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THE MONTH.

THE English mining market is a market of curious moods. It is naturally different from the enthusiastic investment of the bottom dollar which as a rule builds up a mining district in its early stages. The faith and enthusiasm which made Rossland was an occasion of mockery and freezing astonishment to the English representatives of capital who visited Rossland in early days. The English mining market does not and cannot respond to indications of potential success, because it is conspicuously ignorant of what the indications of potential success are. Nor will it respond to local considerations as the market, say in Spokane, does. A boom is easily inaugurated in Spokane provided the territory is tributary to Spokane as a business centre. But in this sense the world is to a lesser or greater degree tributary to London and individual localities suffer from a wider area of comparison. The only thing to which the English market will respond is conspicuous actual success expressed in pounds, shillings and pence. Just how long after success is proven it will so respond is uncertain, but the response is inevitable and when it does come, unmistakeable. It generally carries the British investor into the wildest vagaries of speculative enthusiasm. His eyes become completely blinded to all prudential considerations and he pours his money into the popular country or district regardless. He will cheerfully invest in wildcat shares on Monday in the certain hope of selling them to a greater fool on Tuesday for twice the money. And when Tuesday comes he generally has Wednesday's superlative idiot in his mind's eye. On Wednesday the crash arrives and he sees in the mirror of his past infatuation—himself. This is the natural and salutary process according to the older economists by which wealthy nations get rid of their overplus of capital. But it may be observed that while many people are delighted to apply the generalization of the older economists to classes of the community to which they do not themselves belong, and individual and personal application of the same laws in their own cases is extremely distasteful to them. It ought to console the clergyman's widow who has lost her money in a wildcat mine to consider that she has merely been disbursing some of the nation's extra capital, which, by accumulating, was driving the rate of interest too low. One seldom meets the clergyman's widow, however, who takes such a view of the case. It is reserved as a salve for the conscience of the company promoter. To the energetic citizen of the new country to fertilize which part of such losses go, the sufferings of this amiable lady are neither actual nor present, and, while his heart would be moved very readily in the particular instance, he looks forward to a boom with undisguised eagerness, while its inevitable episodes he regards with an indifference worthy of an older economist than himself. The one reason why British Columbia has never enjoyed a boom on the English market is because British Columbia has never met with the conspicuous success necessary as a forerunner, but on the contrary with conspicuous failure. This failure has been caused by ignorance, dishonesty and over-confidence. In this respect it does not differ from other failures. We have had our Horne Payne syndicates, and our Grant Govan syndicates, and our Galena Mines and our Hall Mines, and speculations in the Yukon colossally abject. And we have had nothing which has justified its existence until lately. There are now, however, very satisfactory indications. The more rotten companies have disappeared, or are one by one making their conge to the public in the hands of a liquidator and in the critical columns of the financial press. The financial journalists of London love the rotten carcass of a dead company. They revel in its decay and putridity. Their flogging of it gives them a cheap advertisement in impartiality and honesty. But if they were as impartial and honest in reference to the companies which are alive, whose business methods are such as to forestall failure, there would be less financial garbage for them to disport themselves amongst.

BRITISH COLUMBIA AND THE LONDON STOCK MARKET

As a whole they are a venal crew and help to maintain the rottenness which they condemn after it has been exposed to the public eye. There is a conventional purity of gold influence and rank under whose protection the most unbusinesslike ventures and dishonest promotions may be launched with impunity; no financial paper will or dare attack them, and maintain a permanent and satisfactory balance between expenditure and income. But that is a digression. British Columbia's difficulties culminated with the shut-down of the Le Roi mine, following as it did upon the long continued trouble in the Slocan in which a fair amount of English money is invested. The Le Roi mine, however, has opened up again. Under the superintendence of Mr. Bernard Macdonald it is more closely realizing what was to be expected from its capitalization. Until the Le Roi mine produces 20,000 tons of ore a month it cannot be placed on a satisfactory dividend paying basis. It cannot produce 20,000 tons a month until the new shaft is in working order. But with the old mechanism it is doing marvels, and an output of 15,000 tons a month must be considered as very satisfactory. As soon as the new hoisting apparatus is in working order the Le Roi will be in a position to ship 1,000 tons a day and maintain this rate of production. Le Roi shares will then fluctuate above £10 instead of above £5; and this is the key to the situation on the London market. This will make the most important factor in the conspicuous success necessary to inaugurate a boom. There are other tributary causes which are working favourably. Notably, the other Rossland properties of the B. A. C., are approaching a condition in which their shares will have an actual market value. The London and B. C. Goldfields also control a most successful group of mines. The Ymir, the Enterprise and the Whitewater will do much to assist a favourable impression of British Columbia in London. There is another mine which will have an important effect and which is besides a beautiful example of the peculiarities of the London market, namely, the Velvet mine on Sophie Mountain. This property is to-day worth a million dollars hard cash of any American mining man's money. The value is there in ore blocked out. In London, however, a nominal market is maintained in the shares at a little above par on a capital of £100,000. Why? Because the group of companies inspired by Sir Charles Tupper are out of favour. They are out of favour because all of the companies so inspired have been failures or very modified successes except the Velvet. So that we have actual failure measured against potential success and the result is complete want of confidence. It is very silly of course. Because the success is just as real and measureable as the failure has been actual. But the English market has not yet got the information of the success through a channel intelligible to it. This channel is a profit and loss account. When the Velvet becomes a producer the reaction upon the market will be greater on account of the disrepute into which it has fallen. The foundation of a boom on the English market has been laid on an enduring basis. The time when it will arrive depends upon other concurrent circumstances. He would be a daring prophet indeed who would set the day and hour. But numerous events point to an early date, probably this fall. The South African thunder storm is clearing up. Much attention has been directed to Canada through the war. The mineral output of the province as a whole is exceedingly satisfactory; and the great advance made this year by Klondike will also count for something. But whether the boom comes as early as this fall or not, come it certainly will. To what proportions it may grow it is impossible to say. How far the latent resources of the country will play up to the influx of capital cannot very well be estimated at present. But the very greatest benefit will result to the province if things are so ordered that the unscrupulous promoter is prevented from killing the goose that lays the golden egg of capital.

THE QUESTION OF AN EXPORT DUTY

There are two industries in Canada, towards which a peculiar policy has been adopted, that namely of prohibiting the export of the raw material. The object is to stimulate the manufacture of the secondary product within the boundaries of Canada. These industries are the wood pulp industry and the industry of nickel mining. There would be no excuse for discussing the wood pulp industry in a mining journal were it not for the general principle involved, and for the fact that a similar policy in reference to the metallliferous ores of British Columbia is frequently advocated in influential sources. The industries in question, nickel and wood pulp, are favoured by a partial monopoly which Canada possesses in the raw material. They are also favoured by a rapidly increasing effective demand for nickel, and for wood pulp for the manufacture of paper. The paper trust of the United States upon the termination of existing contracts is raising the price of paper about 60 per cent. and the commercial world is suffering from a paper famine, a condition of affairs brought about by the great expansion of journalistic enterprise, and the celerity and cheapness with which printing is now accomplished. It is obvious that with such an increase in the price of the products of wood pulp Canada can afford to take liberties with the law of supply and demand, for the time being at least, without losing control of the market already in her possession. But the eventual success of the experiment depends upon whether Canada can manufacture the secondary product as cheaply as it can be made anywhere else, and also upon whether this competitive point can be reached by Canada before a cheaper substitute has been found for the raw material of which Canada has the monopoly. It is not necessary for us to investigate the chances in connection with the particular industry of the manufacture of wood pulp. It is to be hoped they have been carefully gone into before the drastic policy now in force was adopted; although from the parity of reasoning applied to lead and copper mining by the advocates of the embargo upon logs it is doubtful of they were.

A similar condition of affairs presents itself in connection with nickel mining. Canada is in a most favourable position. The principal sources of nickel are Canada, New Caledonia and some of the planetary bodies. These latter need not be considered as commercially available, for an occasional meteorite is not likely to affect the market. In relation to nickel Canada is in as good a position to take strong ground and insist upon the manufacture of refined nickel within her own borders as could well be imagined. But nickel refined in Canada must come down eventually to the same cost of production as nickel refined outside Canada from Canadian ore or else the experiment will fail in the long run. And not only must it do so but it must do so before a new source of nickel

is discovered or existing sources made more available, and also before some substitute is found for nickel or some process of hardening steel is discovered which would render its use unnecessary. Doubtless nickel can be refined as cheaply in Canada as elsewhere in the long run. But not at once. A big transferrence of capital is required as well as other factors not immediately available without increased cost for the development of the industry. The experiment is in danger both from every metallurgical chemist's laboratory and also from the nickel deposits of New Caledonia. In reference to these latter what Mr. Whitaker Wright had to say at the meeting of the nickel corporation in London the other day is not without interest. He said:

"The property acquired by the corporation is of great area, and embraces what I believe may be pronounced the most valuable nickel mines in the entire world. The final legal steps for absolutely vesting this extensive area in the company will shortly be completed, after which we shall apply to the Stock Exchange to grant a settlement in the shares. In regard to title, the mining laws of New Caledonia are more liberal than those of any other colony of which I have had any experience—mining property being held in perpetuity without limit of area or exaction of labour condition—and involving only the payment of a nominal annual tax of about 2d. per acre. In regard to the world's supply of nickel, there are only two sources worth mentioning at the present time, one being the Sudbury mines of Ontario, and the other the mines of New Caledonia. The Sudbury ores, containing as they do sulphide of iron, nickel, and copper, the process of refining is complicated and expensive—further, the nickel produced is not of the best quality, as it contains traces of antimony and arsenic, which for nearly all purposes are very injurious when present in refined nickel. On the other hand, the New Caledonia ores, being hydrated silicate of nickel, free from copper, sulphur, or other injurious impurities, the refining is comparatively simple, and the quality of the nickel produced is of an exceedingly high grade, being in the greatest demand for all purposes. I feel justified in expressing the opinion that this corporation can produce nickel of the purest quality at less cost than it can be produced by any other company, and that you will, in the near future, practically control the nickel market."

However, so far as regards mining in British Columbia the question of nickel refining in Canada, and still more that of manufacturing wood pulp is of purely academic interest. The success or failure of experimental legislation in these connections does not directly affect British Columbia. But it cannot be too carefully borne in mind that if experiments in reference to nickel and wood pulp are successful, they will not owe success to the soundness of the principle involved but to the special conditions under which it is applied. Any attempt to impose similar restrictions upon copper and lead would be disastrous in the extreme and doomed to failure from the outset. It would be a very desirable thing to have all the wheat grown in the Dominion manufactured into flour in the Dominion. Until public opinion is ready for this purpose to impose an embargo upon the importation of wheat, it had better refuse to govern its action by the success of an embargo upon nickel ore, in reference to articles of common production and consumption like copper and lead.

A very interesting question and one that is frequently discussed is whether cheapness of fuel and nearness of fluxing materials or proximity to the ore supply should be the dominant factor in establishing a smelter at any particular point. Of course they are all important factors. Where they can all be procured there can be no question as to the suitability of such a locality as a smelter site. But if one point affords greater proximity to the ore supply, while another affords cheaper power and cheaper fuel which of the two will enable the cheapest smelting to be done. Local point has been given to this abstract question by the rivalry existing between Grand Forks and Greenwood as to their respective merits as smelting centres. The point made in favour of Greenwood by Mr. Paul Johnson is that with the Crow's Nest coal fields to draw from for fuel, the cost of generating power is not nearly so great as might be supposed, while on the other hand, Greenwood is in the centre of the mines all or nearly all of which possess a straight down-hill grade to that point. In his opinion that counterbalances the generation of power from the vast reservoir of power contained in the North Fork of the Kettle River. It may be said in passing that this is a tribute to the immense advantages derived throughout the mining districts through the possession on their eastern borders of this practically inexhaustible supply of coal and coke. That steam power can be generated so easily and so cheaply in any part of the Kootenays touched by the Crow's Nest Pass Railway system is certainly a boon to the smelting industry, but it is a much greater boon to the mining industry. There is no part of the world where such perfect natural conditions exist for the economical mining and treating of ore of all kinds. Not only is there abundance of water and abundance of timber, but there is abundance of the best possible fuel provided by nature in close proximity to the mining districts. The great stimulus given to the production of wealth by the connection of these coal fields with the mines is only now beginning to be felt. It will be years yet before its full significance is realized. It has been the fashion for everyone to turn their eyes to South Africa, the Transvaal and Rhodesia. But what, when we look at the matter in our sober senses, can possibly be made of these countries in comparison with British Columbia? They, neither of them, contain the conditions of prosperity and growth which prevail in British Columbia. Gold is all very well and the Rand contains the greatest goldfields in the world. But silver, lead, copper, iron and coal play a greater part in the consolidation and progress of a country. The very scattered and promiscuous nature of British Columbia's mineral deposits, while it has been a bar to its rapid exploitation, is in itself a guarantee of future stability and permanence. But to return to our original subject, it is probable that proximity to the supply of ore is the determining factor in establishing reduction works in British Columbia, because the country is so favourably endowed in other respects that almost all points are equally situated in respect of fuel and power. Consequently for dealing with the ore of the Mother Lode and other points Mr. Johnson's sagacity was not at fault in locating his smelter at Greenwood. But it by no means follows from that that the Granby Smelting Company have placed themselves at a disadvantage in locating at Grand Forks. It must be remembered

that the very same circumstance which makes many points equal or nearly equal in respect of fuel and fluxes makes many points equal or nearly equal in respect of supply. It is not too much to suppose that the possession of a great water power will counterbalance a possible slight inequality in proximity to the mines, while the location of some of the properties controlled by the company, would, in any case, justify their selection from their point of view. In fact there is room for smelting at both points. At both points it should be successful and profitable. Any special success at either will depend more upon the business management of the respective concerns than upon any superiority of location. Rivalry in this respect the country may view complacently because the keener it becomes the more the country as a whole will benefit.

