may mention, in connection with making this high grade copper matte, an interesting fact, viz.: that whenever the matte begins to come up to 53% copper and above, the gold will "lock up" in the furnace in the metallic copper bottoms which form. One week when making 58% to 63% copper matte I had gold locked up to the value of \$6,000 in the furnace bottom; the next week I had sulphur ores with which I could get the matte down to 45% copper, and I then got all the gold out in five days. Silver does not behave in this way.

The Mother Lode ore is exceptionally free from arsenic and antimony and behaves quite differently to certain other British Columbia ores which carry quite an amount of these metals, and in running which I have found metallic copper and speiss separate out as soon as the matte came up to 47%, causing much trouble in filling up the tap-hole and threatening in this way to plug up the furnace. To obviate this I have found it necessary, elsewhere, to change the

trapped spot to the ordinary way of stopping up the tap-hole with clay and when the bottom was rising up inside the tap-jacket I used to blow the furnace for five minutes and the blast, following through, melted the gathering metallics and speiss. With the Mother Lode ore, however, I have made as high as 67% copper matte in the blast furnace, using a trapped blast, without filling the tap-hole with metallic copper.

For its size (42 inches by 150 inches at tuyeres), I think this furnace has the best record so far for large tonnage and at the same time cleanness of slags made. The coarseness of the ore has a great deal to do with tonnage, and to some extent clean slags, as was discovered when we began to crush it to a 5-inch size, instead of from 2 to 3 inches as at first. A couple of per cent. of silica, more or less, in the slag does not slacken these big furnaces up as quickly as it does smaller ones; neither is high lime as bad. What I have found troublesome, raising the copper in the slag, and making it heavy with a poor separation of the matte, is when the iron in the slag comes up to 30% and 32%, and silica at the same time is low, say 2½% to 30%.

I give below examples of some different kinds of slag made, with the corresponding tonnage.

Nov. 7th, 1900—Slag: $SiO^2=42.7%$; Fe, 21.1%; CaO=20.0%, and Cu 0.33%; matte, 44% Cu; furnace smelted 393 tons of ore.

April 1st, 1901—Slag: $SiO^2=33.8%$; Fe=25.4%; CaO=25.7%, and Cu=0.25%; matte went 49% Cu; tonnage 402 tons of ore; high lime has a tendency to make the slags free from Cu.

July 7th, 1901—Slag: $SiO^2=30.9%$; Fe=32.5%; CaO=16.8%; Cu=0.44%; matte, 53% Cu; tonnage, 399 tons.

January 10th, 1902, (when the furnace put through 459 tons of ore) slag: $SiO^2=37.8%$; Fe=24.5%; CaO=20.9%, and Cu=0.35%; matte, 49% Cu.

We make slag assays for copper twice a day, but do not make it by the generally adopted colorimetric method, which, as a rule, gives too low results and deceives the metallurgist, making him believe and tell others that he makes cleaner slags than he does. The slag samples are taken every hour, chilled in water, and the day and night shifts kept apart. Two grammes are taken for the determination, dissolved in hydronitro-chloric acid evaporated with H^2SO^4 diluted, and the copper precipitated with hyposulphite of sodium solution; the Cu^2S is dissolved in HNO^3 and titrated with KCy; this determination takes somewhat over two hours, but it is correct and reliable, and it will check, as I have proved, to one hundredth of one per cent. (0.01%) of copper. Where you have very little copper in your charge, it is important to have accurate determinations of your slags, and to keep them low in copper, as 0.1 of one per cent. makes quite an item. These daily slags are then put together, and once weekly an average assay of them all is made for gold, silver and copper. The slags, as a rule, have been very clean, as follows:

Copper, varying between 0.30 and 0.037 per cent.

Gold, varying between 0.0025 and 0.0035 ozs.

Silver, varying between 0.04 and 0.07 ozs.

Of course more copper in the slag is allowable in making 50% Cu matte, than in making 30% Cu

matte. Formerly it used to be considered good smelting to have only 0.1 per cent. copper in the slag for every 10 per cent. copper in the matte; thus in making 3% Cu matte, 0.3% Cu in the slag was permissible, and so forth.

The amount of coke used is from 11½ per cent. to 12 per cent. of the weight of the ore. The blast used is from a No. 7½ Connersville Blower making 155 revolutions per minute and giving 80 cubic feet of air per revolution. The blast pressure averages 1¼-inch mercury, equal to 14 ounces.

The feed height above the tuyeres varies from 4 to 8 feet, when little sulphur or much coarse ore, feeding high, when much sulphur or much fine ore, feeding low. The best feed-height, for good running, I have found to be from 7 to 8 feet.

As to the running of the furnace, charges of 3 tons are put in at the feed floor by feeders and not by any mechanical devices which, as I have had occasion to find out, do not pay, but cost a great deal of money and give a bad working furnace and dirtier sags.

A charge comes down to the tuyeres in three-quarters of an hour. Slag and matte run together continuously through a trapped spout into a water-jacketed forehearth on wheels, inside dimensions being 8 feet long by 5½ feet wide by 3 feet deep. The matte, having a specific gravity of 5 to 5.3, sinks to the bottom, and the slag, of a specific gravity of about 3.4 to 3.5, overflows at the furthest end into a large settling pot, and from this into the granulating flume. The matte is tapped at intervals into matte pots, the contents of which are poured into matte-moulds, 2 feet wide by 5 feet long by 4 inches deep, thus cooling off the matte quickly, and delivering it into the shape of cakes 1 to 1½ inches thick. These matte cakes, when cooled, are knocked on the top with sledge hammers and broken up into 3 to 5-inch pieces, and are shipped in this way in bulk into box cars, the lots averaging 30 tons. This does away with a crusher and sacking, and makes the matte pots last longer.

Enlargement of the Plant.—We have, during the latter part of 1901, been at work to double the capacity of the smelter, and to this end erected new sets of lower ore bins, 12 in number, with an increased storage capacity of 5,000 tons, making a total storage capacity for the lower ore bins of 10,000 tons. Another large 560 feet long railroad trestle has been built between the two previous ones in order to facilitate and make possible the handling of over 1,000 tons daily of material for the smelter by the railroad. The foundations for the furnace building extension and the new second furnace are in, and cast iron columns and deck-plates for the new second furnace have been put up. The furnace will be finished as soon as the weather allows the putting up of the brickwork for it. The new 7½ Connersville Blower is ready and in place for the furnace. With this second furnace, which is now completed, the plant has a daily capacity of over 800 tons of ore, and together with coke and coal and matte the railroad will have to handle nearly 1,000 tons daily.

We figure on getting eventually three to four furnaces going, and shall then add converter works for making the matte into blister copper.

THE IRON DEPOSITS NEAR KITCHENER, B. C.*

By W. Blakemore, M.E., Montreal.

THESE deposits consist of a series of parallel veins of hematite iron ore running continuously for a distance of ten miles, the full length of a solitary mountain known as the Iron Ridge, and situate, at its nearest point, a distance of three miles west of Kitchener Station on the Crow's nest Pass Railway. A reference to the accompanying diagram will show that Kitchener is 20 miles east of Kootenay Lake, 70 miles east of Nelson, which is the centre of the smelting industry of West Kootenay, and 120 miles west of the extensive coal fields of the Crow's Nest Pass Coal Company at Fernie. The mountain is peculiar in formation, being entirely separate from the other ranges in the district, and



presenting the appearance of an inverted boat. It starts from the level of the railway and Goat River 2,400 feet above sea level, rises gradually to an altitude of nearly 6,000 feet in a distance of two miles, continues with slight variations at this level for six miles, and then dips down again at the extreme north end at about the same angle as at the south. The main direction of the mountain is 20 degrees W. of N., and upon the east side Goat River flows parallel to it. At its base on the west side is a large creek known as Arrow Creek, and around the north end is a pass connecting the two. The original survey of the Crow's Nest line was around this pass, and it was only abandoned because it involved a detour of 20 miles. In view of the development of the property under consideration, this point is worth remembering, as the possibility of constructing a railway of easy grade all around the mountain was demonstrated by the survey referred to. The character of the ore is chiefly hematite, and upon a few claims this has been found to be slightly magnetic, but over the bulk of

*From a paper read before the Canadian Mining Institute.

the property is pure hematite. The occurrence is in a large body of quartzite approximately 500 feet in width running longitudinally with the mountain, and along the eastern side co-extensive with the quartzite is a green stone dyke of gabbro-diorite. The property consists at the present time of fifty claims, each 1,500 ft. sq., upon which the ore has been located, an area which embraces practically the whole of the summit of the mountain. The property has been held for some years as a copper proposition, and probably from \$10,000 to \$12,000 expended in prospecting for that mineral. In the spring of 1901, however, the iron ore seems to have attracted attention, and for the first time the holders began to realize that it might possess an economic value. It came under my control last May, and from then until the 30th November I expended about \$30,000 in prospecting and proving the property, the result being that the capitalists whom I represented have purchased twenty claims, and hold an option on the remainder. Our season's work has proved that the ore is of the highest quality, that there is sufficient to constitute an important property, and that the surrounding conditions are favourable to development. There still remains to prove the actual extent of the ore as development work would not justify a calculation of tonnage at present, but as I shall show, everything points to an enormous deposit. Owing to the large area to be prospected, much of the work consists of mere surface examinations and prospecting, it being important in the first instance to establish the area over which the iron extended. We soon discovered a 6 ft. vein upon the Keepsake claim near the north end of the property, and on putting the diamond drill to work found the iron continuous and good at a depth of 60 ft. On cross-cutting this vein we found that, in addition to the 6 ft. of solid iron, there was an admixture of iron and quartzite running in alternate bands for a distance of nearly 100 ft. In some cases the quartzite and the ore were mixed, in others there were clean bands of ore. Meanwhile another vein 6 ft. wide had been located upon the Maple Leaf claim, a little distance north; upon this claim a shaft was sunk 50 ft., and the iron at the bottom of the shaft continued of the same thickness and yielded the same assay as upon the surface, viz., 67.2 per cent. of metallic iron. About this time a vein was located upon the "American Flag" claim still farther north, and as it showed up nearly 20 ft. in thickness, it was decided to put a trial shaft upon this. The shaft went down 30 ft. and was then stopped in consequence of water, but the thickness and quality remain the same. Meanwhile the same vein was traced south to the O-Ray claim, upon which a shaft was sunk 50 ft. Here the vein was 18 ft. thick and of uniform quality. In none of these veins was there the slightest admixture of quartzite or other impurity, the whole of the material taken out being put on to the dump for shipment. An average assay of the ore on the American Flag gave: metallic iron, 67.4; silica, 1.7; sulphur, .16; phosphorous, .03; and upon the O-Ray, metallic iron, 64.7. In addition to these veins, one vein 15 ft. wide was located at the end of the season 500 feet east of the American Flag claim and traced for several hundred feet north and south; also another claim upon the Golden Cap to the west, the latter being 8 ft. thick, but upon neither of these veins was any work done beyond uncovering. It will thus be seen that in all there are five veins located up to