The present year will be more remarkable for an increase in the number of producing mines and an expansion in the sources of the supply of the precious metals throughout the province than for any large increase in the amount of gold, silver, lead and copper produced. The great increase in tonnage expected does not appear likely to be realized. For the first five months of the year Rossland has shipped in round numbers 50,000 tons. An average of 15,000 tons for the succeeding months may be relied on from the Le Roi alone. This gives Rossland a certainty of 155,000 tons for the year. It is now evident that whatever output the War Eagle and Centre Star contribute this year, will be compressed into the last quarter of the year. It is unlikely that regular shipments will be resumed for three months yet. The hoisting machinery on the Centre Star main shaft is now almost in working order, but the company is still waiting for its compressor plant and it appears to be doubtful how much longer it may have to wait. A suspicion is abroad that the machinery is not made yet. The same vexatious delay is taking place with regard to the Black Bear compressor for the Le Roi company. The fly wheel and the blue print are the only parts received as yet. But fortunately the Le Roi is not so absolutely dependent on this machinery as the Centre Star is. Pending its arrival little or nothing can be done. It is quite clear that it will require heavy shipments from the War Eagle and Centre Star during the last quarter of the year if the tonnage of 1899 is to be largely augmented. For some reason or another the Slocan country is taking a long time to rally from the effects of the long shut down. The total tonnage produced so far this year is very small. The rate of production is very little greater since the settlement of the labour difficulty was effected than it was before. During last year the Slocan shipped in the neighborhood of 19,000 tons of ore and concentrates. This year so far 7,000 tons covers the output. If the Slocan does not produce 25,000 tons this year it will disappoint reasonable expectations formed of the capacity of the country. One of the large producers in the province, the Hall Mines, has gone temporarily out of business. The question of profitable production in that instance being put aside it will require quite a tonnage from other sounces to counterbalance the effect of its defection upon the gross output of the country.

There are several very hopeful features in the situation, however. The St. Eugene at Ymir is producing and shipping between 50 and 60 tons of rich silver lead concentrates every day. It has already marketed over 1,000 tons and should add to the province's production of silver and lead at least 8,000 tons of concentrates during the year. As silver lead producers the North Star and Mollie Gibson have also to be reckoned with. The Nelson district will also receive considerable assistance from the production of gold bullion within its boundaries, particularly from the doubled capacity of the Ymir mill. The Ymir must now be considered one of the great mines of the province. The Boundary country is an unknown quantity. Its effect upon the total production of 1900 will however be relatively very small. The best to be hoped from it is that towards the close of the year a rate of production will have been established which will be a guarantee for future years even if it does not much affect the present. Again there is the Lardeau country from which the tonnage exported is as yet purely insignificant. Upon the development of all these districts the failure of British Columbia to attract foreign capital is reacting severely. There is no question but that with an adequate flow of capital the mineral output of the country would increase from year to year much more rapidly and not less steadily than it does. In endeavouring to attract capital the people of British Columbia and particularly the government have shown criminal neglect. To discover the best means of inducing investment and once discovered to apply them strenuously is at the present time more important than any question of internal policy. It is a relief to see that politicians of all shades of opinion have at last opened their eyes to the question.

On more than one occasion we have had reason to refer to the slipshod manner in which too many of our local mining companies are conducted and which calls for something more than mere protest. It is about time that if we have laws on our statute books to regulate these matters that they should be enforced. A case in point is the Boundary Creek Mining & Milling Co. of Greenwood. The shareholders seem to be kept absolutely in the dark as regards the operation of this concern and we are informed that even the secretary is, or professes to be, unable to give information when applied to. That the company is still in existence may be presumed from the fact that some valuable ore was recently shipped from one of its mines near Greenwood. Meanwhile in the hope that it may stir up the officials of the company to a proper sense of their responsibilities, we publish the following letter from a correspondent, subscribing himself "Scotch Investor."

"I would be very much obliged to you if you would kindly through the columns of the RECORD inform me and other small shareholders in England as to the status of the Boundary Creek Mining & Milling Company, the head office of which is at Greenwood. Being one of those who bought stock in this concern in 1897 and having received absolutely no information since then as to the operations of the company, any information you can afford me will be extremely welcome. Are not the directors of mining companies in your Province obliged to call annual meetings and issue annual reports and financial statements?"

Writes our Boundary Creek correspondent:

"In the April issue of the "RECORD" you directed attention to the apparently unwarranted action of Mr. Duncan McIntosh, the then managing director of the Winnipeg Mining & Smelting Co., Ltd., own-

ing the Winnipeg mine, situate in Wellington camp, Boundary district, in closing down the mine for no known reason other than that contained in the flimsy excuse that consolidation with the Brandon & Golden Crown company, whose mine adjoins the Winnipeg, was being negotiated. For this both the MINING RECORD and myself were subjected to abuse and misrepresentation by the editor of the Greenwood *Times*, who made among other mis-statements, the following assertions: "The 'RECORD' contains some untruthful statements regarding the closing down of the Winnipeg. The actions of Duncan McIntosh were known to all the officers of his company, and negotiations for the consolidation were carried on by them with the officers of the Brandon & Golden Crown in the East. Last month I met Mr. D. H. Beecher (formerly treasurer and now president of the Winnipeg company, vice Mr. McIntosh retired,) at Greenwood and in response to my enquiry I was assured by that gentleman that the mine was closed down without his previous knowledge. This then is the testimony of one of the directors who since his connection with the company, commencing with its inception, has continuously taken an active interest in its affairs. Regarding the consolidation project, two letters were published in the Rossland Weekly *Miner* of March 29 last, one from the secretary of the Brandon & Golden Crown Co. and the other from the official broker at Rossland of the Winnipeg Co. The former contained the following: 'The idea of consolidation originated entirely with the Winnipeg people, and it is the manager of that company (Mr. McIntosh) who has been forcing the issue, and he it was who gave publicity to the matter.' The latter wrote, in part, 'The directors and officers of the Winnipeg other than Mr. McIntosh were not consulted, so it is quite possible that the consolidation scheme will not get beyond the embryonic stage.' I revert to this matter to show that your advices in this connection were reliable, whilst, on the other hand, the assertions of the Greenwood *Times* in reply were as unreliable as are many of the inflated statements that journal is in the habit of publishing as mining news."

It is hardly necessary, we think, to make any comment on our correspondent's letter, except to say that before the remarks which were published in the April issue appeared, we had received very precise information from more than one independent source on the subject of the closing down of the mine.

We note that work has been resumed at the Winnipeg mine, Boundary district, this time, so it has been officially stated, under the direction of a practical mining man of many years' experience. In 1897, prior to incorporation of the company, the then trustees published a prospectus which contained the following: "A careful, practical, economic and business-like management of the company and operation of its property is assured stockholders, and there is good reason to believe that the mine will be more than paying operating expenses before the end of the coming year." It cannot well be maintained that either the assurance or the anticipation contained in the foregoing has been satisfactorily realized. Again we remember that Mr. Duncan McIntosh, then president and managing director of the company, was last fall interviewed by the Rossland *Miner*, which on Oct. 19, 1899, published, among other statements, the following: "There is 20,000 tons of ore in sight which will run from $20 to $30 per ton. There are 2,000 tons of ore on the dump ready for shipment." Referring to a new strike made by men engaged in grading for the railway it stated: "About 200 tons of ore had already been taken out of this find, and is piled up ready to be sent to the smelter. The assays of this ore average about $87 to the ton." In view of the fact that Mr. Beecher, now president of the company, a few weeks ago was reported by the Phoenix *Pioneer* to have informed its representative that "the returns of from $18 to $24 per ton on the ore shipped thus far more than realized the expectations of the stockholders" it seems that these were either not well informed as to the late manager's opinion of values, or they discounted them. However the statements lately made to our correspondent indicate that matters will henceforward proceed upon a more business-like and dependable basis. With an experienced mining man in charge, liberty to employ all the men he can work to advantage, a thousand tons of ore on the dump to start with, 30 feet of solid ore in a surface vein and 50 feet at the 300-foot level, all the plant and machinery in good working order and equal to developing the mine down to the 500-foot level, and the railway within a few yards of the dump—surely this is a combination of advantages that, with no further erratic interference to prevent, ere the current year closes should prove earler faith in the Winnipeg to have been fully warranted and so restore confidence in the property and stock.

The Vancouver *News-Advertiser* has done much good work for the Boundary creek district during the past three years in publishing more news from that section than any other of the larger newspapers of the Province, and withal more generally correct news. Latterly though, it has, in selecting matter from district newspapers for its mining columns and in publishing "boom" communications from Grand Forks especially to a considerable extent sacrificed quality to quantity. This is to be regretted, since the almost irrepressible boomster correspondents to be found in both Grand Forks and Greenwood should certainly not be encouraged in their mischievous efforts by leading newspapers of the province. As an instance of this unfortunate departure from its earlier avoidance of such evils we refer to a contribution published in the *News-Advertiser* of May 15, in which some grossly exaggerated statements appear relating to Summit camp, Boundary district. The ingenuity displayed by the writer thereof in securing a free advertisement for a townsite in which are largely interested such men as Messrs. A. W. Ross and W. C. Haywood, the elasticity of whose imaginations in depicturing townsite advantages is perhaps not yet forgotten on the Coast—is no doubt, from his own point of view, admirable. But while we are not concerned with this aspect of his effusions, we take strong exception to the misstatements concerning the mines of Summit camp. But to quote: "Huge plants, the transportation of which represents a small fortune, are ceaselessly throbbing; vast ore-dumps attest the fact that mining in Summit has long since passed the experimental stage." This "word picture" is of the kind to be looked for from the pen of an O'Farrell but the *News-Advertiser* has been accustomed to leave such fairy tales for some of its less particular contemporaries to publish. As a matter of simple fact—and it is facts, not fairy tales, the min-

ing and investing public look to reputable journals for—there are neither "huge plants" nor "vast ore-dumps" to be found in Summit camp. Even supposing that the B. C. mine has lately received "two 80-horse power boilers, a 50-horse power hoist and half of a 20-drill Rand compressor" as stated, seeing that this is the only comparatively big plant in Summit camp and that the two or three others in the neighbourhood do not aggregate one-half its power this is no justification for asserting that "huge plants" are at work. Nor can the accumulation on the dumps of a total of less than 20,000 tons of ore, much of which will have to be sorted out as unsuitable for shipment, be truthfully described as "vast ore-dumps." In other respects the contribution under notice is much inflated, but what we have written will suffice to show its general character. It is not a pleasant duty to challenge gross exaggerations in published statements respecting our mines, but so far as this journal is concerned, we shall to the best of our ability endeavour to check the growing abuse of opportunity indulged in by irresponsible scribblers who, either ignorantly or from unworthy motives, attempt to deceive the investing public. In case these remarks be construed as questioning the value of the better developed of the Summit camp properties, it may be advisable to add that the information at our disposal leads us to conclude that at the B. C. mine the indications are for profitable and permanent production and that the Oro Denora is also full of promise.

British Columbia is to be congratulated on the recent appointment by the Dominion Government of Mr. Angus K. Stuart of Greenwood as representative of this Province at the Paris Exposition. Mr. Stuart is not only an excellent linguist, but thanks to a journalistic training which has made him a close observer and a residence of many years standing in British Columbia and the mining camps of South Yale, he has gained a very comprehensive knowledge of the country and its potentialities and is thus fully equipped to do us justice in championing "B. C." at the great Fair during his stay in the French capital.

Elsewhere, our London correspondent refers to the reconstruction of the Hall Mines, Limited, and in this connection we have received an interesting letter from one of the leading mining engineers in Canada in which he says: "I would like to assure you of my high personal opinion of that mine and my belief that capable, economical management can make of it a very remunerative property. The weak point of the property has always been the administration of the mine; for this the responsibility is about equally divided between the London Board and former mine management. Last November a new mine superintendent, Capt. J. R. Gifford, was appointed and who, in the short time he had control, satisfied himself of the ultimate value of the property and the necessity for vigorous exploitation. This exploitation discovered in the south vein of the seventh level large bodies of valuable ore; in one place five feet of ore gave 64 ozs. of silver and 2.6 per cent. of copper. These discoveries were made 200 feet below the level of former stopes running above No. 5 adit, and, to my mind, are of the highest significance as indicating a future for the property." It is a matter for congratulation, meanwhile, that the Hall Mines is to have another chance, and we trust, under better auspices.

At extraordinary general meetings of the Goldfields of British Columbia (Limited), the Waverley Mine (Limited) and the Tangier Mine (Limited), held recently in London, resolutions were unanimously adopted for the voluntary liquidation of these companies. A new company, entitled the Empire Goldfields (Limited) is to be formed with a capital of £200,000 divided into shares of £1 each, for the purpose of acquiring the assets and liabilities of the existing companies. The scheme of amalgamation provides that every holder of five shares in the Goldfields of British Columbia will receive one share in the new company; holders of four shares in the Waverley, one share; and holders of one share in the Tangier one share. The shares in the new company are to be issued with a liability of 1s. per share. By this arrangement there is just a bare possibility that shareholders of these unfortunate concerns may improve their position; but unless very different methods are adopted than those employed in the past, this chance is of the slimest.

At a recent political meeting held in Kaslo, the Premier, Mr. Martin, was asked:

"Is the Mr. Smith Curtis, now Minister of Mines, the same gentleman who about six months ago published in the Rossland *Miner* a letter over his own signature that the Provincial Government had the power, which they should exercise, to take possession of any mine where operations were suspended by the owner and to work such mine? Is the Premier prepared to say that this will be a feature of the policy of his government and to what extent will it be applied in the Slocan?"

Mr. Martin replied: "I believe Mr. Smith Curtis did write such a letter and I believe that, in extreme cases, there is such power on the part of the government of the province and in an extreme case, for the public good, it should be exercised. Except for purely business reasons no company should be allowed to close a mine down. I do not think any mine owner has the right to deliberately shut down his mine for the purpose of affecting disputes between him and the persons who are working for him."

We challenge Mr. Martin to show any authority justifying his belief that a government of British Columbia has a right to interfere with private property in the way he intimates. But very few people take Mr. Martin seriously and it is a matter for thankfulness that there is no fear of confidence being shaken by the return of this gentleman to power.

The extension of the Yukon & White Pass Railway to White Horse is expected to be complete by August. This should mean much for a district of which there are high hopes as a copper producer and of which some of the claims are now sufficiently developed to justify a prediction that a first shipment of smelting ore may be made this summer. The White Horse copper claims are stated to run extraordinarily well in copper with some silver and a very little gold. If future development should prove the permanency of the ore bodies, the best of the White Horse copper properties should be easily able to pay the White Pass & Yukon Railway Company's prepaid freight rate to the smelter, which will be about

$12.50 a ton. Mr. Hawkins, the managing director of the railway, is extremely sanguine with regard to the copper possibilities of the White Horse district of the Yukon, which he believes will add considerably to the already large returns of the railroad.

Mr. James Dunsmuir has publicly announced that he will hereafter employ only white labour in his Vancouver Island collieries. So far so good. But he has also stated that he has been accustomed to pay Mongolians as highly as white labour. If we accept this statement it is only reasonable to conclude that either the Chinaman has been overpaid or the white man underpaid. In either case Mr. Dunsmuir should come in for criticism. The only grounds upon which Mongolians should be allowed to compete in our labour market are those of expediency and cheapness. If Chinamen are to be employed at all it must be because the productiveness of their labour in relation to the wages paid them is greater than can be obtained from the employment of white labour. It is a matter of opinion whether in a new country cheap Mongolian labour is or is not a desirable factor. But if coolies are employed at all they should certainly be paid at the "coolie" rate of wages. That, to our mind, is the crux of the "Mongolian question." The Chinaman in British Columbia has been pampered and overpaid until he has come to consider himself a personage. We have erected barriers to keep him out, but so long as he knows he can earn as much in a day here as he can in a week or even two weeks in his own country he will continue to emigrate and the fact that the barrier in the shape of a poll-tax exists, by limiting the number of immigrants has simply had the effect of bringing the Chinaman into keener competition with the white worker.

There are encouraging signs of profitable future developments of the coke and fire brick industries in connection with the Island collieries and clay deposits at the Union mines of the Comox district of the Island, and the coke produced there is being found at Whatcom, Washington, to be superior for iron smelting purposes to the home product of that State. It is likely therefore that this will lead to a large import of Island coke for such smelting uses. Moreover trial consignments of the coke are being made to Japan, which may become a considerable purchaser of the fuel, for use in her metal industries. And as regards the fire bricks made of the clay at Union test results made in Vancouver are stated to show that these are, if anything, superior to the fire bricks now in general use in the province and imported from Gartcraig, Scotland. All of which would seem to indicate a very considerable enlargement of industrial activity in the Union district.

It may be worth noting, as indirectly illustrating the interest taken in British Columbia mines in very distant parts of the world, and directly, the wide circulation of the MINING RECORD enjoys, that during the month of May among the requests sent in to this office for copies of catalogues of machinery advertised in these pages, we were asked to send particulars of special classes of machinery to a firm in Rannegunge, India and also to another in Valparaiso. American manufacturers expect, of course, to sell machinery in British Columbia by advertising in the MINING RECORD, but it will doubtless come as an agreeable surprise to (say) a firm in Boston, if through our instrumentality they can introduce their make of machinery so far from home as British India.

The MINING RECORD is not a political paper. We may nevertheless without suspicion of partisan views, express a very decided opinion that there is no present likelihood of the redemption of Mr. Joseph Martin's conditional and qualified promise to build and operate, as a Provincial Government undertaking—if found possible—a railroad between Vancouver, New Westminster and the Kootenays, via the Fraser Valley and the Similkameen country. The railroad which would need to be at least 330 miles long, would cost for construction and working capital at least $12,000,000, a sum far beyond the Province's borrowing resources. Especially is this the case in view of the fact that both as regards the Similkameen and the Kootenays, the projected line would have to face most formidable competition from the Canadian Pacific Railroad, which already taps the Kootenays and is preparing to enter the promising Similkameen copper country by a comparatively short branch of its main line running in from Spence's Bridge. Any initial attempt at a provincial railroad needs certainly to be made on a far shorter and less costly route and one moreover subject to less formidable competition.

The stockholders in the Le Roi Mining Company are to be congratulated on the recent very successful development of their mine and consequent enlargement of its output, which, in the third week of May, reached the record figures of 4,030 tons. Up to and including that period the Le Roi has held during the present year the undoubted position of being the great producer of Rossland, as out of 48,661 tons thence shipped in 1900, the Le Roi accounted for no less than 28,659. At present the mine continues to be the only large shipper, the effecting of improvements to machinery and doing of development work having temporarily reduced almost to a minimum the output of the War Eagle and Centre Star properties. It is satisfactory also to learn that although the Le Roi output is so satisfactorily growing, greater attention is being paid to the further development of the ore bodies in the mine than is being devoted even to present shipments. Meanwhile general indications tend to show that those interested in that promising mine, the Centre Star, must possess their souls in patience a little longer as machinery alterations and necessary further development work are not progressing very rapidly.

We regret to learn that there is a possibility of a suspension of operations at the Cottonwood River Company's gold gravels in Cariboo, as a result of winter floods causing great and almost irreparable damage to flumes. It is to be hoped that such a result may yet be averted, as the Company, under British auspices, is a thoroughly bona fide concern which has expended much capital and development work under trustworthy management.

We have received the prospectus of the Tyee Copper Company, Limited, the capital of which is £120,000 divided into 120,000 of £1 each, 20,000 being offered to public subscription. This company has been formed to acquire from the Tyee Development Company three claims, the Tyee, Herbert and Maggie Fraction, in the Mount Sicker district. The vendors are to receive £80,000 in fully paid shares for their properties, which is a fair enough arrangement. We however take exception to one statement in this prospectus, namely, that referring to "estimated profits," which allows an output of 100 tons of ore per day, or an annual production of 30,000 tons. The Tyee is not yet a sufficiently developed mine to safely admit of an estimate of this kind being made concerning it; and the promoters would have been better advised if they had omitted this part of the prospectus altogether and allowed the public to form their own conclusions from the engineers' reports, which are quite satisfactory enough. Thus Mr. W. Thompson, A.M.I. C.E., after examining the mine reports: "As regards the prospects and future of the property, I am of opinion that the developments which have taken place since last year, both in this property and the adjoining one, fully justify the development and equipment of the mine on a much larger scale. * * * I would say that I have great confidence in the future of the Tyee property. There seems *every probability* (the italics are ours) of the ore bodies being large and the ore of a grade which will yield a handsome return." In the report of Mr. W. Pellew-Harvey, the following statement is made with regard to the "ore in sight": "An estimate of the quantity of ore in sight cannot be given with any degree of accuracy. The developments accomplished have consisted of sinking to prove the existence of the ore body in depth, and with but few short drives on the lode east from the various levels, practically nothing but the cross-cutting of the lode has been accomplished. But evidence of value has been adduced through this work, which shows that there is little doubt but that large ore bodies exist at depth, and these can now be rapidly opened up from the various levels driven." All of which, together with smelter and assay returns, goes to show merely that the Tyee is but a very promising prospect; but provided the development work is as well and carefully carried on as in the past there is no reason at present why the undertaking should not result satisfactorily.

Mr. H. N. Galer, Asst. Sec'y-Treas. of the Granby Smelter.

We are indebted to the Provincial Mineralogist for advance sheets of the Minister of Mines Report for 1900, which will be issued to the public early in June. We have not space this month to review this work extensively, but hope to take an early opportunity of doing so. The chief features of the Report this year is a description by the Provincial Mineralogist of the Boundary Creek district which was visited by him last summer. The photographs accompanying the Report are more than usually good, and there are excellent diagrams or charts, the one showing the growth of the mineral industry in British Columbia and the other comparing the output of this province with the rest of the Dominion.

A very satisfactory meeting of the Payne Consolidated Mining Company was held in Montreal early in the month. In his speech the chairman, Lt.-Col. Henshaw, said among other things that he believed the ore now being produced would average 90 oz. silver and 45 per cent. lead per ton, and net $57 per ton, which on a production of 1,000 tons per month would be $57,000; or allowing $15,000 for working expenses the company's monthly net profit would be $42,000. This is equal to a monthly dividend of one per cent. on a capital of $2,600,000, leaving a surplus of $16,000. The value of the ore blocked out and ready for shipment is about $900,000. From October, 1896, to June, 1899, the Payne paid dividends to the amount of $1,100,000, creating at the same time a surplus of over $200,000, as well as paying the original owners of the property. This is an excellent record and a few such mines as the Payne on the London market would have a most salutary effect.

In evidence of the growth of the mining industry in British Columbia our Rossland contemporary, the *Miner*, publishes a list of machinery plant supplied to no less than fifty-three (more or less) developed mines last year. Included in this list are several 40-horsepower drill compressors and other equipments of like magnitude. A representative of a large San Francisco iron works was recently interviewed on the subject of the business outlook for the sale of machinery in this province, and his replies were all distinctly favourable, and speaking of the mining possibilities he remarked: "There is no part of the continent, and my business has led me over most of it, that is so promising as the interior of British Columbia." But at last "promise" is beginning to give place to "performance."

THE BOUNDARY CREEK DISTRICT.

THE TOWN OF GRAND FORKS AND THE GRANBY SMELTER.

THE Granby smelter, which is now nearing completion, was located on its present site, owing to the exceptional water power in the vicinity. To utilize this power a dam 175 feet across the top, 75 feet from heel to toe at the bottom, and constructed of sawn timbers 12x12 inches and filled in rock was thrown across the north fork of the Kettle River and a flume 11x9 feet and a mile long constructed to carry the water to the works, the grade being 0.01 inches to every 33⅓ feet. At extreme low water this stream will furnish 1,200 horse-power, and the smelter will use, under actual head of 45 feet, 15,000 miners' inches after deducting friction and all losses. The dam will afford about 30 feet of this head, the rest being made up between the dam and the power wheel. The value of this water power to the Granby smelter is very apparent. Steam power, it is estimated, costs in the mining districts from $125 to $150 per horse-power per annum; electrical power in Rossland is supplied at a cost of $60 per horse-power per annum. The latter, it is understood, was offered to the Granby smelter company, by the West Kootenay Power and Light Company, of Bonnington Falls, for $75 per horse-power per annum. But the smelter company can, by generating its own power, effect a considerable saving over any offer from an outside source, for beyond the initial expense of installation, the present system will be no longer a charge beyond the cost of maintenance and repairs. It is estimated that the saving as compared with steam will be from $25,000 to $75,000 per annum, according to the amount of power used, which at the start should not exceed 350 horse-power. Of the works themselves the following is a very excellent account by Mr. C. A. Bramble, at present with the Canadian contingent in South Africa, but formerly a correspondent of the MINING RECORD residing at Columbia and practising as an assayer and metallurgist:

A spur track two and a-half miles in length, with a very easy grade, runs from the main line a short distance above Columbia, to the north end of the works. The power house is within 1,000 feet of the smelter buildings, and about 100 feet below them. There is ample room at the smelter site proper for as large a plant as the company will ever care to put up, and there is ample dumping room for years to come. The main power with which the blowers, sampling works, etc., will be given is to be given by a duplicate set of 16-in. turbine wheels, operating, as before mentioned, under an effective head of 45 feet. This will develop 250 horse-power net. These are mounted in pairs on horizontal shafts and are cased in a steel flume mounted on I beams. These wheels are connected with the flume by a steel intake pipe 4 feet 7 inches in diameter and discharging into a single draft chest and draft tube, 16 feet long, set at 45 degrees downward inclination.

The wheel used is the New American, made by the Dayton Globe Iron Works. One of the greatest advantages of this wheel is that it works at its greatest efficiency when the gates are three-quarters open. These two pairs of turbines are each directly connected with one Westinghouse rotating arm, alternating-current generator, having a capacity of 180 kilowatts, 250 volts, the full lode efficiency being 93.5 per cent. A section of the power house is shown in the accompanying drawing.

The foregoing description applies to the main power battery. During the day all will be in use, running at three-quarters capacity, but they are so arranged that one battery will run the works at night, hence giving an opportunity every evening to overhaul one battery. By this arrangement they are practically equal to duplicate engines. There is also in the same power house a single 10-in. turbine wheel, developing 40 horse-power net. This is directly connected with one Westinghouse 4-pole lighting generator of 22.5 kilowatts capacity, 125 volts. This is for lighting the entire plant, and is self-contained. Moreover, when the works are running, and it is necessary to shut down for repairs, or in case the large power battery is not running, the works would still be lit. It was considered better engineering to have the lighting plant separate from the power generator.

There will also be in the same power house one single 13-in. horizontal turbine wheel, which will develop 55 horse-power. This wheel is belted to a Stillwell-Bierce & Smith-Vale Company triplex pump, of the double-action type, having a guaranteed capacity of 750,000 gallons each 24 hours, against a maximum pressure of 100 lbs. to the square inch, or against a 200-foot head. This pump will furnish water and pressure to granulate the slag, as it runs continuously from the furnaces.

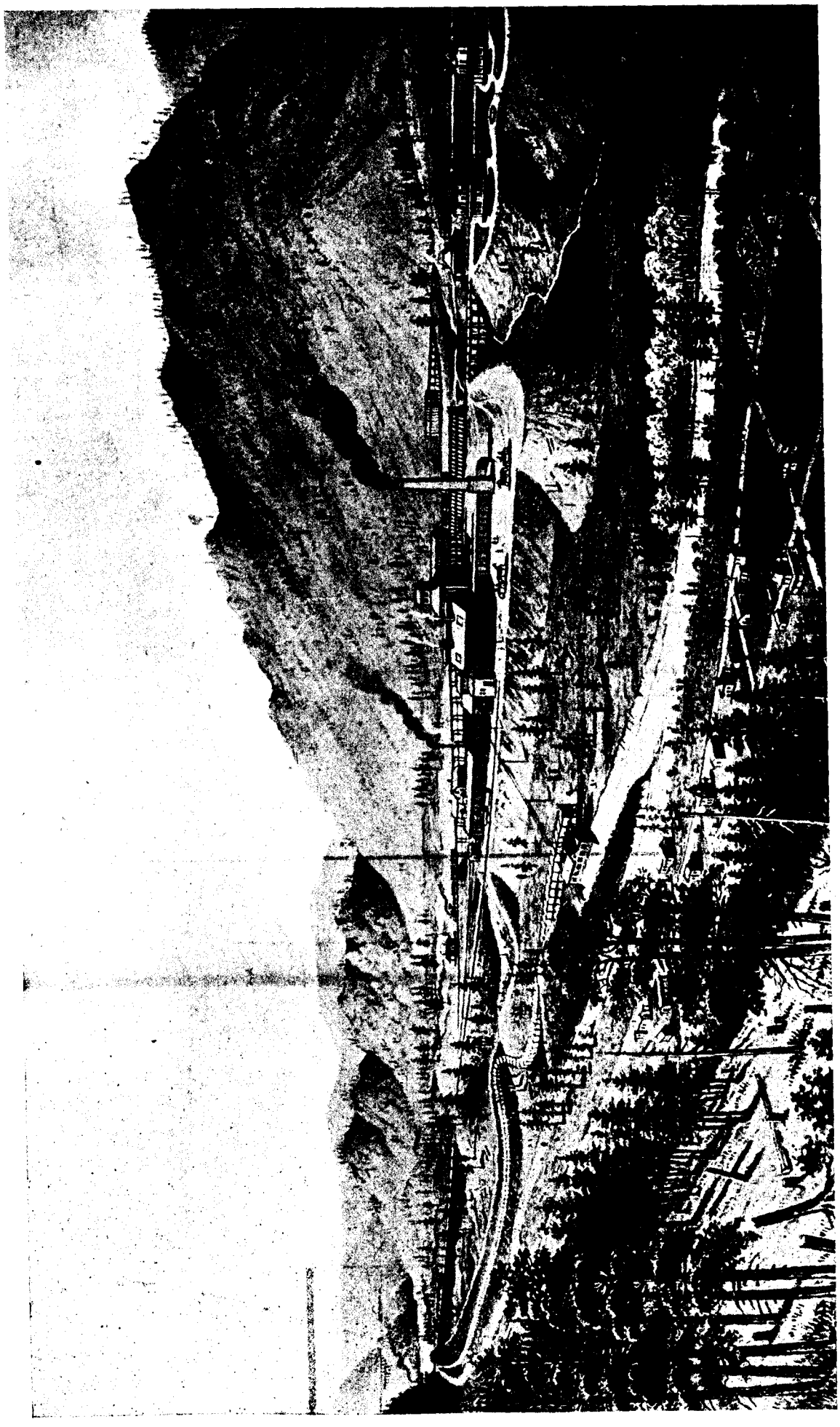
There is also in the same power house one equal to the first mentioned, namely, 16-in. wheels, to supply extra power should such be required. The power house is 100 feet long by 30 feet wide, and all the batteries are set in line, on one long concrete foundation. The end of the flume enters at one end, of the building, about 35 feet above the centre of the wheel, the water being tapped out of the side of the prospective water wheels.