date, aggregating 63 ft. in thickness, and that actual exploration has proven these to a depth of 50 ft. *in situ*. The dip of the veins may be taken as 75 per cent. Beyond the actual exploratory work done, there are other evidences upon which the extent of the iron may be fairly considered. In the gulches which are found upon the mountain side the same veins have been uncovered at a difference in elevation of 1,200 ft., and they maintain their uniformity at those points. The diorite dyke referred to is continuous throughout the whole length of the mountain, and can be traced across the level ground and through a railway cutting on the Crow's Nest line. Having regard therefore to the character of the deposit, to the persistency of the green stone dyke alongside which the iron occurs, to the formation of the mountain, and to the fact that the measures are found regular at the base as well as at the summit, there is no reason why the iron deposits should not also continue to that depth, but whether this be so or not, sufficient has already been done to show that there is an enormous deposit of iron of the highest quality quite sufficient to justify great expectations for the future of the property. I need hardly say that work will be continued during the coming season until a thorough proof is made.

With reference to the quality, this is so surprising that I have some diffidence in placing the figures before you, but still they speak for themselves, and are the result of assays made by five or six independent authorities, including McGill University, Mr. Milton Hersey of Montreal, and Mr. Robert Hunt of Chicago; they have also been verified by practical tests made at the works of the Dominion Iron and Steel Co., and as they are the results of bulk assays and not selected samples you will, I am sure, agree with me that the ore is one of the purest and highest grade base metal ores to be found anywhere. More than 100 assays were made; of these 60 were taken from the veins, and taking those only into account, excluding float, we got an average of 60 per cent. of metallic iron, 5 per cent. silica, .10 sulphur, and .03 phosphorous. A comparison of these figures with those yielded by the celebrated Lake Superior ores, and with the Newfoundland ores, shows that the Kitchen ore is decidedly superior, being higher in metallic iron and lower in sulphur and phosphorous. An average assay of Lake Superior ores gives: metallic iron, 60; sulphur, .010; phosphorous, .06; and of Newfoundland: metallic iron, 55; sulphur, .012; phosphorous, .060.

Naturally the question of interest in connection with this matter is the future of the property and its value to British Columbia. Of this it may safely be said that sufficient iron has already been discovered to determine the existence of a first class fluxing proposition, and even for this purpose the property will in the future be valuable. But unless all my expectations are baseless, we have here a property which when thoroughly proved will be shown to contain such an extensive body of hematite ore of the highest quality, that it will be possible, whenever the Province is ripe, to establish a large iron and steel making industry in the West, which will compare not unfavourably with that of the East. All the local conditions for cheap manufacture are favourable. The ore can be mined and shipped for \$2 a ton. There is abundant limestone in the neighbourhood upon

the west side of Kootenay Lake, which can be delivered to a smelter at 50c. a ton. The high grade coal and coke of the Crow's Nest Pass is only 120 miles away, and can be brought to Kitchener at a cost of \$3.00 for coal and \$5.00 for coke. Allowing for the higher rate of wage prevailing in the West, I consider that pig iron can be made on this property at a cost not exceeding \$10 a ton and this iron can be delivered at a cost of \$13.00 to \$15.00 at the coast. At the present time pig iron delivered at any of the coast cities is worth \$22.00 a ton, and even admitting that prices are above the normal, there would still be a wide margin in favour of the local product.

It may be too soon for British Columbia to support such an industry, but except in the face of a very high tariff the Western States would be customers for steel produced at Kitchener, and in any case the Orient trade would be fairly within our grasp, as under no circumstances would it cost as much more to produce steel at Kitchener as the difference in cost of transportation between Pittsburg and the Pacific coast and Kitchener and the coast, and this would be the final and determining factor in competition. The property is in the hands of men who will develop it in the best interests of the Province; it will be made to serve Canadian interests every time, and the proprietors have not only the will, but the ability to handle it in such a manner as will, in my opinion, produce important financial results for Western Canada.

A NEGLECTED ASSET.

(By Clive Phillips-Wolley.)

IT is often said that more money is made out of the or copper for the sake of which it was originally by-products of a mine, than out of the gold, silver developed, and this in some cases is undoubtedly true.

There are by-products of a mineral zone for a mining camp just as there by-products of an individual mine, and it is one of these which experience leads us to believe is badly neglected in British Columbia.

Thirst is no doubt a by-product of mining, but that is sufficiently well attended to by the saloons of every camp. The development and treatment of it ranks first in the paying industries of all mining fields, unfortunately.

Sciatica and rheumatism, not altogether unconnected with the first-mentioned by-product, are almost as common as thirst, and to these, although nature has provided every facility, we do not pay sufficient attention.

It is undoubtedly true that these two diseases are the peculiar curse of our mining districts in the Northwest, and prey principally upon the strong frames of men whose trade makes them careless of weather and exposure and whose temperament makes them as reckless of wet within as of wet without.

Nature, foreseeing as usual, has provided the cure where she has allowed the evil to exist. In the vicinity of most of our mining fields hot springs of sul-

phur or lithia bubbles up from the ground. Without going as far afield as Paso Robles, in California, or even Green River Hot Springs, in Washington county, we have Banff beyond our borders and within them the lithia springs of Halcyon, on the Kootenay lakes, Harrison on the C. P. Railway, only about 80 miles from Vancouver, a set of springs on the West Coast of the Island, treated of in a recent issue of the Record, and no doubt others as yet unknown to fame. If our memory serves us there is a spring near Ainsworth and on at least one of the exquisite islands in the Gulf of Georgia sulphur water is to be found.

According to that admirable delineator of animal life, Mr. Seton Thompson, even the grizzly bear has sense enough to recognize the curative qualities of a sulphur spring and to use it, and from Halcyon, in Kootenay, to Harrogate, in Yorkshire, tens of thousands of sufferers seek and obtain relief from the hot sulphur water treatment.

Our contentions are:

That, in very many years experience, we have never yet seen any perfectly conducted springs;

That any perfectly conducted hot springs would make more money than most mines;

That if we chose to try we could have those perfectly conducted hot springs in our own country instead of going over the boundary or to the old country for them.

What is wanted is a first rate mineral spring in an accessible position. This we have in every instance mentioned. We have heard it stated that, perhaps in the least known of those mentioned, the water is the best, carrying a larger per centage of lithia than any other springs in North America, or perhaps in the world. But there are other requisites besides a good spring to make a sanitarium a success, and here it is that we break down. We remember well going to one establishment and inquiring for a masseur. The host, a bluff and no doubt honest fellow, asked us what a masseur was, and being told replied: "Oh, we don't go in for none of that gory rot here. You kin jest soak in the water and dry yourself." And yet any sciatic patient knows that massage is half the battle. In another magnificently equipped establishment the attendant doctor never even took the trouble to examine the patient's heart to see whether he could stand the extreme heat to which he was submitted, and, indeed, as manager of an hotel which boasted a superb cuisine, had not time to attend to the symptoms of particular patients. And yet if one patient at that hotel had dropped dead from heart trouble his death would have caused serious loss and discredit to the springs, whilst on the other hand every patient who was there would have been content to pay more if he felt that his case was being treated specifically by one who had special knowledge of his disease.

In another establishment the bath house was so abominably dirty that it hardly caused you an extra shudder to be put into a hole of hot filth alongside the coloured boot boy of the hotel and if you were a specially hard or brave man you managed to choke over the talk of the niggers and half-breeds and get your bare feet out of the way of casual expectorants,

and to believe that there was no danger of contagion from syphilitic patients.

Besides these graver evils there are minor ones which may still mar the success of good springs.

Men's bodies depend somewhat on their spirits, therefore you must give them something to do, lawn tennis, billiards, a library or golf. Their sciatic legs depend to some extent upon their stomachs, so that in a perfect sanitarium they should be delicately and plainly fed.

Granted that we have in British Columbia springs as good as any in America, or it may be, as any in the world; granted, too, that sciatica and rheumatism are sufficiently common in Northwestern America to provide ample custom for a good hot springs hotel, this is the way in which a very painful experience suggests that they should be run in order to create a stream of tourist travel to British Columbia in order to make a great fortune for the proprietors of the springs, in order to afford relief to many of our own people, and in order to make a fortune and a world-wide reputation for one man, the doctor in charge.

In scenery such as you have at Halcyon or Banff, fine hot springs as naturally good as those of almost any of the establishments mentioned, build there not only a good hotel such as you have in some of them, but a first-rate bath house, not a filthy line of mud holes or a roof over a common pool of Bethesda, and see to it that you have walks or rides in which your guests can take exercise, such inexpensive amusements as tennis, quoits, croquet, golf or cricket if possible, and a small gymnasium with bars, trapeze and punching bag in any case and for wet days a billiard table, ping-pong, and above all, a fair library. All these things are obtainable and most of them reasonably cheap, and yet I know of no one hotel which has all these simple requisites of health. The last and all important *sine quo non* is more difficult perhaps to obtain.