The smelter proper consists of two double-decked, steel-jacketed furnaces, 160 by 44 in. The total height of the furnaces from the charge to the furnace is 14 feet. The jackets come within 18 in. of the charge floor. The heights of the lower set of jackets is 7 ft. 6 in., and that of the upper set 2 ft. 6 in. The furnace has a continuous flow water jacket and bronze slag spout. The tuyeres are 5 in. in diameter and 9 in number. The lower side of the furnace has 3 water jackets on the side and one on each end, while the upper jackets number two on the side and one on each end.

The bottom of the furnace is of the moveable type, and the brickwork is supported by a cast-iron bedplate, mounted on eight wheels, and is raised and lowered by 8 jack screws built in the wheel frames. The tuyeres are made of cast-iron at the furnace end, connecting with the blast-pipe through 6-in. boiler tubes, which are joined to the cast-iron end by air-tight expansion joints. All jackets are hung from the wrought-iron I beams, which are supported in turn by the cast-iron deck-plates resting on the columns.

On each side, and in the centre of the furnace, are small-water-cooled tapping jackets, for tapping out when the furnace is blown out. The furnace. above the feed floor, is of brick, bound with suitable buckstays, and there is a charging door on each side of the furnace, opening the entire length, and about 2 feet high.

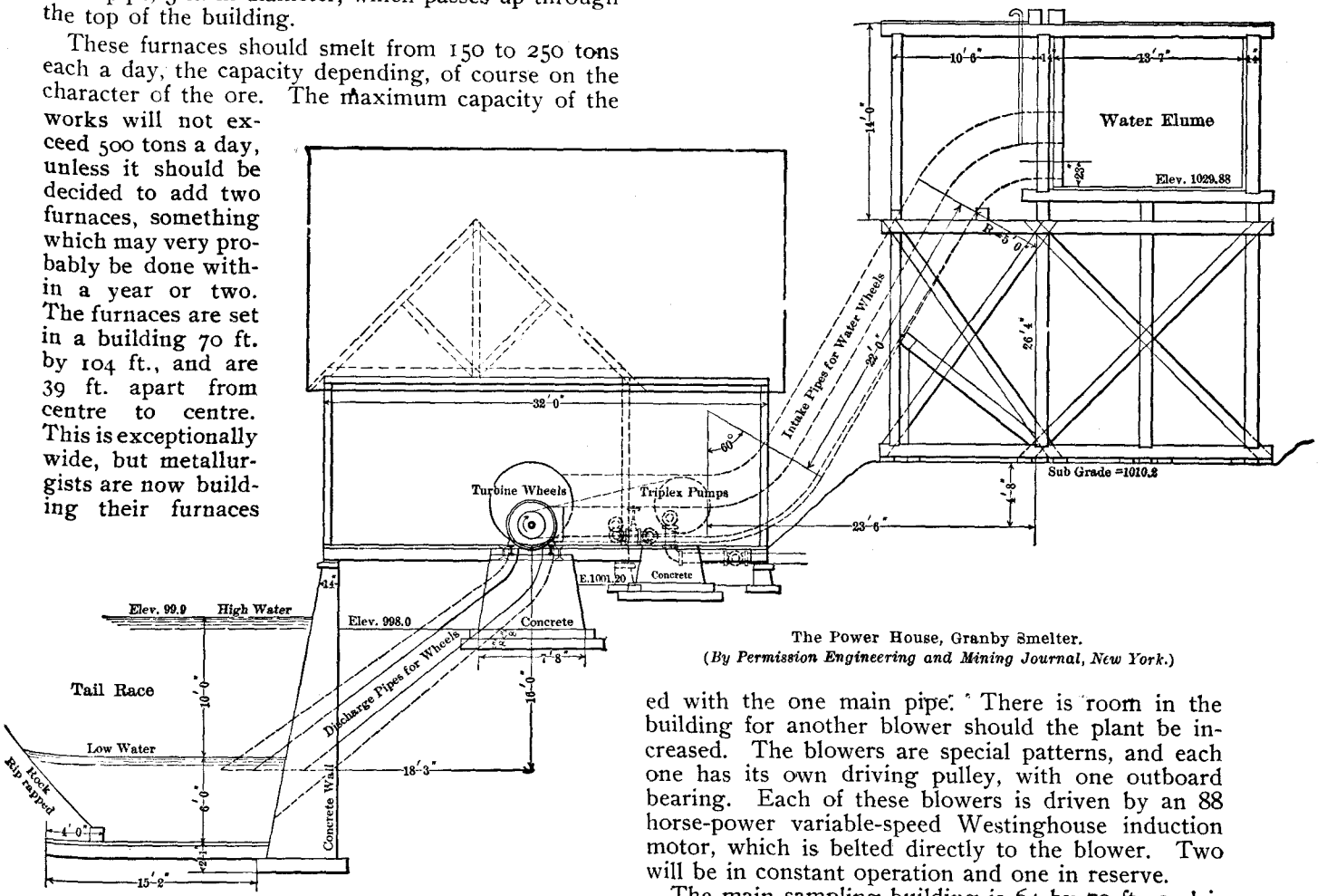
The gases pass off from the top, in a 4-in. diameter take-down pipe, which is connected with the big flue-



General View of the Granby Smelter Site and Works.

dust chamber leading to the stack. This pipe is fitted with a damper, and should anything go wrong in the flue chamber the gases can be led into the air by another pipe, 3 ft. in diameter, which passes up through the top of the building.

These furnaces should smelt from 150 to 250 tons each a day, the capacity depending, of course on the character of the ore. The maximum capacity of the works will not exceed 500 tons a day, unless it should be decided to add two furnaces, something which may very probably be done within a year or two. The furnaces are set in a building 70 ft. by 104 ft., and are 39 ft. apart from centre to centre. This is exceptionally wide, but metallurgists are now building their furnaces much further apart than was their practice a few years ago.

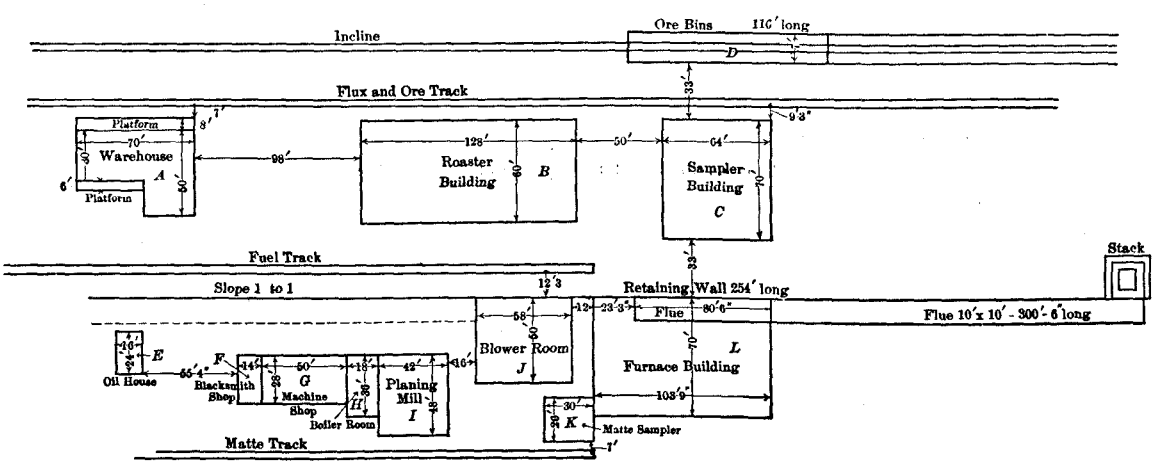


The Power House, Granby Smelter.
(By Permission Engineering and Mining Journal, New York.)

The down-takes of the furnace are connected with the big flue chamber, 10 by 10 ft. on the inside, and 300 ft. in length. The stack is 11 by 11 ft., inside measurement, and 150 ft. high.

The blower room is 50 by 58 ft., and is 12 ft. from the furnace building. It contains three No. 8 Coonersville blowers, one for each furnace, and one in reserve. These are connected with the furnaces by a 54-in. diameter blast pipe, all blowers being connected with the one main pipe. There is room in the building for another blower should the plant be increased. The blowers are special patterns, and each one has its own driving pulley, with one outboard bearing. Each of these blowers is driven by an 88 horse-power variable-speed Westinghouse induction motor, which is belted directly to the blower. Two will be in constant operation and one in reserve.

The main sampling building is 64 by 70 ft., and is surrounded on three sides by ore bins. The ore train as it comes into the smelter will be carried by an incline to a series of receiving bins, parallel to the front of the sampling works, 23 ft. above the floor of the same, and 23 ft. distant. These receiving bins will have a total capacity of 1,000 tons. The bins are filled directly from the cars, which have bottom dump. During the day the ore from the receiving bins is

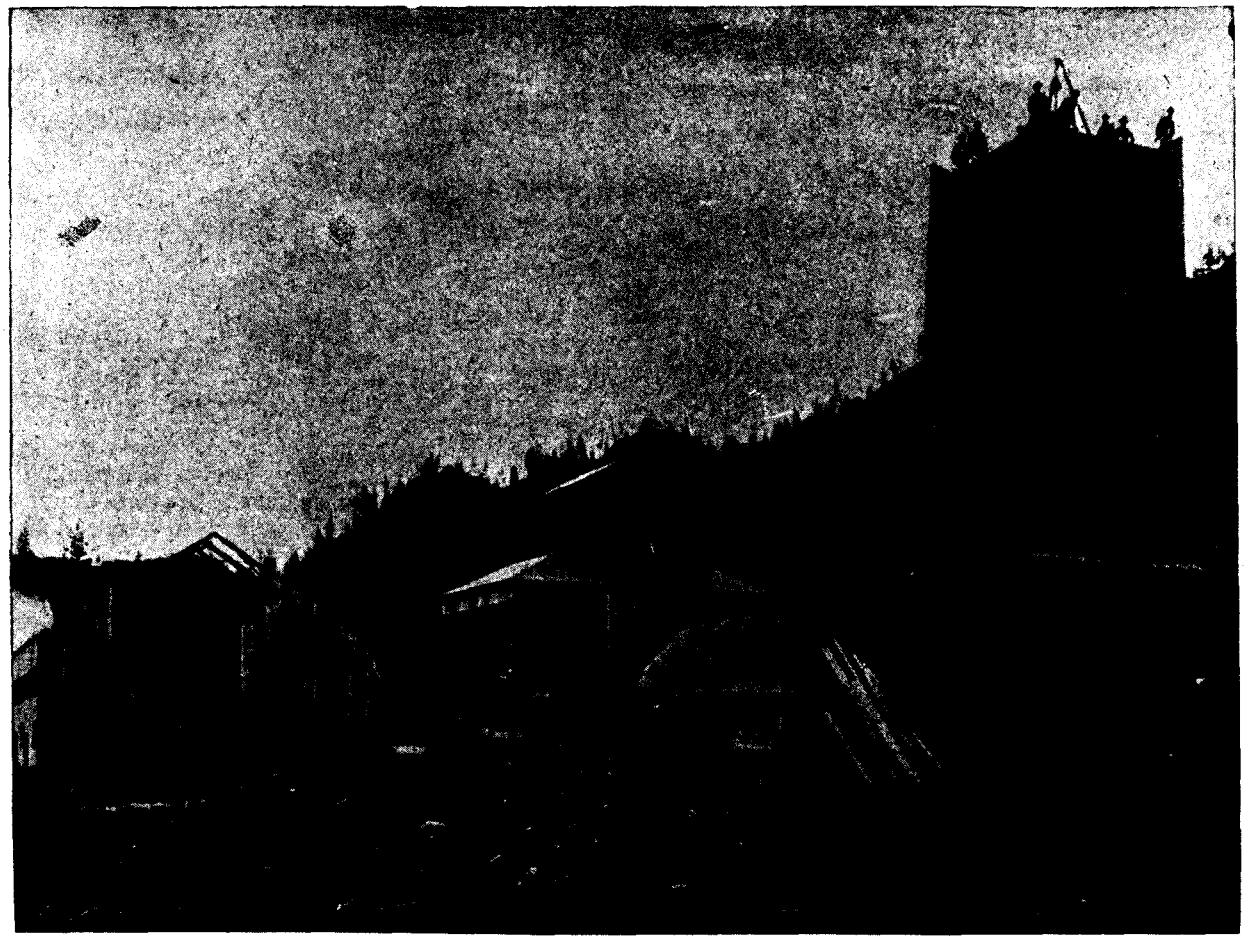


Plan of Granby Smelter.
(By Permission Engineering and Mining Journal, New York.)

taken by small iron cars, which dump into a No. 5 Gates gyratory crusher. This crusher has its opening a little below the floor of the sampling works and crushes a ton at a time. After this rough crushing, which reduces the ore to lumps the size of a man's fist, it is elevated to the top of the building by a continuous steel bucket elevator. It is next sampled by the Snyder automatic sampler. The bulk of the ore is distributed to the bins on three sides of the sampling works by a special cast-iron spout. After being cut the sample passes to a 7 by 10-in. Blake crusher. Once more it is cut by a smaller Snyder sampler, from which the sample goes to a set of 10 by 18-in. economic rolls, which reduce it still further. One more cutting, by a smaller Snyder sampler, and the sample is delivered on steel plates, where it is again cut by hand, and then goes to a fine sample grinder.

It is intended that the matte shall be shipped after being brought up to 45 to 50 per cent. copper. For the present it will go to some Eastern refinery. This shipping matte, after having been cooled, will be crushed by a 7 by 10-in. Blake crusher, which will be placed in one corner of the furnace building on the furnace floor. This crushed matte will be raised by an ordinary cup elevator to a special matte sampler. This matte sampler building is built on the corner of the furnace building and is 26 by 30 feet. The building is so arranged that the crushed matte can be sampled automatically or by hand. It has the same automatic arrangement as the ore sampler. The lower part of this building contains four bins, holding about one car of matte each, and it will contain the matter after it shall have been sampled. The gates by which the matte is drawn off are 2 ft. higher than a car floor and the shipping track is so arranged that the car door and the floor from which the matte is sacked are on the same level.

When the works are increased, in a year or two, it is proposed to put in a matte converting plant complete and to ship converted copper. Next spring a roasting plant, and, if deemed desirable, a briquette machine, will be installed. Plans have already been drawn up for a roasting building and briquette plant, 60 by 128 ft., but nothing will be done until it is known exactly what capacity will be needed. In any case roasters cannot be delivered for six months. For the present 60 per cent. of the ore will be roasted in piles.



The Granby Smelter in Course of Construction.

The works also contain a carpenter shop and planing mill, 42 by 48 ft. The machine shop, 28 by 50 ft., is equipped with two lathes, drill press, planer, bolt cutter and pipe machine. There is, moreover, a blacksmith and repair shop, 28 by 40 ft., containing punch, shears, forges and steam hammer. A warehouse, 30 by 100 ft., where supplies can be loaded or unloaded directly from the cars, will be a great convenience, especially as it is the intention of the smelter company to furnish all supplies and do all the repairs for the several mines.

Behind the smelter, and at an elevation of about 120 ft. above the works, is a 100,000-gal. tank. This is supplied with water through an 8-in. steel riveted

pipe extending from the pump to the power-house, a distance of about 2,000 ft. from the tank. This water is to be used principally for granulating the slag, as it runs continuously from the settler in front of the furnace. The slag and matte, as it flows, runs first into a water-jacket receiver, oval in shape, 5 by 5 ft. and 2 ft. deep. The matte is tapped from the receiver periodically, and is either taken to the matte sampler, to be shipped, or, if low-grade ore, is re-roasted and re-smelted. The slag, as it flows over the receiver, runs into a large settling pot, which, in turn, overflows into the slag launder, where it is granulated by the water which carries it to the dump. This large settling pot is placed in front of the receiver as a precaution to prevent the loss of matter should the receiver, through negligence, become too full. All the machinery in the various buildings is run by Westinghouse induction motors. There is a 75-horse-power motor for the sampler, a 30 horse-power motor for the matte sampler, a 15 horse-power motor for the machine shop and a 10 horse-power motor for the elevator in the main blast furnace building. The main switches for distributing the power will be in the blower room.

An office building, two stories high, is situated within 1,000 ft. of the works. There will also be a one and a-half story laboratory building, 45 by 40 ft., containing an assay office. The superintendent's residence will be 35 by 40 ft. and two stories in height. These buildings are to be very modern in style, with bath room and all conveniences, lighted by electricity and heated by a steam plant situated in the basement of the office building. The accompanying plan shows the arrangement of the buildings, including all but the office and laboratory.

The work of construction of the smelter proper was directed by Mr. A. B. W. Hodges, an American metallurgist, while the plans for the dam, flume and power house were designed by Mr. B. C. Riblet, the well-known engineer of Nelson. While on the subject of the smelter it may not be out of place to refer briefly to one of the principal towns of the Boundary Creek district, to which the establishment and operation of these works in the immediate vicinity necessarily means a great deal. This town, Grand Forks, is situated in a fertile and picturesque valley at the junction of the main Kettle River and the North Fork of this stream. The population at present exceeds twenty-five hundred—the increase last year having been remarkable. The business and residential opportunities of the town, as one of the important centres of this promising mining district, are exceptionally good. A progressive municipal policy is in force and the credit of the town is such that recently corporation debentures, to the value of $75,000 were purchased at par by the Merchants' Bank of Halifax and the Eastern Township's Bank. Excellent electric lighting and water-works systems, a well-equipped fire brigade and a police force are among the evidences of municipal

The Smelter, with Workshops Completed.

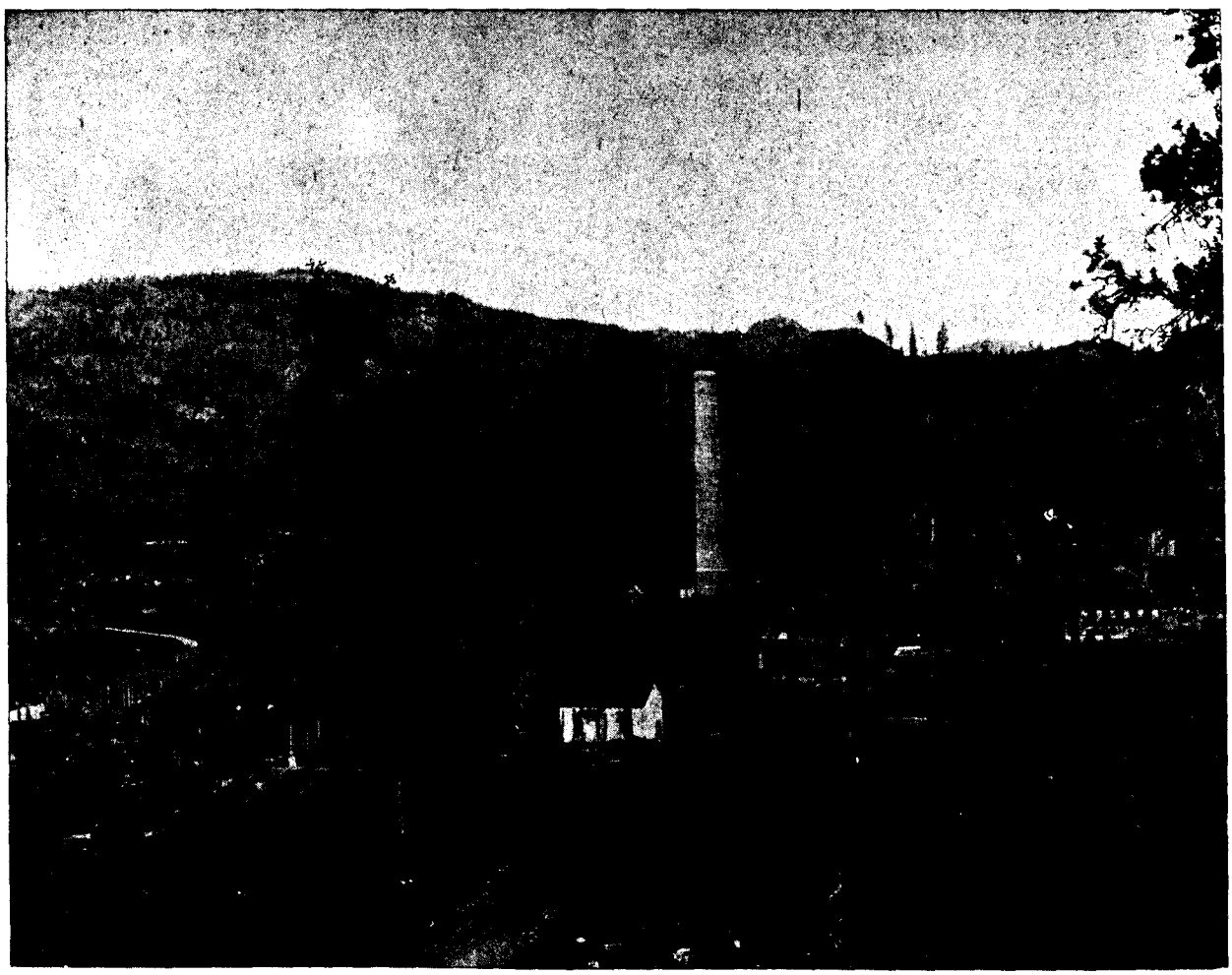
economy. Many retail business houses are doing a trade exceeding $100,000 a year, while the figures for two wholesale houses are much larger. New industries are being established daily, and a brief enumeration of a few of these may be given: Three saw-mills, a planing mill, a steam laundry, bottling works, two brickyards, foundry and machine shops, wholesale liquor and hardware stores. There are fourteen hotels, the Yale having been built at a cost of $50,000. Building operations last year exceeded $450,000. The activity in building this spring surpasses all records. Here are also located the district court house, the registry of the Supreme Court, customs house, and a mining recorder's office.

Grand Forks is in the centre of an extensive valley, the extreme width of which is not less than twenty miles. This represents an area of over 45,000 acres of rich soil, admirably adapted for general farming and fruit growing.

Throughout the district there is a good supply of timber. Of course, in company with other Boundary Creek towns, the completion of the Robson-Midway Railway has had a very marked effect on the growth and prosperity of Grand Forks. The cost of building this railway averaged $40,000 a mile—the most expensive road ever built in Canada. Robson is 1,495 feet above the sea; the summit of the range where it is crossed by the track is 4,000 above the sea. Grand Forks, in the Kettle River Valley, has an elevation of 1,700 feet. After leaving this point the line begins to climb once more, and at Eholt it is 3,100 feet; then it drops to 2,500 feet at Greenwood and 2,000 at Midway. The Bull Dog tunnel, 3,500 feet in length, penetrates the divide between the Arrow Lakes and Kettle River.

The rejection of the Kettle River Railway bill by the Dominion Parliament a month ago has not disheartened the champions of railway competition. At the next session of the Provincial Legislature, Mr. T. W. Holland, of Grand Forks, and others intend applying for the incorporation of the Grand Forks and Kettle River Tramway Co. The proposal is to build an ore road tapping the various camps. It is confidently believed that the Great Northern will ultimately extend its lines northward to Republic, and thence to the international boundary at Nelson, Wash., four and one-half miles from Grand Forks. When the short link furnished by a Canadian company is to be built depends apparently upon the caprice and whim of the legislators at Ottawa. Mining men are of the opinion that the establishment of railway communication between Grand Forks and Republic would result in the shipment of Republic ores to Grand Forks for treatment.

In conclusion a word may be said of the Miner Syndicate, whose promotions not only include the Granby smelter but various other important enterprises, having a total capitalization of $7,600,000. The



The Granby Smelter, Showing Flume Partially Built.

syndicate takes its name from Mr. S. C. Miner, of Granby, Quebec, who has invested very heavily in the Boundary Creek ventures. A large proportion of the ore to be treated at the Granby smelter will, of course, be shipped from the several properties, which include the City of Paris, in White's Camp, the Majestic and Grey Eagle mines, and last but not least the Knob Hill and Old Ironsides mines in Phoenix Camp. It is stated that in these two properties alone there is sufficient ore in sight to keep the smelter continuously in full blast for four years. The treatment charge for Phoenix ores at the Granby smelter will not exceed, it is believed, from $3.50 to $4.00 per ton.

The Granby Smelter as it now Appears.

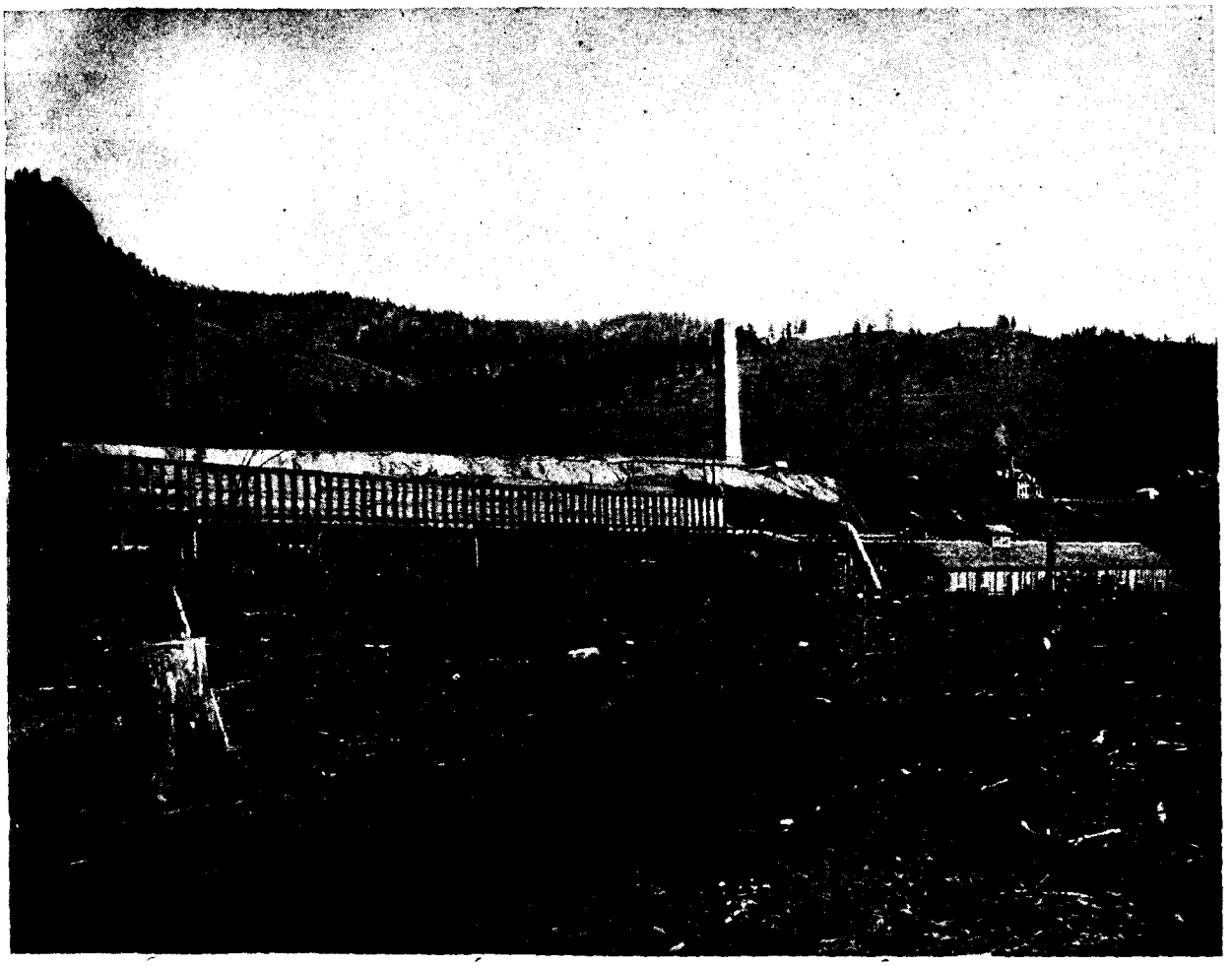
THE NICOLA DISTRICT.