The whole establishment, though it may with advantage be a good hotel and a pleasant loafing place as well, should be primarily a place to cure rheumatism and sciatica, and for that reason it should be under the control of a really competent doctor, who will make it his business to study and prescribe for each patient who requires his attention.

Think for a moment what this would mean for the doctor and for the establishment. There is no disease which is more the despair of the ordinary doctor than sciatica. We know of a thousand recommended cures, from a potatoe in your trouser's pocket to a diet of fresh killed panther, but we know of no specific and no specialist.

With thousands of cases passing through his hands every year, could a young, able and ambitious man fail to obtain such a special knowledge of this disease as to make him master of the situation.

An hotel run at a hot springs with such waters as we have in British Columbia, in such scenery as we are surrounded by, with so many rheumatic people for its clients, could not fail to make millions, if it had a man at its head who was as good and careful and experienced in the hydropathic treatment of the

different forms of rheumatism as some of our surgeons are in the use of the knife.

We do not think that an apology is necessary for this article in a mining paper, because mineral springs are assuredly one of our mineral assets, and you can hardly have a mining community without rheumatic cripples.

It would pay the province to establish such a sanitarium if the services of the right man could be secured; it would pay a railroad to tax its powers to provide such an establishment and equipped at a point which is not snow-covered in the season when the rheumatic miner is down from the North; above all it would pay some young doctor who added ambition to brains and application and a reasonably big balance at the bank, or in a friend's pocket. But the man must be in earnest and not a humbug; the springs good, the masseurs first rate; the hotel accommodation fair; niggers, expectorants and foul swearers under control (out of sight if possible); the hotel clean and run so that the most dainty of women might patronize it, and every facility afforded for the healthy exercise of the muscles, which are brought to the springs for treatment.

COMPANY MEETINGS AND REPORTS.

THE TYEE COPPER COMPANY.

THE third ordinary general meeting took place to-day at the Cannon Street Hotel. Mr. T. H. Wilson (the chairman) said that the total amount of drivage during the year had amounted to 1,637 feet, while 1,530 tons had been stoped in two months. In the next year's statement a complete profit and loss account would be furnished, as they would then be producing. Mr. Gardner, their secretary, had recently visited the property and would give a full report of what he had seen. The chairman moved the adoption of the report, which was seconded by Mr. A. Straube. Mr. William Gardner then gave an interesting account of his visit, and reported that what he had seen had convinced him their confidence in the property had not been misplaced. He went down the shaft to the 100-foot level and inspected the workings. A new ore body had just been struck, the whole face of the drive being in bright yellow ore. The opening up of this ore body continued and the various assays proved the very high quality of the ore. A sample taken by him gave the following results: Copper, 21.85 per cent.; gold, \$8.80; silver, \$6.82 per ton of 2,000 lbs. An average sample gave copper, 12.73 per cent.; gold, \$5.00; silver, \$3.45, being probably a fair value for the whole lode at that particular point. Mr. George Thomson, of New York, an experienced metallurgist, had made the conservative valuation that the whole mine might be expected to run: copper, 6 per cent.; Gold and silver, \$4.50 per ton of 2,000 lbs. Mr. Thomson also calculated that on a matter of 2,000 tons of ore per month a profit of \$15.00 per month should be made as soon as the smelter was in proper working order. He believed the company possessed one of the finest properties in British Columbia yet opened up. The report was unanimously adopted.

RAMBLER CARIBOO CON.

In the annual report of this company, the chairman, Mr. A. F. McClaine, states:

"In the yearly reports submitted to us by the Managing Director, and by us laid before your annual general meeting, we find very gratifying financial conditions, which briefly stated shows the Company's cash surplus to be \$45,000, July 1st, and including July operations would be \$55,000.

"The above statement in detail, together with complete plans of mine development and surface improvements, we anticipate mailing to shareholders on or about 1st November, as at such time all additional improvements to concentrator and power plant will have been completed, and can be much more intelligently presented, both as to cost and operation.

"We find conditions generally at the mine in a healthy state, and we see no reason why the present monthly dis-

tribution should not continue and if present mine conditions attain, extra or additional dividends can be earned and distributed."

CORRESPONDENCE

PROPOSED BRANCH OF U. S. MINT AT TACOMA.

To the Editor, Sir:—I beg to call your attention to the enclosed clipping from Engineering and Mining Journal, New York city, re the proposal in United States Congress to establish a branch mint at Tacoma to catch the gold coming from the Yukon District. Does it not look as if a branch mint would be required at Vancouver in order to keep the Yukon gold in Canada? I write you, as I know you are interested in the Yukon gold, and this proposal may have escaped your notice. Hoping the information may be of some service to you, I am, your truly,

J. WALTER WELLS.

Provincial Assay Office, Belleville, Ont.

Extract from summary report of 56th Congress of United States, taken from *Engineer and Mining Journal*, July 20th, 1902:

"The establishment of a coinage mint at Tacoma, Washington, was proposed at the 56th Congress, and the committee had this bill under consideration from the date of its introduction until February 11th, 1902. In making its report the committee called attention to the fact that there is naturally tributary to the proposed mint an aggregate annual output of gold and silver valued at from \$30,000,000 to \$50,000,000. On a basis of \$30,000,000 it is estimated that the saving to the government would be in round numbers equal to the expense of maintaining and operating a branch mint at Tacoma."

POSTPONEMENT OF THE NEW B. C. LOAN.

From our London Correspondent.

PROBABLY you have already heard by cable that it has been decided to postpone the issue of the new B. C. loan; but to prevent an erroneous impression gaining credence, it may be as well to state the actual facts. With the termination of hostilities in South Africa a general revival in the London stock market was confidently anticipated, and it was generally expected that issues of a gilt-edged description would be eagerly absorbed. But the predicted revival did not materialize; on the contrary, there was a series of sensational developments in the mining market, which resulted in an all-round marking down of quotations and a continued display of apathy on the part of the public towards all classes of investments from Consols downwards. Rumors that the government intended to almost immediately issue a big Transvaal loan, the upset in the Kafir market, the anxiety as to the progress towards convalescence of the King, and the approach of the holiday season, all tended to discourage the long looked for revival in the city. And the results of the appeals by Victoria (Australia) and Montreal were so disheartening that although every preparation had been made by those responsible for the issue of the new B. C. loan, and it had been readily underwritten—I understand on high authority, practically fully—it was felt that it would be unwise to publish the prospectus under such disheartening conditions. As to the wisdom of this decision, there can be no possible shadow of doubt. Had it been issued it would have been "taken" by the powerful groups identified with those in charge of the operation, but attractive as it would have been under ordinary conditions to the investing community in this country, it is hardly probable that it could have fared better than the Montreal loan. And as you will have heard the underwriters of the latter had to take up a very large proportion of their subscriptions. The consequence would have been a very large addition to the already considerable quantity of stock of this class at present undigested. Those in charge of the new loan, having their finger on the pulse of the market wisely—very wisely—decided that in the best interests of the Province it would be advisable to postpone the issue until a more favourable season. And in this decision they are amply fortified by the

comments of the leading financial journals, who one and all recognized that in releasing from their obligations those who had underwritten the loan, its sponsors had acted generously, and that later in the year they would be more than compensated for their present action. With the King crowned, peace in South Africa, the holidays over, and normal conditions prevailing in the city, the public may be expected to take a little more interest in Stock Exchange securities. Of late their appetite has not been equal to the supply of Colonial investments on offer, and they will be all the better for a little relief in the creation of this class of stock. Presently market conditions will undergo one of those transformations which are so characteristic of the financial world, and with money plentiful and cheap and the public in a more cheerful mood, those very securities which are now going a begging will be in keen demand at materially higher prices than those now obtaining. Then will be British Columbia's opportunity. And it may be confidently relied upon that those in charge of the affairs of the Province in London will not be slow to seize that opportunity.

PROSPEROUS CONDITIONS IN THE DRY ORE BELT.

From our own Correspondent.

AS INDICATED by many signs, this section of the dry ore belt is in a very prosperous condition this summer. The old stand-bys, the Arlington and the Enterprise, continue shipping heavily, having to their credit 2,500 and 1,500 tons respectively. Shipments from other developments bringing the total to 4,250 tons in round numbers.

Development on a large scale is fairly under way in a number of promising mines after satisfactory preliminary work. Properties are being purchased, bonded and leased quite freely and by strong hands. The town of Slocan, which is the centre of this activity, is feeling very brisk and jubilant, the more so as they are practically assured of a big sawmill and wood-working plant in the very near future.

With reference to the condition of affairs on the different creeks:

Ten Mile: The Kalispel has been leased and bonded by A. Teeter and associates, of Slocan, who have a force at work driving a working tunnel on the lead. The Enterprise is shipping freely both concentrates and clean ore. The Mahon, above the Enterprise, has shown very rich ore in both tunnels on their west veins. The Iron Horse Company have settled their discussions and are settling down to work again.

Twelve-Mile Creek is more than busy. The Sapphire Mines Company have had a comprehensive plan for development laid down by Mr. Wayne Choate, M.E., after an exhaustive study of the conditions. They have also acquired the Monte Christo and the May and Jennie adjoining.

The Jubilee and the Myrtle groups near the head of the creek are both reported under option.

Springer Creek: The Republic Company have about completed their wagon road up Republic mountain. They are thoroughly well pleased with the result of their development work. They will join the ranks of the shippers almost immediately. Several of the adjoining claims are reported under option to this company.

The Ottawa group has been purchased outright by the Pittsburg syndicate that held the bond on this property. They continue opening it up as fast as they can drive the main adit under the superintendence of Mr. McPhee.

The Arlington keeps on the even tenor of its way, shipping only the high grade ore, but they find ten tons or more daily of this.

The Speculator continues developing with ten to twelve men.

The Hampton, near the head of the creek, is again sending down exceedingly rich ore.

The contract for the Golden Crown tunnel has been let by Mr. Rammelmeyer, and it is again under way.

The Exchange group: Two claims sold for cash to Chas. Dempster and associates, and the new owners will take out a shipment at once, as well as force development.

Lemon Creek: The Black Prince continues development with a full force under Mr. Norman's bond. The Two

Friends adjoining sold to one of the large interests, and work is to be resumed on this, one of the best known of the properties in camp.

The Meteor group, at the head of the first North Fork, has been leased, and the first crew gone in to work.

The owners of the Charmer have made a small trial shipment to Nelson.

Besides these there are so many that it would be of no use to try and make a complete list doing more or less development work, and generally with very satisfactory results.

W. D. MCGREGOR.

FISH CREEK DISTRICT.

(From Our Own Correspondent.)

WITH the low prices for lead and silver, that have prevailed for some time, the free gold camps of the Kootenay have come into greater prominence, and at present there is a noticeable increase in activity both as regards the mines, and also the development work being done on the prospects of this class. Among the camps which have felt this most strongly that on the Fish Creek, in the Lardeau has been the leading one, and at present it is the liveliest camp in the district. The first discovery of free gold in this portion of the Lardeau was in 1869, when a number of claims were located on Fish and Pool Creeks. Among these a number of good properties have been opened up, and are now being operated.

Those on which the most extensive work is being done are the Camborne group, owned by the Northwestern Development Syndicate, Ltd.; the Eva group, owned by the Imperial Development Syndicate, Limited, and the Oyster group, owned by Messrs. Pool & Young and associates.

On the Camborne group the company have installed an electric power plant of 500 horse power, and three power electric drills are now being used to develop the property. The company with this plant is furnishing electric lights for the camp and mine workings, and a line of wires is now being connected with the townsite of Goldfields, which adjoins the group, and has recently been taken over by the syndicate. It is also the intention of the syndicate to generate sufficient power to operate an electric car line for both passenger and freight between Comaplix, which is the head of navigation on Arrow Lake for the camp, and Goldfields. A sawmill with a capacity of 40,000 feet per day, is being built at Goldfields which will supply lumber to the rapidly growing town and the mines. The machinery for a ten-stamp mill and 5,000 feet aerial tram has been shipped and will be installed on the property on arrival. For the purpose of making a thorough test to determine the process of treatment best adapted to the ore a shipment of twelve tons was made to the granite mill five miles west of Nelson. The results obtained were reported as follows:—

Feeder sample assayed (per ton)	\$ 44.00
Recovered by amalgamation	33.07
Recovered by concentration	1.80
Value of concentrates	207.20
Gold bullion recovered (ounces)	25.63
Percentage of total values saved by amalgamation . .	82.7
Percentage of total values saved by concentration . .	4.7
Total recovery (per cent.)	87.4

This mill test was considered as most satisfactory and means much for the Fish River camp. The test has demonstrated that the ore is strictly free milling, and as the ore of the Camborne from which the same shipment was taken is identical with that found on a number of claims on which much development work has been done it would indicate that all that is required for the progress of the camp is development and stamp mills.

The development work done on the Camborne, principally under the superintendence of the managing director of the syndicate, H. Z. Brock, consists of three tunnels, one of which is being driven on the vein to develop the upper claims. It will cut the vein in these to a depth of 2,000 feet and when completed will have a length of considerably over a mile, the surveys showing the distance to be 6,900 feet. This tunnel will have a double track, and electric cars will be used in hauling ore to the mill which is being erected at the month.

On the Eva group on which the first discovery of gold was made in the district active development has been carried on for two years, resulting in over 2,000 feet of underground workings. This development has blocked out many thousands of tons of free milling ore. The lead is from 100 to 150 feet wide, and the ore shoots occur on either wall with numerous cross fissures from wall to wall, which carry high values. There is also a large tonnage of high grade ore on the dump, which was taken out in development work only. The Eva is splendidly situated for cheap mining and milling. A tunnel 3,000 feet long driven from the mill site at the foot of the mountain on the lead would tap the upper workings at a depth of 2,000 feet vertically. The Oyster group adjoins the Eva and like it and the Camborne carries free milling gold on all the claims. On the Criterion claim especially, one of the group, the surface showings are wonderfully rich. Another feature of this claim is a ledge of galena which increases from 18 inches in width at the surface to three feet at twenty feet.

The Wide West, Beatrice and Iron Dollar groups are also situated in this district and are being rapidly opened up.

The formation throughout is a micaschist, with frequent intrusions of porphyry dykes. There are plenty of streams of water power on nearly all the claims. The camp is situated about 100 miles from Nelson and is reached from Comaplix on Arrow Lake. A road eighteen miles in length is the only means of getting in from Comaplix to the camp at present, but it is expected that an electric line will be put in as soon as the development of the camp warrants it.

YMIR DISTRICT.

(From Our Own Correspondent.)

THE most disastrous forest fire within the recollection of residents in West Kootenay is now raging on Wild Horse Creek and has inflicted incalculable damage on mining property in that section. The principal sufferers are the Ymir, Blackcock and Wilcox companies. The Ymir Company were extremely fortunate in saving their cyanide plant which was entirely surrounded by the flames and only saved by the vigorous efforts of the crew who were working for their own salvation as well as for the company's property. As it was, many private residences of employees and many thousand cords of cut cordwood belonging to the company have been destroyed. At the Blackcock mine, all the buildings were consumed and the resident families of Messrs. Julien and Andet were forced to take refuge in the tunnel to which also all the portable household property was removed.

The next property to suffer was the Wilcox mine, which lost all its buildings, including a large new frame building which had just been completed. A number of men had just started on the construction of the new aerial tramway, but fortunately only a few timbers had been formed, so that the loss is much less than if the fire had occurred a little later. The men here were also forced to take refuge in the tunnels, and a number of them had a narrow escape, the first sets of timbers in one of the tunnels used as a refuge igniting and nearly suffocating the imprisoned men.

In the same neighbourhood the Roanoke Camp and the sawmill belonging to the Ymir Company were completely destroyed, while in a different direction the buildings of the Tamarae Company, together with the upper terminal and towers of the aerial tramway shared the same fate.

The main wagon road up Wild Horse, together with the branch roads to the Ymir, Wilcox and Foghorn mines, were rendered quite impossible, all the bridges and most of the road cribbing being destroyed. The Government, however, already has a gang of men repairing the damage. One of the chief items of loss is the quantity of valuable mining timber which has been consumed. The Ymir, Blackcock, Wilcox and Foghorn companies had all purchased blocks of timber land, a large proportion of which have been swept by the flames to such an extent that only a few blackened stumps remain.

The Wilcox Company will at once rebuild a large and more commodious set of frame buildings, and the work of construction of the aerial tramway has already been recommenced. As soon as the tramway is completed, regular shipments of the rich ore from the Fourth of July vein will be commenced.

Reports from the Big Four group, owned by the British Lion Company, Ltd., are very encouraging. Mr. A. A.

Vernon, the manager, is selecting ore with a view to commencing shipments very shortly. On the Hercules, also owned by the same company, a contract has been let for the further sinking of the shaft to the 100-foot level. The ore in the shaft is improving with every additional foot of depth. The present showing indicates the existence of a large body of high grade pyrrhotite ore carrying copper. It is understood that the wagon road to connect with this property will be commenced under Government supervision within a week. The same road will form a trunk road at the creeks and will fill a much needed want. It will be utilized by the Eldorado, Union Jack, Silver Lake and Big Horn companies.

RECENT DEVELOPMENTS IN THE LARDEAU.

(From Our Own Correspondent.)

THERE has been nothing whatever of interest to report for some months, but as so often happens in a mining district, there is of a sudden a simultaneous occurrence of important incident, and this has been the case here of late. Perhaps the most important recent event was the practically complete transfer of the management of both the Great Western Mines and the Double Eagle Co. to the London shareholders, who intend, with the ample capital they have, to introduce machinery. So the first piece of mining machinery, in the form of a boiler and a five-drill compressor with the necessary adjuncts, has arrived in the Lardeau via the new Trout Lake and Argenta road, and has been duly delivered at the Nettie L. The Silver Cup, which is under the same management, is going to follow the example, but the first is building a rope tramway (double rope system) to make the hauling somewhat less expensive, both as regards the machinery now and the ore, etc., in future. In this district a rope tramway of some sort is an absolute necessity if a property is to be worked economically, as the hills are exceedingly steep and packing very expensive in consequence, but it stands to reason that a property must have proved itself worth the expense before the plant is installed, and this the Silver Cup has done. All the more or less developed prospects are being steadily worked on now, notably, perhaps, the Black Warrior group, though it is difficult to do more than just mention the names of the properties without attempting to describe them or give any idea of their values.

The Triune, of course, is being developed, and an aerial tramway put in there, the owners evidently intending to work their mine in such a way as to ensure them a supply of ore for their smelter all the year round.

It is of great interest to this district to know that the Ferguson smelter was actually blown in on the 12th inst., and most certainly appeared to be running very smoothly and well. The absence of the usual noise round a smelter was remarkable, and by no means disagreeable. Of course outsiders do not know what was charged into the furnace, either in quantity or value, nor what was the result, but to all appearance everything was working unusually well for a first start. Some alterations being found requisite to the machinery, the furnace was blown out the same evening and will so remain till the necessary work is done—it is said to be connected with the exhaust that causes the blast to the furnace, and certainly did not seem (to an outsider) to affect the working of the furnace itself. In any case, if this smelting plant shows it can save values at a fair cost, it will be of immense benefit in treating those very large quantities of ore which are of too low grade to stand the expense of shipping, and for that reason alone if for no other, its future performance will be awaited with the keenest interest.