(By I. W. Broomhead.)

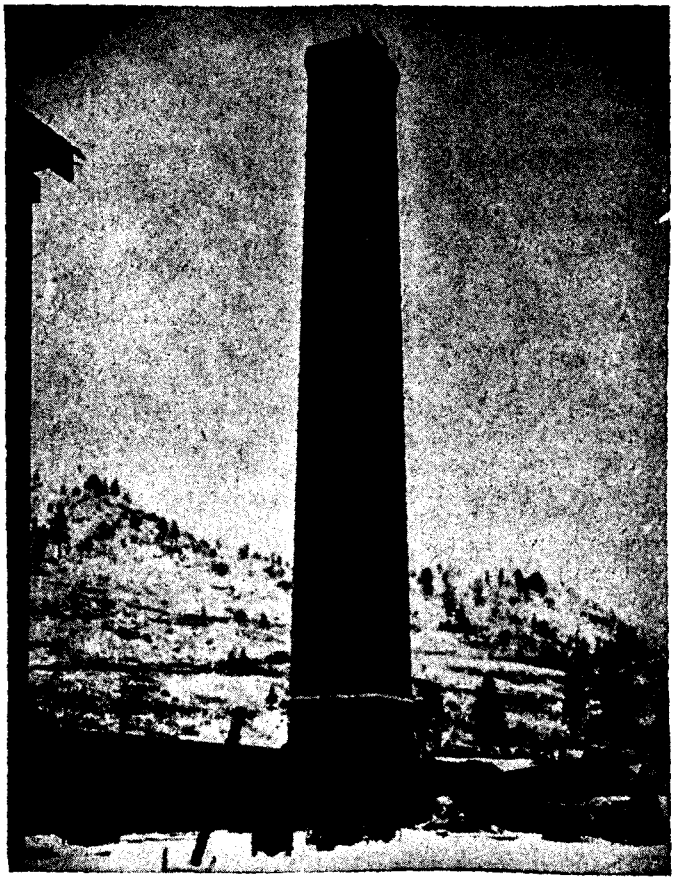
THE writer spent some months last year in British Columbia, during which time he visited the Nelson, Rossland, Revelstoke, Kamloops, Nicola, Tulameen, Spence's Bridge and intervening districts, going into the country via the Crow's Nest Pass and returning from Vancouver over the main line. The *Financial Times* of London published at the time a series of articles containing its views as to the country and its mining capabilities. But since that visit such important developments have taken place in several of the out-of-the-way and as yet little heard of districts surrounding Nicola—developments which in a somewhat remarkable manner confirm the views contained in the *Financial Times* articles at a time when very little work had been done in the district, that it may prove interesting to your readers to receive some account of them. The writer's description of the Ten-Mile Creek prospects in the *Financial Times* was:

"Ten-Mile Creek is situated 27 miles north of Nicola, and to within a mile of it the public waggon road runs. There are a number of copper claims in the surrounding mountains, upon which a little prospecting work has been done. On the Aberdeen claim, through which a mountain stream flows, a ledge 3 1-2 feet wide, showing micaceous iron has been exposed. It runs 12 degrees north of west and south of east, with a dip of 80 degrees to the south. A quartzite intrusion exists in the footwall between the granite and the ore body. Lower down the hill side two well-developed granite walls, about 20 feet apart, are exposed by erosion of the softer granite and porphyry, and may give some indication whether the lode widens out when depth is attained. The mineral and float can be traced for a considerable distance. I found small beads of native copper on heating the surface ore on a blacksmith's forge, and it apparently also contains some gray copper. The iron capping on the lode will, as is frequently the case, probably be found in depth to run into copper."

On the writer's arrival in London, about two



The Granby Smelter—Another View Showing Flume.



The Big Stack of the Granby Smelter.

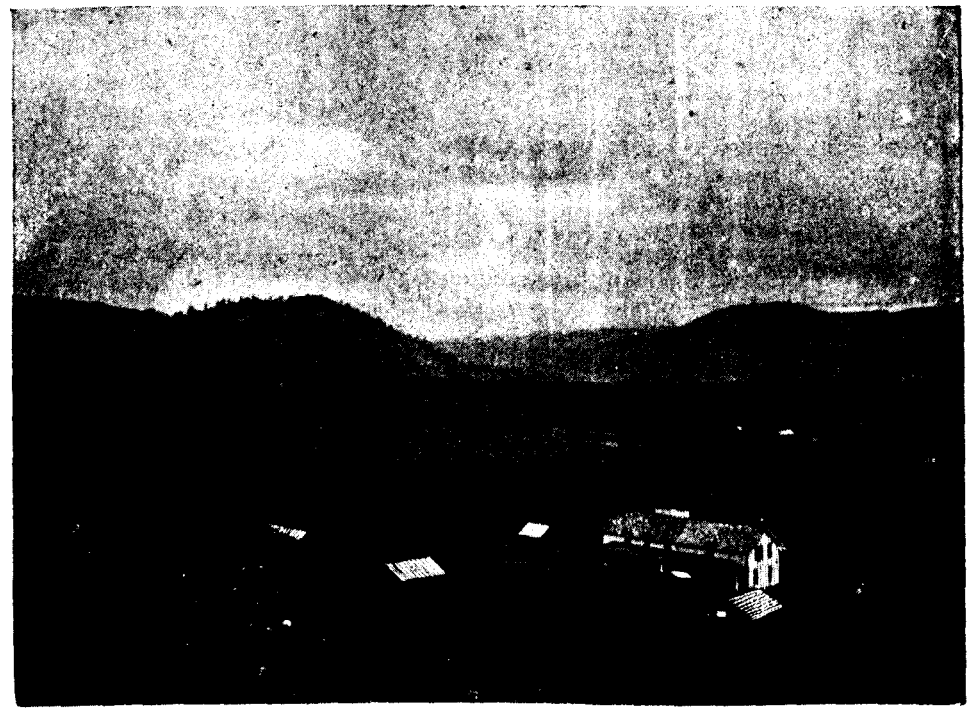
months after his visit to Nicola he received a letter from Mr. John Clapperton, who had acted for twenty-four years as Mining Recorder for this district. Mr. Clapperton told me the lode had been stripped for 160 feet down the mountain side on the Aberdeen claim and an adit level driven at that point which disclosed a lode eight feet wide very rich in copper, samples of which he forwarded to London. These he stated were not picked, but were an average of the ore showing in the lode as taken by himself. He also sent on samples of this ore from the adjoining claim, the Plymouth Queen. Both samples were forwarded to Messrs. Livingstone, Sulman & Picard, metallurgical chemists and assayers, 60 Gracechurch St., London, for assay, with the result that after crushing and mixing all the samples from each claim the Aberdeen gave 50.3 per cent. in copper, 4½ ounces in silver, and a trace in gold, and the Plymouth Queen gave equally good results. Since these samples came to hand more work has been done on the claims but the lowest assay of any sample received has been 39.9 per cent. in copper, while silver values have shown higher values than in the first samples. It is certainly gratifying to the writer to learn that his good opinion of the district has been borne out by subsequent developments, for at the time of his visit no mining was being done in the district and it was at his suggestion that prospecting was carried out on the Aberdeen claim on lines which have resulted in so short a time in showing so large and rich an ore body.

As the Ten-Mile Creek is accessible by vehicle from Nicola, Spence's Bridge, or Savona on the C. P. R. main line, mining men will no doubt pay this district a visit during the coming year.

The Slate Creek is another property upon which

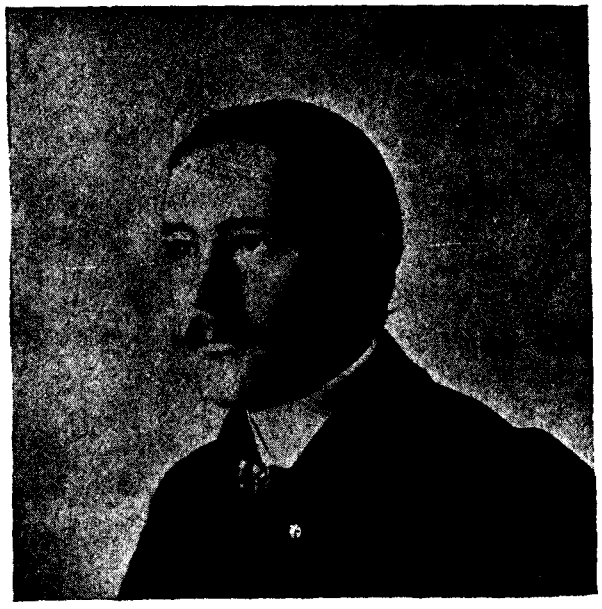
The Granby Smelter Site Before Work was Started.

the writer spent a week during September of last year and as operations here are to be commenced shortly a few details about the property and its equipment may be interesting. The Slate Creek alluvial claim of 320 acres is situate 70 miles south of Nicola at the junction of the Slate Creek with the Tulameen River, three and-a-half miles from Otter Flat, on the Nicola-Princeton road. In September last year the Provincial Government built a nine-foot road from Otter Flat to the Slate Creek property.



The Carson Smelter Site, Four Miles from Grand Forks.

To bring water from Slate Creek for mining purposes on the auriferous portion of the company's ground was the first requirement, and to accomplish this a ditch half a mile in length, two feet in depth, four feet in width, sides sloped to 2½ feet in bottom, with good grade, was made. Between the intake of the water from Slate Creek and ground to be worked a high ridge called the Hog's Back intervenes through which a tunnel 250 feet in length has been cut five feet in width and six feet in depth and safely timbered throughout. From this point to the



Mr. A. B. W. Hodges, Supt. of the Granby Smelter.

penstock a flume 1,500 feet in length down a steep grade has been built from which extend some 300 feet of iron piping connecting with the monitor. A very powerful stream of water is thus obtained, and the supply from Slate Creek in September was ample for all requirements. The ground to be worked lies several hundred feet above the Tulameen River, the south bank of which is quite close, and of which bank 600 feet has been leased to the company for twenty years for dumping ground. From the mouth of Slate Creek a cart road winds round the face of the steep embankment to be worked, in which a number of open cuts disclose three distinct alluvial deposits. The one nearest the surface consists of large boulders and sand, the second of well worn iron stone and pebbles, and the last of red sand going to a depth not yet disclosed. All three contain gold and with the iron stone native platinum is found, the proportions being obtained by the writer being from 23 to 58 cents per cubic yard. Considering the natural facilities for economical working, costs ought not to exceed five cents per cubic yard.

This property has been acquired by an English syndicate.

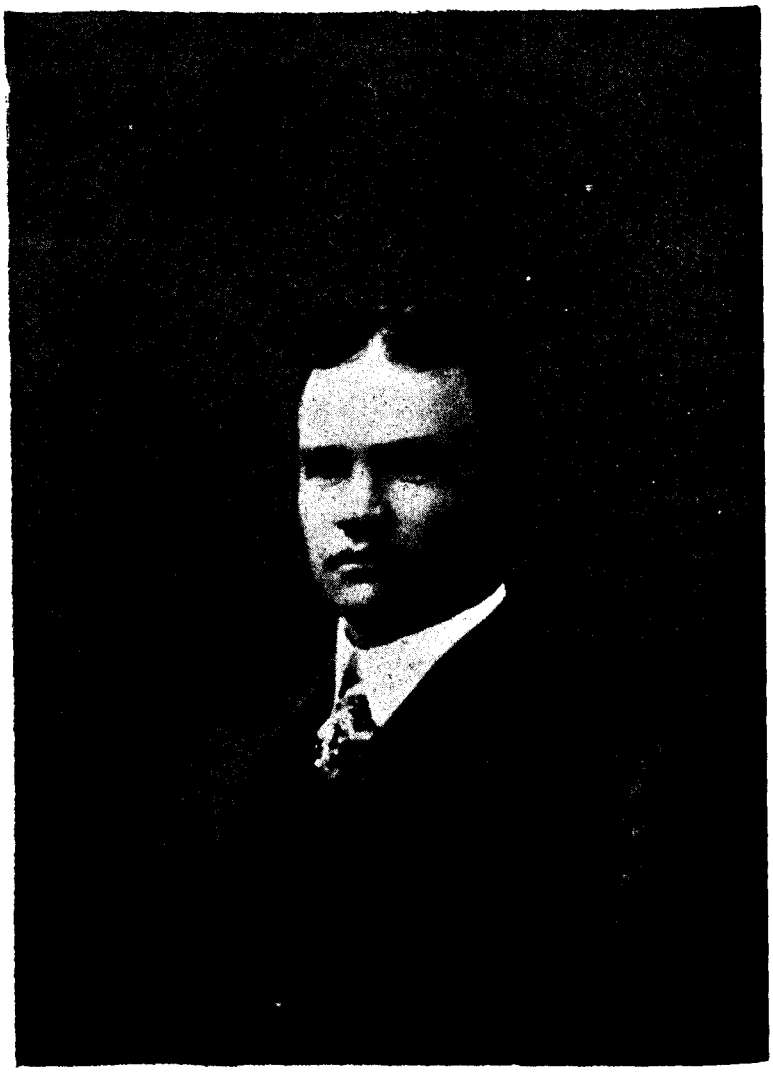
REVIEW OF THE ALASKAN BOUNDARY QUESTION.

(By Alexander Begg, Author of the History of British Columbia.)

IN writing a "review" of the Alaskan Boundary question, it will be necessary to take a retrospective glance of the circumstances connected with the passing of the treaty, to arrive at an intelligent view of the subject, and go back as far as September, 1821, when the Emperor of Russia issued an ukase or edict which contained regulations relative to trade on the northwest coast of America; on the eastern coast of Siberia and the Aleutian, Kurile and other islands of the Pacific.

The treaty referred to, which defined the line of demarcation between that portion of the continent of North America claimed by Great Britain and Russia, was passed at St. Petersburg in 1825. Its final location, however, has not as yet been settled, although seventy-five years have elapsed since its passing, except that portion of the line of demarcation from the Arctic Ocean running south along the 141st meridian to the North Pacific Ocean. The balance of the international line, which has now come to be required as the boundary between the United States (Alaska) and Canada (British Columbia), southeasterly to the southernmost point of Prince of Wales Island (Cape Chacon), is the portion yet in dispute.