MINING RETURNS AND STATISTICS.

BOUNDARY DISTRICT.

ORE shipments from this district to Aug. 31st are as under:—

Granby Mines, Phoenix	206,245
Snowshoe, Phoenix	2,042
Mother Lode, Deadwood	70,092
Sunset, Deadwood	4,520
B. C. Mine, Summit	2,718

Emma, Summit	1,067
Winnipeg, Wellington	785
Golden Crown, Wellington	625
No. 7 Mine, Central	482
Jewel, Long Lake	2,175
Providence, Providence	60

Total tons	291,351
Granby Smelter treatment, tons	192,498

ROSSLAND.

Production from Rossland from January 1st to August 23rd, 1902, has been as follows:—

Le Roi	149,461
Le Roi No. 2	43,537
Centre Star	5,070
War Eagle	600
Rossland G. W.	2,400
Giant	1,430
Cascade	300
Columbia-Kootenay	30
Bonanza	90
Velvet	430
Spitzee	20
White Bear	25
Total	203,243

THE SLOCAN.

According to the New Denver *Ledge* the ore shipments from the Slocan from January 1st to August 16th are:

Payne	850
Ivanhoe	295
Sunset (Jackson Basin)	703
Reco	322
American Boy	576
Arlington	2,549
Hewett	765
Bosun	730
Last Chance	150
Wonderful	151
Enterprise	1,380
Lavina	85
Bismarck	42
Queen Bess	160
Silver Glimmer	77
Whitewater	2,653
Ottawa	8
Capella	20
Florence	1
Trade Dollar	20
Slocan Boy	64
Neepawa	101
Hartney	25
Marion	80
May	5
Paystreak	7
Surprise	22
Monitor (for July)	765
Slocan Star	528
Duplex	7
Emily Edith	20
Wakefield	140
Prescott	4
Rambler	3,260
Molly Gibson	1,500
Washington	30
Folliott	2
C. O. D.	2
London Hill	115
Ruth	266
Antoine	20
R. E. Lee	60
Spectator	4
Red Fox	20
Antoine	20
Total tons	18,646

Of this aggregate tonnage, the Slocan City mining division has contributed 4,041 tons.

CATALOGUES, CIRCULARS AND TRADE NOTICES.

SILVER-PLATED AMALGAMATING PLATES FOR SAVING GOLD.

THE greatly increasing demand for these plates by gold miners has demonstrated their superiority over all other methods for saving gold in quartz or placer mining, particularly fine or float gold. These plates are in great demand in all the Pacific Coast mining regions from Alaska to South America, the Rocky Mountain mining States and Australia. Denniston's San Francisco Plating Works, 743 Mission street, San Francisco, of which Mr. E. G. Denniston is proprietor, is constantly filling orders for them, sending out a great many thousands of square feet every year to gold miners all over the world. The plates for all the large stamp mills in Alaska were made at this establishment. Mr. E. G. Denniston is the pioneer in this line of business, having established his works 35 years ago and has received every first class premium awarded for silver-plated plates at the fairs held on the Pacific Coast, having received 26 silver medals. The reputation of his plates is world-wide, he having been successful in competition with all others. Only the best Lake Superior copper and refined silver are used in their manufacture. They are made of any size, plain or corrugated. The great success of Mr. Denniston's plates is due to his thorough knowledge of the business and possession of the best facilities, also to adhering strictly to agreement in depositing full weight of silver on every order. The work done at Denniston's San Francisco Plating Works consists of gold, silver, platinum, nickel, brass, copper and bronze plating on every description of metal work. The work done is first class, and done at lowest possible prices. Parties wishing to purchase silver-plated mining plates will find it greatly to their advantage to get Mr. Denniston's prices before purchasing elsewhere. Meanwhile they should send for the firm's circulars.

HENDRIE & BOLTHOFF MACHINERY.

The Hendrie & Bolthoff Mfg. and Supply Co. issue a very comprehensive machinery catalogue (No. 8) of over 200 pages, in which they endeavour to present the most complete line of up-to-date machinery ever placed in a catalogue of this kind. They have certainly succeeded in doing so. The company, which, by the way, was established over forty years ago, have earned a very enviable reputation for their machinery, and "Hendrie & Bolthoff" hoists in particular are held in very high esteem by mining engineers the world over. We shall be glad to supply our readers with copies of this catalogue.

NORTHERN MULTIPOLAR MOTORS.

Bulletin No. 20, issued by the Northern Electrical Mfg. Co., describes this type of motor very clearly, and also shows the various types and forms of the machine as designed by the company to meet the requirements of service in American manufacturing establishments.

THE SHATTUCK PATENT SOLAR ATTACHMENT.

Messrs. Wm. Ainsworth & Sons, of Delver, Colo., have placed upon the market a new and improved solar attachment, designed and patented by Orville F. Shattuck, a prominent mining engineer of that city. The attachment is arrang-

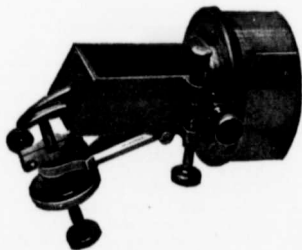


Fig. 1.

ed to fit over the objective end of the telescope in place of the cap, which renders it easily detachable and makes it unnecessary to send a transit to the factory to have it fitted, provisions being made whereby an engineer can give the accurate dimensions required and place his order when in

the field, thus effecting a saving in transportation charges and time.

This solar attachment overcomes by its optical construction, the Polar adjustments so difficult to maintain in others, being dependent only on the accuracy of the vertical arc and limb, the two most carefully constructed parts of the transit, hence giving results commensurate with the accuracy of the instrument to which it is attached.

It equals direct observation for accuracy and can be operated in one-tenth the time.

Fig. 1 shows the attachment three-quarters actual size.

For instruments having no vertical arc a latitude level is provided at small expense and is even more accurate than the arc.

The difficulties attendant upon the use of former solar attachments, their inaccuracies when not in perfect adjustment, the difficulty of maintaining their adjustments and their unprotected position on the transit, have rightly prejudiced engineers against them.

The reliability of the solar attachment shown herewith depends upon principles similar to those of the sextant; i.e., that a ray of light which suffers reflection twice in the same plane is bent at an angle with its original direction equal to twice the angle between the two reflecting surfaces.

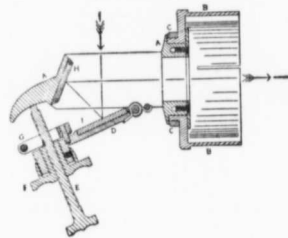


Fig. 2.

Referring to Fig. 2, which is a sectional view in the plane of the attachment about three-quarters actual size: The main frame AA carries the stationary mirror H and revolves axially by means of a bearing in the cap B, which fits over the objective end of the transit. C is a clamp ring used in connection with the clamp and tangent screw, (not shown) for rotating the frame AA about its axis. The movable mirror I is adjustable to any required angle, being mounted on a swinging arm D, which is provided with an adjusting screw E, a graduated differential nut F, and a clamp G.

The ray of light enters from above as indicated by the arrow and is incident upon the movable mirror I; it is thence reflected to the stationary mirror H, thence in through the object glass to the cross-wires of the instrument. Thus the maintenance of the angle between the incident and emergent ray depends upon the angle between the mirrors rather than upon the polar bearing.

The declination angle corrected for refraction is set off by means of the movable mirror actuated by the screw, E, and the differential nut, F, the method being to sight at some object on the horizon, (B Fig. 3) with the solar attachment off, the telescope level and the vernier set at zero. Then with the lower plate clamped and the vernier set at the South polar distance, corrected for refraction, which has

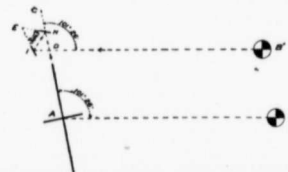


Fig. 3.

been previously computed, sight at the same object, (B Fig. 3) with the solar attachment in place, bringing the object onto the cross-wires by means of the adjusting screw, E, and the differential nut, F.

Then referring to Fig. 3, angle CDB equals angle CAB,

If the object sighted be less than five or six thousand feet distant, allowance is made for parallax by making the distance BB equal to the distance from the axis of the telescope, A, to the optical centre of the solar attachment.

Now depress the telescope to the latitude of the place of observations, (See Figs. 4 and 5), revolve the solar about its axis and the transit in a horizontal plane until the image of the sun is brought to the proper position on the cross-wires. The line of collimation then becomes the polar axis with the transit in the Meridian and the solar revolved about

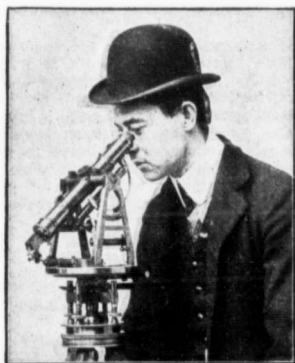


Fig. 4.

its axis will follow the path of the sun. The engineer having carefully set off his angles and knowing that his transit is in adjustment, is assured of reliable results.

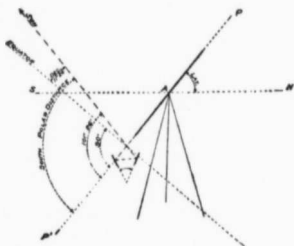


Fig. 5.

Fig. 4 shows an operator making an observation to determine the Meridian. Fig. 5 is a graphic illustration of the same when the sun's declination is North $11^{\circ} 26'$; A being the axis of the telescope and PP the polar axis, coincident with the line of collimation.

After the transit has been set in the Meridian the reading of the differential nut is taken and the attachment is removed. It weighs less than three ounces and may be carried in the pocket without fear of damage.

In taking subsequent observations during the day as a check on the work, it is only necessary to set off the hourly change in declination by means of the graduated differential nut, each division of which represents one minute of arc, place the attachment in position, and if the instrument be in the Meridian, the sun will come to the proper position on the cross-wires.

Another valuable feature of this solar attachment is its adaptability to underground surveying. In connection with the delicate level under the transit telescope it is especially useful in carrying accurate transverse lines up or down shafts or steep inclines in the same manner as with side and top telescope.

Catalogue C-4, giving complete description will be mailed on request by Wm. Ainsworth & Sons, sole manufacturers.

A NOTABLE APPOINTMENT.

A CORRESPONDENT writes: "We have just noted the appointment of Mr. C. O. Baker, Jr., of Baker & Company, platinum refiners, of Newark, as a member of the Board of Directors of the National State Bank of Newark one of the strongest financial institutions of New Jersey. While Mr. Baker is to be congratulated on his appointment, we who have known him for so long feel as though this financial institution with which he is now so prominently connected is to be more so. It would indeed be difficult to find a gentleman of more sterling worth and strength of character."

THE NEW ANCHOR FENCING.

MESSRS. ESPLIN, FRAME & CO., sole manufacturers of the Anchor Wire Fence for Ontario, have just sent out their last orders of their first import this season. They imported fifteen carloads of wire totaling 450,000 pounds, which is equal to about 200 miles of fencing; and this has all been sent out. On account of having only the right to erect the fence in Ontario it bars this company from supplying the demand in this province, separate companies having purchased the exclusive right of manufacture and sale in respectively Manitoba, the North West Territories and British Columbia. In spite of this fact their business in Ontario is increasing tremendously. By this it will be easily seen that the Anchor Fence is already in great demand in Ontario. The Anchor Fence is without doubt the cheapest and best wire fence on the market, and the B. C. Anchor Fence Co., controlling the sole patent rights for British Columbia, should find a ready sale for their product in this territory.

AN EXTENSIVE AERIAL TRAMWAY INSTALLATION.

THE aerial tramway recently installed by the Leschen & Sons Co., of St. Louis, at Deep Gulch, Colorado, is 4,200 feet long. The line consists of two stationary sustaining cables securely anchored at each end. The loaded buckets run on a rope 1.8 inch in diameter, while the empty ties return on a 1-inch rope. The buckets are propelled by an endless steel wire rope three-quarter inch in diameter. This rope passes around one 8-foot sheave at both the terminals of the line, the one at the mine having a number of grips which clamp the rope tightly and afford the means to control the speed of the tramway when in operation. To this wheel are attached the brake-bands for stopping the tramway or controlling it.

The buckets are attached and detached automatically to and from the traction cable by means of patent clips, button-shaped, which are attached permanently to the cable. Each of the buckets has a capacity of 6 to 2 cubic feet and they are so placed in the pendent as to swing freely, thus allowing them to be dumped at the lower station of the line as described later.

The difference in elevation between the two terminals of the tramway is about 2,000 feet, and the weight of the loaded buckets travelling down is sufficient by far to operate the tramway by gravity, and in addition has sufficient force to bring supplies up to the mine. About midway of this tramway is placed what is known as an intermediate station, so designed that later on it can be used for loading ore from another mine located near by. This intermediate station is situated in a position where snow falls very heavy, and for that reason the entire length of the terminal for a considerable distance on each side is covered with a snow shed.

At the lower terminal of the line the tramway consists of a single span 2,100 feet in length without any means of support between. This is the most remarkable feature of this tramway, and is illustrated by the photo mentioned above. Owing to the automatic levers with which his tramway is furnished, very little labor is required in the entire operation, and brakings are reduced to a minimum. As a bucket enters the upper terminal it is automatically detached from the traction rope and its momentum is overcome gradually when it is placed in the loading position. After it is loaded it receives an acceleration to overcome its inertia, and is then again attached to the line automatically and travels to the lower terminal. At this station the same operation occurs

In addition, however, the bucket is automatically dumped by means of a frame connected with the terminal shaft. As soon as the bucket enters this terminal and before it is discharged it is weighed automatically by a specially designed scale. The ore brought down in this tramway is of two classes; one which is loaded into the buckets in bulk, and the other of a higher class, which is loaded into the carriers in sacks.

PROFITS OF THE ALLIS-CHALMERS COMPANY.

We have to congratulate the shareholders of the Allis-Chalmers Company on the receipt, on August 1st, last, of a dividend amounting to 1 3/4 per cent. This is the fifth consecutive quarterly dividend declared by the company from profits on net earnings.

SEATTLE AS A MACHINERY SUPPLY CENTRE.

To all appearances Seattle promises to become an important distributing point for the mining machinery trade, which is rapidly developing, of the British and American Pacific. Thus of late many of the larger American firms have established agencies and branch houses there, and we have just learnt that the Hallidie Company, the proprietors of the well-known Hallidie Wire Ropeway, contemplate the immediate removal of their main office from San Francisco to Seattle.

COAL EXPORTATIONS AND TRADE.

EXPORTATIONS from the Vancouver Island collieries during the month of July were as follows:

	Tons.
New Vancouver Coal Co.	30,618
Comox.	9,853
Ladysmith	22,263
Total.	62,734

In a recent report Mr. J. W. Harrison, coal and metal broker of San Francisco, remarks:

"The shipping list from Newcastle, Australia, is shrinking materially. The number of vessels on the way and loading foats up 16. At this time last year there was almost double the quantity of colonial tonnage engaged for this port. There are to-day five more vessels chartered to load coal in Australia for Honolulu from this port. It is true that the major portion of vessels going to Honolulu will average much smaller tonnage than those for here. Coal freights from the Colonies are quoted higher, and the advance will lead to a decrease of shipments." Footing up, however, the arrivals for the month of July this year, as against the coal arrival for the same month of 1901, we find that there has been about 8,000 tons more coal entered the port of San Francisco this year than last. It would be generally supposed that on account of the large quantity of fuel oil which is displacing coal, that the quantity of coal consumed this year would be considerably less than last.

It evidences very strongly that our manufacturing interests are doing a very much more extensive business and have a most encouraging outlook for the future. There have been fourteen coal arrivals from Australia during the past month, which leaves only seventeen on the chartered list of coal carriers. This is the smallest quantity that has been on the loading list for a considerable time, and as there is a reported advance on coal freights from the Colonies, the chances are that not many new names will be added to the list for several months. Business in the fuel line is reported fairly good, although the ruling prices leave but small profits to importers.

THE LOCAL STOCK MARKET.

THE resumption of mining operations at the War Eagle and Centre Star, and the generally improved conditions throughout the country has had a favorable effect upon the market and the better class of stocks have

advanced considerably, and the outlook is decidedly hopeful. Cariboo McKinney has gained five points, from 16 to 23; Centre Star is quoted at 42, from 38; War Eagle, 23 from 19; North Star 19 from 17. Payne is firm at 17 and Fairview in great demand at 8 1/2 @ 9. Cariboo Hydraulic, in consequence of a report that the gold yield this year will be disappointing, has declined to 80, but very few shares are offered. Locally Mount Sicker and Brenton shares have sold freely, and the company has now taken the treasury stock off the market.

THE METAL MARKET.

SILVER continues steady, the market being without any special feature. Indian buying in London has somewhat fallen off, owing to exportations from China to Bombay. Prices during the month have ranged between 52 1/2 and 52 3/4.

The copper market is dull, notwithstanding that consumption is heavy. Manufacturers, however, are not buying, preferring to work up their stocks rather than enter the market at the present time. It is likely that a large business will be done in the near future, as buyers will shortly be forced to replenish their supplies. The latest quotations are: Lake, 11 1/2 @ 11 3/4; electrolytic in cakes, wire bars and ingots, 11 3/8 @ 11 1/2; cathodes, 11 3/8 @ 11 1/4; casting copper, 11 3/8.

The American lead market is fairly active. Prices, however, remain at 3.97 1/2 @ 4.05, St. Louis; 4.05 @ 4.10, New York, Cabiegram, London, Aug. 28th, quotes lead at £11 1s. 3d.

Spelter is very active, a large business having been done at 5 1/4, St. Louis; 5 3/8 @ 5 1/2, New York.

WATER MEASUREMENT AND REGULATION IN THE YUKON.

IN view of numerous recent disputes in the Yukon which have arisen in connection with the recording of water-rights, an order-in-council has been passed defining what is understood by the "miners' inch," and instancing a method of measurement the following table is officially published:—

Dimensions of Orifice in Inches.		Head in Inches Over Centre.	Discharge in Cubic ft. per min.	Number of Miners' Inches of 1 1/2 Cubic ft. per Minute.
Wide	Deep			
6	2	6.25	11.99	17.98
12	2	6.25	24.25	36.38
18	2	6.25	36.39	54.59
24	2	6.25	48.70	73.05
4	4	6.25	19.71	29.56
6	4	6.25	25.57	38.35
12	4	6.25	47.30	70.95
18	4	6.25	71.65	107.48
25 1/2	4	6.25	101.58	152.37

Large quantities of water for mining or other purposes may be measured at any convenient point by discharging over weirs, through orifices or by any accepted and correct method of measuring water. Smaller quantities of water, where delivered from ditches, flumes or canals into small ditches or flumes, shall be measured at the point of diversion of the branch ditch or flume. It shall be taken from the branch ditch, flume or canal through a box or reservoir, arranged at the side, and the water shall have no appreciable velocity of approach. The orifices shall be vertically at right angles to the delivering water way, and the edges and corners shall be square and sharp, and the top, bottom and sides at right angles to the pressure board, and the discharge shall be freely into the air. The distance between the sides and bottom of the orifice shall be at least three times the least dimension of the orifice.

THE MINERAL PRODUCTS OF THE UNITED STATES IN 1901.