The ukase occupied nearly ten pages of a closely printed pamphlet as laid before the President of the United States, and contained sixty-three sections. The first section set out by stating that "the pursuits of commerce, whaling, fishing and other industry, on all islands, ports and gulfs, including the whole northwest coast of America to the 45° 50′ north latitude, are all included in the edict for the purpose of granting the same exclusively to Russian subjects." The second section "prohibits all foreign vessels not only



Mr. B. C. Riblet, who Planned the Water-Works System for the Granby Smelter.

from landing on the coasts and islands belonging to Russia, but, also, does not permit them to approach those coasts and islands within less than one hundred Italian miles, without the vessels being subject to confiscation, along with the whole cargo." (An Italian mile measures 2,025 yards.)

A writer in the *North American Review,* (new series, number 37, printed in Boston, 1822,) remarks: "We doubt if pretensions so extravagant and unfounded—so utterly repugnant to the established laws and usages of nations—have been set up by any government claiming rank among civilized nations since the dark ages of ignorance and superstition, when a bull of the Holy See was supposed to convey the rights of sovereignty over whole continents, even in anticipation of their discovery." * * * * Even the attempts of Spain to usurp the exclusive navigation of the South Sea, in the vicinity of her American possessions, arbitrary as they were, and violating as they did the indisputable rights of other nations, must, when examined with reference to the different periods when they were made, yield in absurdity to the claims now before us."

President Adams, on receiving the Russian edict, say: "A few years afterwards, it (Norfolk Sound) was visited for commercial purposes, and, abounding in valuable furs, soon became the general resort of all those engaged in that trade. It was frequented by the vessels of Great Britain, France, and the United States several years before the Russians had extended their excursions so far eastward, and it is, therefore, clear that they had no claim on the ground of occupation. If, then, prior to 1799, Russia possessed no rights on this part of the coast, but such as were common to and enjoyed by other nations, we confess," the reviewer continues, "ourselves unable to perceive why the establishing of a few hunters and mounting some cannon in the corner of Sitka Bay, should give her the right of restraining an intercourse and interdicting a commerce which had hitherto been as free as air, and prohibiting the approach of vessels of other nations to shores which the navigators of such nations first discovered and explored. The claim of Russia to sovereignty over the Pacific Ocean, nortl. of latitude 51°, on the pretence of its being 'a close sea,' is, if possible, more unwarrantable than territorial usurpations."

"We have," the *Review* writer continues, "the au-

General View of the Town of Grand Forks, Boundary Creek District.

along with a note from the Russian Ambassador, M. de Poletica, expressed surprise at the extraordinary claim set forth, and inquired if M. de Poletica "is authorized to give explanations of the grounds of right upon principles generally recognized by the laws and usages of nations, which can warrant the claims and regulations contained in the edict?"

M. de Poletica, in reply, declared himself "happy to fulfil the task," and wrote a lengthy letter to the Secretary of State, from which it would appear that the edict chiefly related to, "as he said, 'the new regulations adopted by the Russian American Company, and sanctioned by His Majesty the Emperor, relative to foreign commerce, in the waters which border upon the establishments of the said company on the northwest coast of America.' "

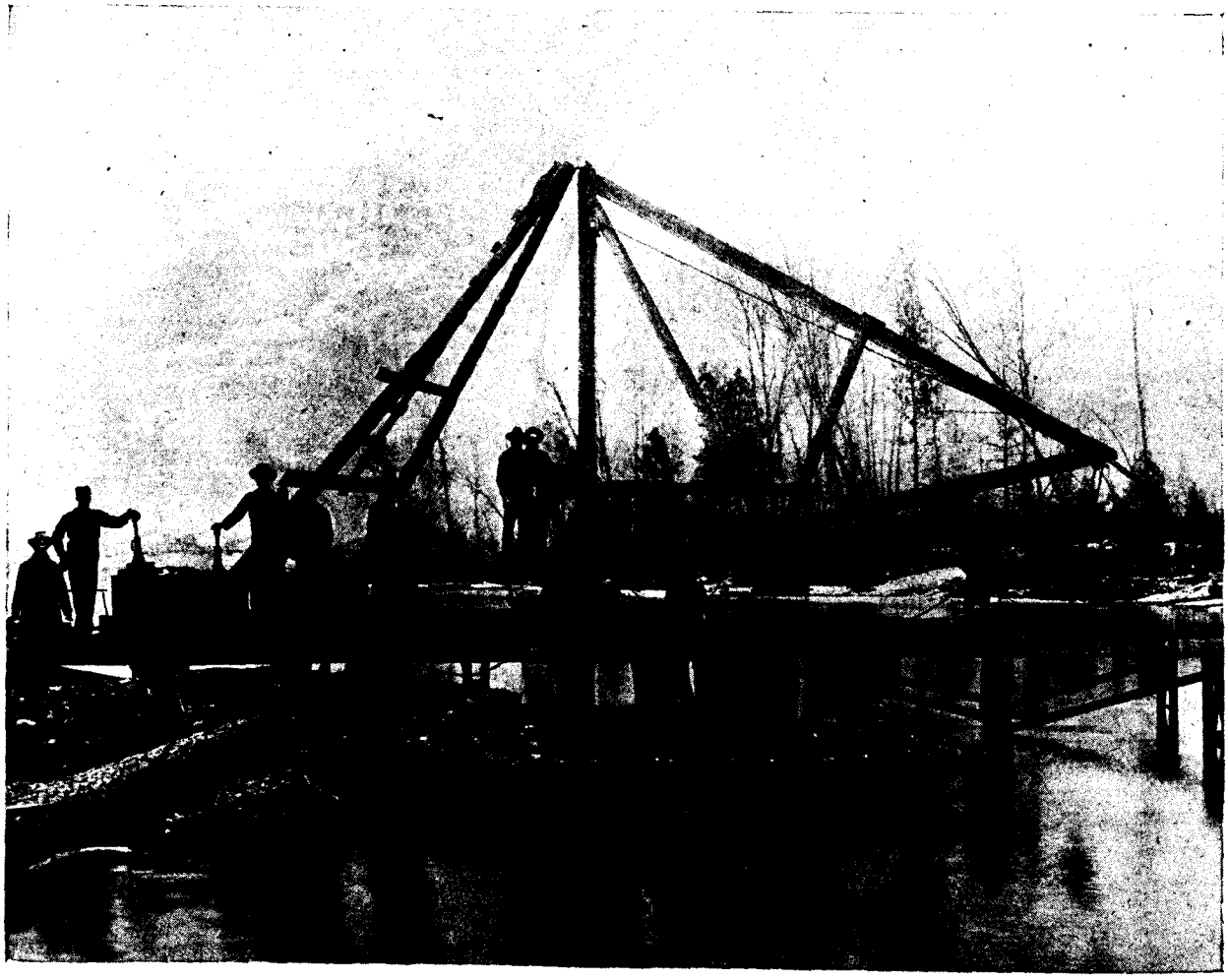
The reply by M. de Poletica, which, according to his proposition of fulfilling the task, was to contain certain historical facts, is published in full in the *Review*, and is shown to be incorrect and erroneous, in many of the important points which the ambassador undertook to establish.

In his criticisms, the writer in the *Review* goes on to thority of Humboldt for stating, that in 1802, the Russian government limited their territorial claims to the north of 55°. They are now extended to 51°, and M. de Poletica informs us, that this is only a moderate use of an incontestible right—intimating that the just claims of Russia extend still further south. If these usurpations are submitted to, is it improbable that a further use may be made of 'incontestible rights?' With the ingenuity which that gentleman has displayed, it would not be difficult to extend the Russian claims quite to the borders of California, and establish them there as satisfactorily as he has done to the 51st degree. The Russians have already made a considerable settlement on Spanish territory at Port Bodega in latitude 40°, and it is possible that, guided by the same spirit of philanthropy which prompted the dismemberment of Poland, the august Emperor may choose to occupy the fertile but defenceless province of California and annex it to his already extensive dominions. * * * * Great Britain, we apprehend, may see fit to advance claims that will be found to conflict with those of Russia. * * * * In justice to the memory of her celebrated navigators, Cook and

Vancouver, we must declare," continues the reviewer, "that the world is more indebted to their indefatigable labours for a correct knowledge of the coast than to those of all others who have visited it. Her subjects were the first Europeans who engaged in the fur trade, and a free access to the interdicted shores, is, at the present time, as important to them as to those of any other power."

A reference to "Captain George Vancouver's voyages of Discovery" in the years 1790-'91-'92-'93-'94 and '95, shows that during the summer of 1794, two of his boats in charge of officers Whidbey and Johnstone had been engaged in exploring and surveying the northwestern coast of North America, from Cape Spencer to Port Conclusion. They had instructions from Captain Vancouver in concluding the survey, and in the event of the two parties meeting, to put the finishing stroke on the examination of those shores, within the limits of Captain Vancouver's commission, to take possession of the continent from New Georgia northwestward to Cape Spencer, as also of all adjacent islands which had been discovered within those limits, in the name of and for His Britannic Majesty, his heirs and successors. Those instructions were carried into effect to the full extent, for it is recorded in the "Voyages" referred to that the parties met on the 17th of August, 1794, and on "stopping to dine the boats' colours were displayed; the boats' crews drawn up under arms, and possession taken under the discharge of three volleys of musketry, with all the other formalities usual on such occasions; and a double allowance of grog was served round to the respective crews for the purpose of drinking His Majesty's health. The happy meeting of the two parties having taken place on the birthday of His Royal Highness, Frederick, Duke of York, the sound in which they met, Captain Vancouver says: "I honoured with the name of Prince Frederick Sound, and the adjacent continent, northwestward from New Cornwall to Cross Sound, with that of New Norfolk." Thus by discovery, survey and taking possession of the continent and islands as specified, the title and sovereignty of the whole was unquestionably vested in Great Britain.

The British Government having learned of the promulgation of the Russian edict, lost no time in representing to the court at St. Petersburg that His Britannic Majesty could not admit or consent to the regulations contained in the ukase. The Right Honourable George Canning, then Secretary of State for Foreign Affairs, nominated Sir Charles Bagot, British plenipotentiary at St. Petersburg; and instructed him to proceed to the Russian court, to open a convention to have the ukase abrogated, and the territorial boundaries between Great Britain and Russia defined and established upon the basis of the instruction forwarded to Sir Charles Bagot in 1822. The Russian plenipotentiaries were Mons. de Politica, the Imperial Chancellor of State, and Count de Nesselrode, Imperial Secretary of State.



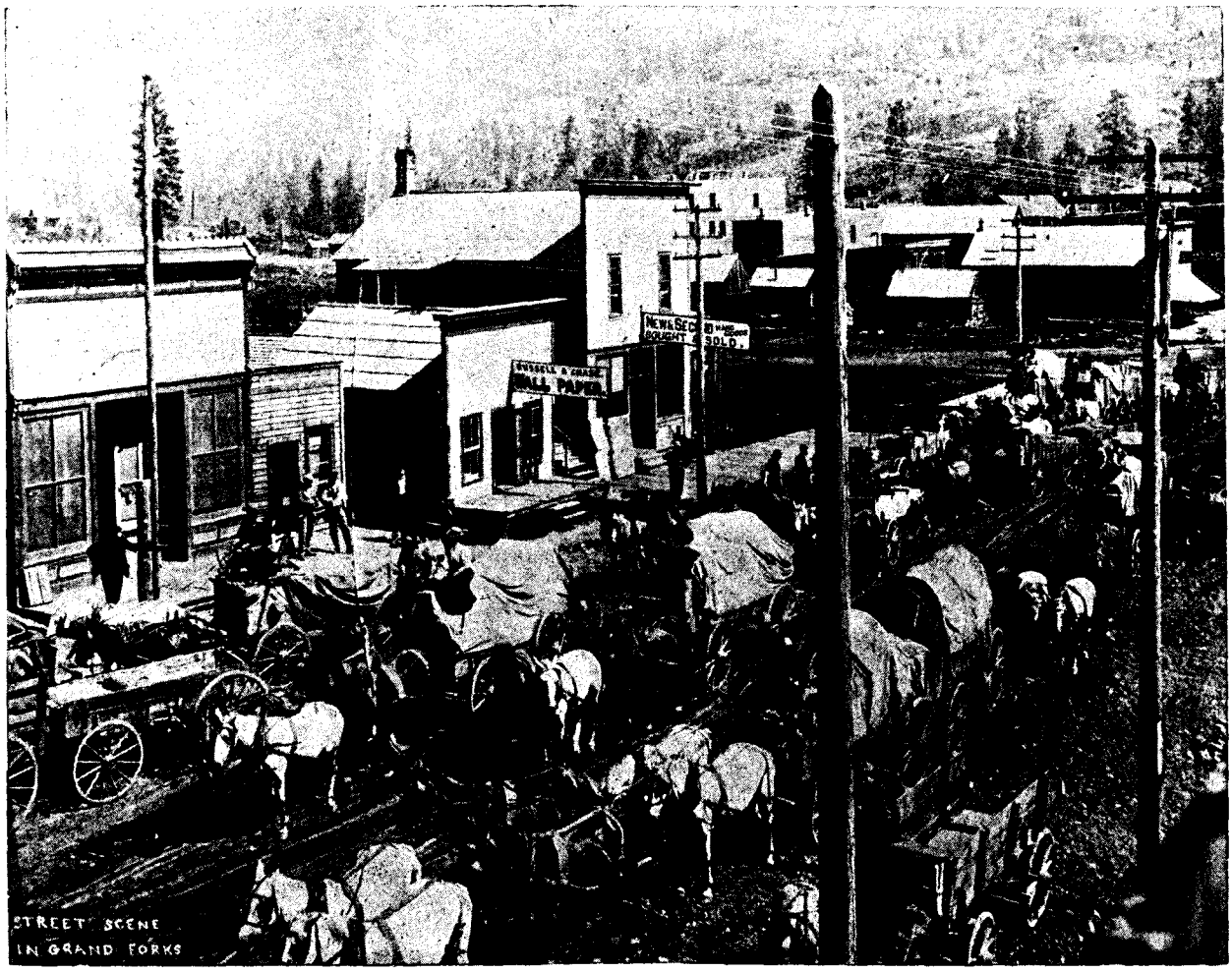
A Dredge at Work on the Kettle River.