IN the annual statistical summary of the United States Geological Survey for the calendar year 1901, the total mineral output is valued at \$1,092,224,380 as against \$1,064,408,321 in 1900. The non-metallic mineral products are here valued at \$566,351,095; the metallic products at \$324,873,284, while those in the unspecified class, including building and glass sand, iron ore used as flux in lead smelting, tin ore, nitrate of soda, carbonate of soda, sulphate of soda and alumina clays used by paper manufacturing have an estimated value of \$1,000,000.

Following is the value of some of the various products: Pig iron, \$292,174,000; silver, \$77,126,382; gold, \$80,218,800; copper, \$86,629,266; lead, \$23,280,200; zinc, \$11,205,760; quick-silver, \$1,382,305; aluminum, \$2,238,000; antimony, \$542,020; bituminous coal, \$236,201,899; Pennsylvania anthracite, \$112,504,045; natural gas, \$27,067,500; petroleum, \$66,417,335; brick clay, \$13,800,000; cement, \$15,788,789; stone, \$55,165,576; grindstones, \$580,730; borax, \$1,102,110; phosphate rocks, \$5,310,403; pyrites, \$1,024,449; salt, \$6,617,449; zinc white, \$3,110,120; asphaltum, \$555,335; clay, all other than brick, \$2,501,332; limestone for iron flux, \$4,665,836; mineral waters, \$7,588,962.

COMPANY NOTES AND CABLES.

Enterprise (British Columbia)—Cablegram from the company's representative at Nelson, British Columbia:—"Final June returns give a profit of \$2,000 (£508). Estimated profit for the entire month of July \$3,750 (£773), in each case exclusive of zinc production."

Le Roi No. 2—Manager cables, Rosslund, 7th August:—"The shipments last month amounted to 5,675 tons. Contents, 2,949 ozs. gold, 7,235 ozs. silver, 135 tons 15 cwts. copper. The returns from ore after making a deduction of all smelting charges, amount to \$49,450. Cost of mining may be taken at \$21,500. Profits for last month, \$27,950 (equivalent sterling, £5,763). No shipments for three days on account of wreck on railway." (June shipments, 6,316 tons.)

McDonald's Bonanza (Klondike)—Cablegram from Dawson dated 6th August:—"Skookum Claims—Total return to date, 679 ozs. No. 2 Bonanza—Clean up after six days, 161 ozs. From Bench Claims to date, 172 ozs. The estimated value is \$13,250."

Nimrod Syndicate—It is announced that Mr. R. D. Feherstonhaugh, the manager of the Atlin Mining Company, Ltd., a subsidiary of the Nimrod Syndicate, Ltd., cabled on the 8th inst.:—"We have cleaned up after a run of 20 days; have recovered 470 ozs., being the proceeds of 48 feet of sluices." (Office note:—"The last clean up amounted to 225 ozs. from 48 feet of sluices.")

Ymir.—Cablegram from the manager at Nelson, British Columbia:—"During July 50 stamps ran 631 hours (26 days 7 hours); estimated profit on operating, \$3,460 (£713). Above was arrived at after development, \$1,300 (£267); repairs, \$750 (£154); fighting fire, \$1,310 (£267) &c. written off; total amount crushed, 3,330 tons (dry weight). Commencing 20th July—Mine mill has been obliged to shut down for three days owing to bush fires. The total loss is \$3,000 (£618), flume, cordwood, labour. Do not apprehend any further danger from forest fires except to timber land. The mine continues to look about the same. We are at present running on better grade ore." (June—Estimated profit, £1,412.)

Alaska Treadwell—"240-stamp mill ran 28 1-2 days; 300-stamp mill ran 28 3-4 days; crushed 82,192 tons ore; estimated realizable value of the bullion, \$69,286; saved 1,560 tons sulphurets; estimated realizable value of same, \$63,172; working expenses for month, \$75,880."

Alaska Mexican—"120-stamp mill ran 28 3-4 days; crushed 19,333 tons ore; estimated realizable value of the bullion, \$21,104; saved 351 tons sulphurets; estimated realizable value of same, \$16,628; working expenses for month, \$22,597."

Yukon Goldfields—The London office of the Yukon Goldfields, Limited, has received word from Dawson that the clean up for the month of July amounted to \$4,250.

McDonald's Bonanza—The London office published the following information regarding the clean up on the company's properties: "Skookum Claims—Total returns to date, 679 ozs. No. 2 Bonanza—Clean up after six days, 161 ozs. From bench claims to date, 172 ozs. The estimated value is \$13,250."

Atlin Mining Company—Intelligence has been received that the Atlin Mining Company had a clean up at the beginning of August, after a run of 20 days. The amount of gold recovered was 410 ozs., from 48 feet of sluices. The last clean up amounted to 225 ozs. from 48 feet of sluices.

Le Roi.—The manager cabled August 9th:—"Shipped from mine to Northport smelter during the past month 14,500 tons of ore, containing 8,400 ozs. of gold, 14,000 ozs. of silver, 672,000 lbs. of copper. Shipped from dump to Northport during the past month, 1,677 tons containing 1,000 ozs. of

gold, 1,350 ozs. of silver, 55,000 lbs. of copper. Estimated profit on this ore \$100,000." June return:—"Shipped 11,475 tons, estimated profit \$72,641, and from dump 3,353 tons, estimated profit \$21,761."

Report of the Le Roi Mining Company, Ltd., for June, 1902:—

"Tonnage shipped, together with contents and gross values per ton:—

	Dry tons.	Ozs. Au.	Ozs. Ag.	Lbs. Cu.	wet.
1st class	11,475	6,841	11,065	505,408	
2nd class dump ..	3,353	1,627	1,760	75,829	
	14,828	8,468	12,825	581,237	

Value per ton 1st class \$17.70
Value per ton, 2nd class \$12.68

Mine Expenditure.—The expenditure for the month on mine account was \$47,832; the expenditure not charged to mine account was \$891—\$48,718. The cost of breaking and delivering ore on the railroad cars for the month was \$2.91 per ton. The cost of loading the second-class ore from the dump, including putting on tramways and chutes, was \$3.97. The cost of delivering first-class ore on the railroad cars, including all mine expenditure other than cost of loading second-class dump ore, was \$4.05 per ton.

"Northport Smelter—The expenditure for the month was \$156,220. The following statement gives the details of the ore received at the smelter during the month, and the contents:—

	Dry tons.	Ozs. Au.	Ozs. Ag.	Lbs. Cu.	wet.
Public ores:					
Le Roi No 2	5,750	3,012	6,127	215,728	
Le Roi Ores:—					
1st class	11,475	6,842	11,065	505,408	
2nd class	3,353	1,626	1,760	75,829	
	20,578	11,480	18,997	796,965	

The tonnage treated during the month was as follows:—Roasted ores, 19,103; raw Le Roi No. 2, 5,725; raw Rosslund, Great Western, 52; raw Le Roi first-class, 625; raw Le Roi second-class, 1,070; total, 26,575.

The gross value of the first-class ore shipped from the mine was equal to a value per ton of \$17.70, equal to \$203,117. From this deduct difference between gross value and refiners' settlement rates and interest on gold and silver values for 90 days and copper 60 days, \$2,888, equal to \$33,050; 11,475 dry tons net value per ton \$14.82 equal to \$170,067.

Cost of mining, \$4.05; freight, 40c.; interest, 6c.; \$4.51 per ton, equal to \$51,754. Cost of smelting, \$3.95; interest, 3c.; \$3.98 per ton, equal to \$45,673; total cost of mining and smelting, 97,427. Net estimated profit, \$72,640.

The gross value of the second-class dump ore shipped was equal to a value per ton of \$12.68, equal to \$42,516. From this deduct difference between gross values and refiners' settlement rates and interest on gold and silver values for 90 days, and copper 60 days \$1.55 per ton, equal to \$5,197; 3,353 dry tons at \$11.13, equal to \$37,319.

Cost of loading on cars, laying tracks and making chutes (per ton) 40c.; freight, 25c.; interest for 90 days, 1c.7 cent of smelting, \$3.95; interest, 3c., equal to \$4.64 per ton, or \$15,558 on total tonnage. Net estimated profit, \$21,761.

Le Roi No. 2—Manager's report for the month of June:—"Output—The total tonnage of ore hoisted from the mines amounted to 6,660,295 dry tons, of which 6,316,295 tons were shipped to the smelter, and the remaining 344 tons were stored on the second-class dumps at the mine.

The daily output for the month averaged 265.41 tons per day worked, of which an average of 252.64 tons daily were shipped to the smelter at Northport, and 13.76 tons per day placed on the second-class dumps.

GROSS VALUES IN THE 6,216,295 DRY TONS SHIPPED.

	Per ton.
3,183.035 ozs. gold at \$20 equals	\$63,660 70 or \$10 80
6,560,060 ozs. silver at 51c. equals	3,345 63 or 53
235,933 lbs. copper at 12½c. equals	29,499 12 or 4 67

Making the total gross value \$96,505 45
Or the average value per ton \$15 28

Providence Mine, Boundary District—The following returns have been received by the owners of the Providence mine, which is situate about 400 or 500 yards from Greenwood City limits from two cars of ore shipped recently to the Trail smelter:—

Car No. 1 contained 45,847 lbs., as under.
 20,436 lbs., net value to shippers\$2,517.71
 25,411 lbs., net value to shippers 1,488.48
 \$4,006.19

Car No. 2 contained 41,657 lbs., as under:—
 6,452 lbs., net value to shippers\$ 756.33
 35,205 lbs., net value to shippers 1,604.99
 \$2,361.32

These returns give a net average value, after paying a freight and treatment rate of \$15 per ton, of \$145.53 per ton for the 43 tons 752 lbs. comprised in the shipment. Details of the metal contents of the whole of the ore are not available, but it is known that one part gave an average assay return of 0.61 ounces gold, 525 ounces silver, and 11.3 per cent. lead.

Fisher, Maiden—The following report was presented at a recent meeting of the directors of the Fisher Maiden Troy mines, near Silverton:—

The company has just received a crown grant for the group of claims comprising the Fisher Maiden property. During the year \$9,973.80 was realized from the sale of treasury stock. From the proceeds of the sale of stock the company has just completed a bunk house capable of accommodating 40 men, a new mess house in proportion, a blacksmith shop, temporary ore bins and an office and assay office combined, all of which are located in close proximity to the present workings.

From the old workings situated about 800 feet up the mountain several open cuts were made along the ledge at intervals down to within 15 feet of Four-Mile Creek, where a tunnel was started. After going through 60 feet of wasa bedrock was encountered and the ledge uncovered. After drifting 40 feet the ore chute was struck and followed 110 feet without a break, varying in width from one to eight feet and having an average width of 2 1-2 feet.

The average value, based on the assays made by the company, was placed at \$80 to the ton in silver and lead. Estimating the ore back at 50 feet from the tunnel to the surface would give \$100,000 worth of ore above the tunnel level. The tunnel has been timbered to bedrock.

In driving through the ore chute in the tunnel no ore was stoped, but about 160 tons were taken out in the course of the development. After passing through the ore chute of 110 feet the tunnel was continued on the ledge about 50 ft. towards and under the old workings. While the ledge showed good quartz, the values were not there, but it is believed with further drifting another ore chute will be encountered which is opened up in the old workings and which when struck, will give a vertical depth of 600 feet, approximately.

In order to make the property produce as soon as possible and to assist in paying expenses of development, instead of continuing the tunnel under the old workings, a second tunnel has been started directly under tunnel No. 1 at a further depth of 62 feet. If the ore chute of tunnel No. 1 is found to be continued in tunnel No. 2, it is estimated that 17,050 feet of ore will be blocked out between the two tunnels. Estimating 10 cubic feet of ore to the ton would give 1,704 tons. If assay values of \$80 to the ton are maintained this block of ore would be worth \$136,000, or a total of \$236,000 worth of ore from the second tunnel to the surface.

Tunnel No. 2 is now in and timbered for 150 feet, where bedrock was again encountered. The superintendent estimates that the men are now within 20 feet of the ledge and 100 feet from the ore chute. The work is going ahead at the rate of about four feet per day, with three eight-hour shifts.

It is the intention to make an upraise as soon as the ore chute in tunnel No. 2 is penetrated, and then stope out the ore and continue both tunnels in under the old workings and into the ore chute known to exist there. The superintendent estimates 1,200 tons of ore in sight above the first tunnel level.

The report recommends the building of a road 1-13 mile to connect with the government road to Silverton.

Silver Cup and Nettie L.—Fourteen hundred tons of ore from these mines conveyed during the winter and spring to Trout Lake Landing is now being shipped to the smelter. The gross value of the ore is said to be in the neighbourhood of \$195,000.

East Kootenay.—Shipments from the Windermere district to date are as follows:

Mile.	Pounds.	Value.
Paradise	1,598,310	
Paradise, in transit	300,000	
Delphine	73,831	\$3,529 26
Delphine, in transit	135,500	
Red Line, in transit	162,000	
Swansea	4,000	
White Cat	2,000	
Silver Belt	29,500	1,456 00
M. T. Fraction	34,000	2,252 29
M. T. Fraction, in transit	45,000	
Bunyan	1,000	
	2,385,141	\$7,286 55

Yukon—The total gold shipments from Dawson to the outside for the present season, since the opening of navigation, amount in round numbers to \$6,500,000. Up to August 1 the shipments, as shown by the export certificate records in the comptroller's office, aggregate \$5,883,347. Since the first of this month two bank shipments of a quarter million dollars each have been sent out and a number of fat individual pokes have been taken by different ones. The record given by the comptroller is the first exact record ever afforded in the territory, but since not all the exports of the several camps in the territory are recorded here from month to month, the total as given does not embrace some of the shipments from other places, which may amount in the aggregate to \$100,000 or \$200,000 more. The other chief points which may export gold are Big Salmon and Forty-Mile.

The shipments from Dawson by months this season were as follows: May, \$19,890; June, \$3,550,324; July, \$2,313,130.

During the month of July there were recorded at the Commissioner's office, 163 placer grants, 500 renewal licences, 120 quartz claims, and 140 renewals of quartz licences. The revenue from the sale of free miners' certificates during the month was \$5,439.

Since the establishment of the Seattle Assay Office in July, 1898, nearly \$60,000,000 in gold has been deposited at that institution. The following official statement is issued under date of July 1st, 1902:

Number of deposits, 21,092; troy ounces 3,506,032.66; avoirdupois tons, 120 1-5; coinage value \$57,563,046.25.

Origin of the foregoing:—

Neme, Alaska	\$7,773,751 00
Balance of Alaska	1,013,313 00
Total for Alaska	\$ 9,387,064 00
British Columbia	2,405,004 26
Yukon Territory	45,109,318 76
Washington, Oregon, Idaho and foreign gold	601,569 23
Total	\$57,563,046 25

The foregoing is not the total output of the districts mentioned, as a portion is shipped each year to the United States mints and to other United States assay offices and those of British Columbia.

The customs returns for July were \$102,226.81 as compared with \$68,255.03 during the corresponding month of last year. In 1901 only 35 per cent. of the merchandise sent into the Yukon was of Canadian origin. This year, however, the returns show an increase to 60 per cent.

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LOCAL STOCK MARKET FOR THE MONTH OF AUGUST.

Prepared by the Stuart Robertson Co., Ltd., successors to A. W. More & Co., Ltd., Stock Brokers, Victoria, B. C.

COMPANIES.	Week Ending Saturday, August 2.				Week Ending Saturday, August 9.				Week Ending Saturday, August 16.				Week Ending Tuesday, August 26.				DIVIDENDS.
	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 McKinley	\$0 18	\$ 14½	\$0 17	14	\$ 19½	\$ 18¾	\$ 16½	\$ 15	\$ 22½	\$ 21	\$ 19½	\$ 18¼	\$ 24	\$ 21	\$ 21	\$ 19½	.....
Cariboo Hydraulic	1 05	90	1 05	90	90	90	90	90	90	90	90	90	90	90	90	90	.....
Centre Star	40	39	39	38	39½	39½	39	37½	39	36	37	35	43½	43	38	36	.....
Crow's Nest P. C.	125 00	112 50	120 00	112 50	127 50	120 00	120 00	112 50	130 00	120 00	127 50	117 50	125 00	120 00	125 00	119 50	.....
Dardanelles	3¼	2½	3¼	2½	3¼	2½	3¼	2½	3	2½	3	2	3	2½	3	2½	.....
Evening Star	8½	7½	7¼	6½	9½	8½	9	8¼	9½	8½	8¾	8½	9	8¼	9	8	.....
Fairview Corp'n.	8	5	8	5	8	6	7½	5	7½	5½	7	5	9	7½	7	5½	.....
Iron Mask	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Jumbo	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
North Star	19	15	19	15	20	17	19	16	20	18	20	17	20	18½	19	17½	.....
Payne	17	15½	16½	15	19	16	17	15	19	16	18½	15	18	17	17	15	.....
Rambler	81	79	80	78½	80	78½	79	77	81	78	79½	78	79	76	74½	73	.....
Siocan Star	1 00	.....	1 00	.....	1 00	.....	1 00	.....	1 00	.....	1 00	.....	1 00	.....	1 00	.....	.....
Sullivan	7	6½	7	6½	7	6½	6¼	5	6½	5½	6	5	6¼	6	5	5	.....
War Eagle	14	13	14	12	14	12½	13	11½	14	12	13	12	20	17½	13	12	.....
Waterloo	13¼	13¼	1½	1	13¼	1½	13¼	1¼	2¼	1¾	2	1¾	3½	2½	2½	1¾	.....
Winnipeg	8	.....	8	.....	8	.....	8	.....	8	.....	8	.....	8	.....	8	.....	.....
St. Eugene	50	50	50	50	50	50	50	50
Granby	3 00	2 90	3 00	2 70	3 00	2 80	2 90	2 70	2 90	2 80	2 80	2 70	3 00	2 70	3 00	2 40

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References—Any Bank in Vancouver, also Dun's & Bradstreets Agencies.



"MINERAL ACT AMENDMENT ACT, 1898."

NOTICE is hereby given that under the provisions of section 143 of the "Mineral Act." His Honour the Lieutenant-Governor in Council has been pleased to rescind the order of the 15th of May, 1902 published in the British Columbia Gazette of the same date, with regard to the interpretation to be placed upon paragraph 2 of section 5 of the "Mineral Act Amendment Act, 1898," and to make the following order in lieu thereof, namely:—

That paragraph 2 of section 5 of the "Mineral Act Amendment Act, 1898," be so interpreted that, should any Free Miner perform assessment work on his claim during any one year to the value of one hundred dollars or more in excess of the amount required to be done in any one year by the "Mineral Act" the right thereby given such Free Miner of recording a certificate of work done to the value of each one hundred dollars, so as to cover his assessment work for an additional year in respect of each one hundred dollars in excess, shall be exercisable only during the year in which such excess shall be performed.

And it is further ordered that this order shall take effect from the first day of June, 1902.

J. D. PRENTICE,
Clerk Executive Council.

Provincial Secretary's Office,
5th August, 1902.



NOTICE.

"Canadian Contingent Exemption Act, 1902."

All South African Volunteers entitled to avail themselves of the privileges of the above act are requested to communicate with the undersigned without delay, as also the next of kin of those deceased, or of those who have not yet returned to British Columbia, or any other persons interested in mining properties held by such volunteers.

The latest date for receiving applications for exemption under the above act is the 21st day of September, 1902.

EDWD. GAWLOR PRIOR,
Minister of Mines.

Department of Mines, Victoria, B. C., 4th of August, 1902.