Many conferences were held, and propositions and counter-propositions made on both sides, which lasted over two years. In a despatch from G. Canning to Sir C. Bagot, dated 20th January, 1824, a letter from Mr. Pelly, chairman of the Hudson's Bay Co., is referred to. It represents that the most southern establishment of Russia on the northwest coast of America is Sitka, in latitude 57°. Mr. Pelly positively affirms that the Russians have no settlement on the mainland, nor any commerce to the eastward of the coast. In the same despatch Mr. G. Canning remarks: "The questions at issue between Great Britain and Russia are short and simple. The Russian ukase contains two objectionable objections: First, an extravagant assumption of maritime supremacy; secondly, an unwarranted claim of territorial dominions." * * *

Sir Chas. Bagot, on 17th March, 1824, sent a despatch to G. Canning stating "it is with feeling of considerable disappointment that after constant negotiations for more than six weeks, after having gone to the utmost limit of your instructions, and after having taken upon myself to go beyond them, I should, nevertheless, have to acquaint you that I have entirely failed in inducing the Russian Government to accede to what I consider to be a fair and reasonable adjustment of our respective pretensions on the northwest coast of America, or the adoption of any line of territorial demarcation which appears to me reconcilable under the spirit of your instructions, with our legitimate interests in that quarter of the world."

"In order that I may put you in complete possession of the whole course of my negotiations upon this subject, and may explain the precise grounds upon which I have felt myself compelled to suspend for the present all further proceedings in this business, it will, I fear, be necessary that I should enter into detail, and that I should load this despatch with several papers which are now become of importance. It was on the 16th of last month that I had my first conference with the Russian plenipotentiaries. * * I laid before them Count Leiven's note to you of January 31st, 1823, proposing that the question of strict right should be provisionally waived on both sides, and that the adjustment of our mutual pretensions should be made upon the sole principle of the respective convenience of both countries. * * * This basis of negotiation was willingly accepted by all parties." * * *

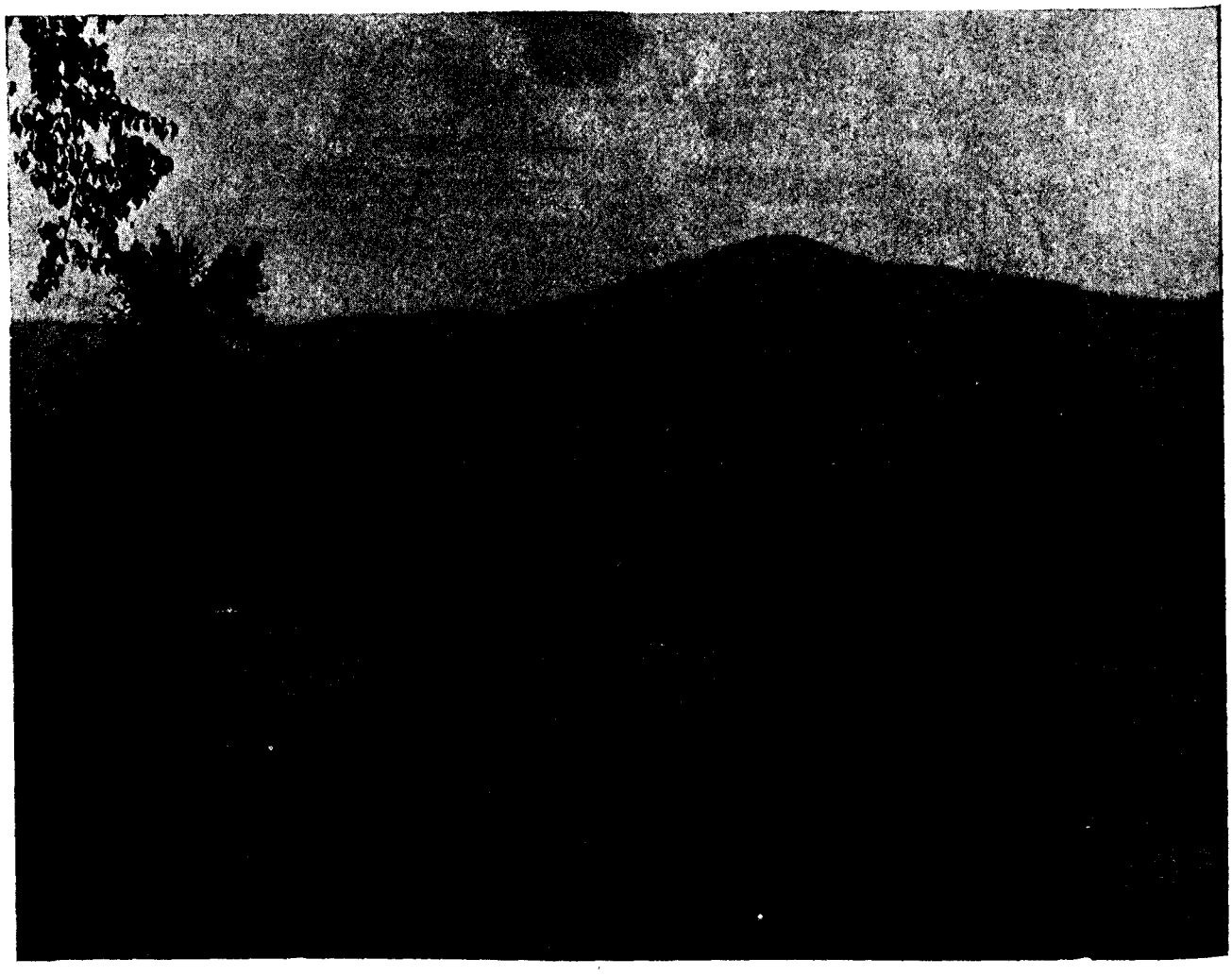
A proposal was verbally made by Sir Charles Bagot "to make as the boundary, a line drawn through Chatham Strait to the head of Lynn Canal, thence northwest of the 140th degree of west longitude, and thence along that degree of longitude to the Polar Seas." This proposal was taken for consideration by the Russian plenipotentiaries, who at the next conference offered a contra project, which was reduced to writing, and marked "A." It was, generally speaking, found to be inadmissible. Sir Charles Bagot then submitted a modification of his original proposal—marked "B," to be submitted at the next meeting of conference. At the next meeting, paper "B" was met by objections,



A Street Scene in the Busy Town of Grand Forks, Boundary Creek District.

and a paper marked "C" brought in by the Russian plenipotentiaries, which was replied to by a paper from Sir Charles, marked "D," which contained his ultimate proposition, and stated that it never had been affirmed by the plenipotentiaries of His Imperial Majesty, that Russia possessed any establishments whatever on the mainland south of 60° or 59° north latitude.

Ten days after Sir Charles Bagot had presented paper "D,," he was invited to another conference, when he was informed that the Imperial Government had, after anxious consideration taken their final decision, and that they must insist upon the demarcation to be drawn between the British and Russian occupancy on the northwest coast of America, and of the comparative inconvenience of admitting some relaxation in the terms of Your Excellency's last instructions, or of leaving the question between the two governments unsettled for an indefinite time, His Majesty's government have resolved to authorize Your Excellency to include the south points of Prince of Wales Island within the Russian frontiers, and to take as a line of demarcation a line drawn from the southernmost point of Prince of Wales Island, from south to north, through Portland Channel, till it strikes the mainland in latitude 56°; thence following



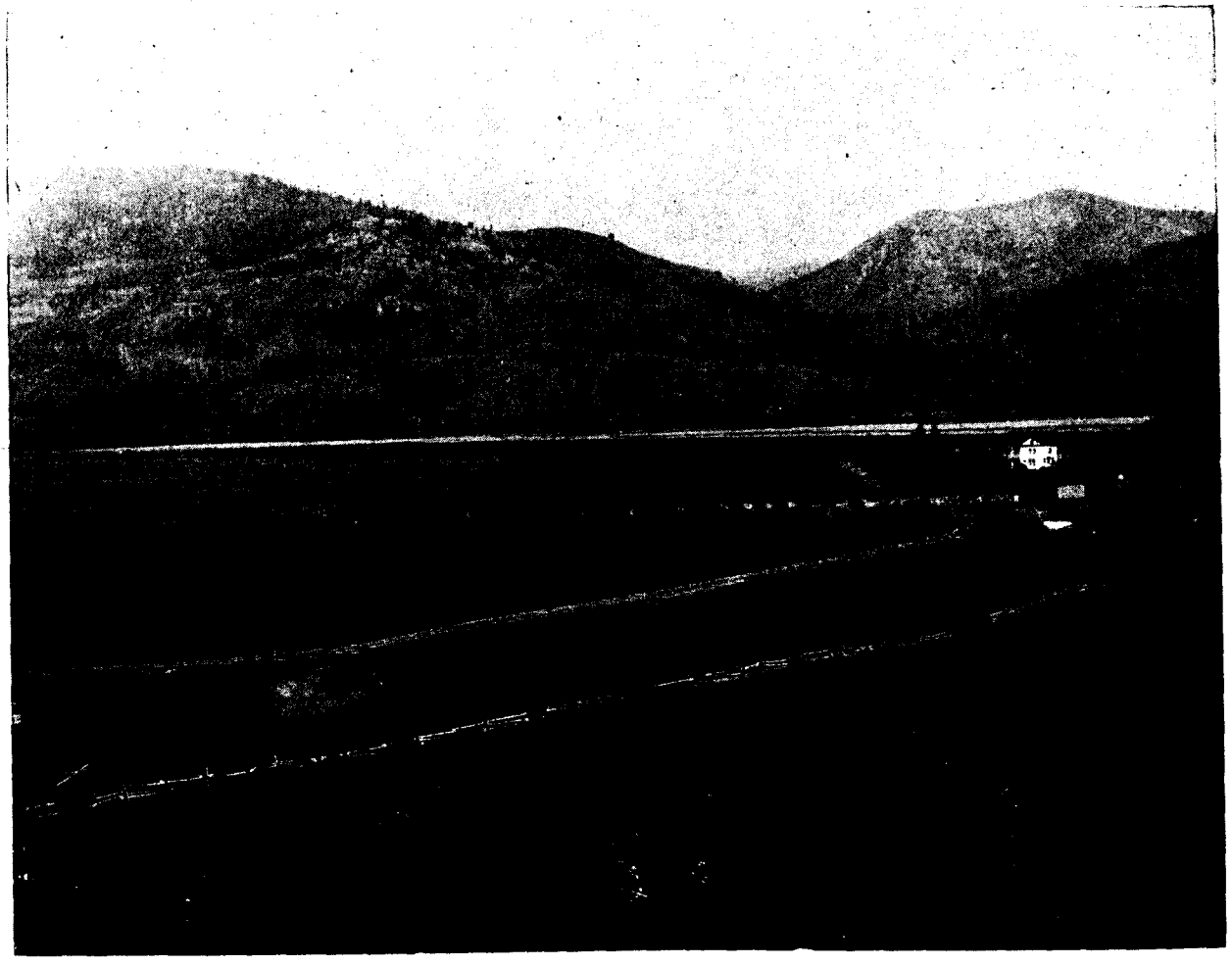
A Hotel in the Town of Grand Forks.—This Hotel Cost $50,000 to Build.

tion as described by them in the first paper marked "A." Finding this to be the case, Sir Charles stated to them that he had already gone far beyond the utmost limit of his instructions, and that he was sorry to say that he must "now consider the negotiations as necessarily suspended, so far, at least, as the question of territorial demarcation was concerned." "Such has been the course of my last negotiations upon the question, and such the grounds upon which I have thought it my duty to suspend it for the present." On the 12th of July, 1824, the Right Hon. G. Canning sent another despatch to Sir Chas. Bagot stating—"After full consideration of the motives which are alleged by the Russian Government for adhering to their last propositions respecting the line of demarcation to be drawn between the British and Russian occupancy on the northwest coast of America, and of the comparative inconvenience of admitting some relaxation in the terms of Your Excellency's last instructions, or of leaving the question between the two governments unsettled for an indefinite time, His Majesty's government have resolved to authorize Your Excellency to include the south points of Prince of Wales Island within the Russian frontiers, and to take as a line of demarcation a line drawn from the southernmost point of Prince of Wales Island, from south to north, through Portland Channel, till it strikes the mainland in latitude 56°; thence following the sinuosities of the coast along the base of the mountains, nearest to the sea to Mount Elias, and thence along the 139th degree of longitude to the Polar Sea." (The degree of longitude was afterwards corrected to the 141st meridian.) The despatch continues: "The advantages conceded to Russian by the line of demarcation traced out in this convention, are so obvious, as to render it quite impossible that any objection can reasonably be offered on the part of the Russian Government, to any of the stipulations in our favour. There are two points which are left to be settled by Your Excellency. First, in fixing the course of the eastern boundary of the strip of land to be occupied by Russia on the coast. * * * This is done by a process that that line shall in no case be carried

further to the east than a specified number of leagues from the sea." The distance specified in the treaty is ten marine leagues from the ocean—and "shall never exceed the distance of ten marine leagues therefrom." —(Article IV of Treaty.)

Sir Charles Bagot was succeeded as British plenipotentiary at St. Petersburg, by Mr. (afterwards Sir) Stratford Canning, who was appointed under instructions dated December 8th, 1824, as follows: "Sir,—His Majesty having been graciously pleased to name you his plenipotentiary, for considering and signing with the Russian Government a convention for terminating the discussions which have arisen out of the promulgation of the Russian ukase of 1821, and for settling the respective territorial claims of Great Britain and Russia, on the northwest coast of America, I have received His Majesty's commands to direct you to repair to St. Petersburg for that purpose, and to furnish you with the necessary instructions for terminating this long protracted negotiation. * * * The whole negotiation grows out of the ukase of 1821. * * * * So entirely and absolutely true is this proposition, that the settlement of the limits of the respective possessions of Great Britain and Russia on the northwest coast of America was proposed by us, only as a mode of facilitating the adjustment of the differences arising from the ukase, by enabling the Court of Russia, under cover of the more comprehensive arrangement, to withdraw, with less appearance of concession, the offensive pretensions of that edict. The right of his subjects to navigate freely in the Pacific cannot be held as a matter of indulgence from any power. Having once been publicly questioned it must be publicly acknowledged."

"It is comparatively indifferent to us whether we hasten or postpone all questions respecting the limits of territorial possession on the Continent of America; but the pretensions of the Russian ukase of 1821, to exclusive dominion over the Pacific could not continue longer unrepealed without compelling us to take some measure of public and effective remonstrance against it." * * * The despatch from the Right Hon. G. Canning, covering the appointment of Stratford Canning, concludes by stating: "It remains only in recapitulation to remind you of the origin and principles of the whole negotiation. It is not, on our part, essentially a negotiation about limits. It is the demand of the repeal of an offensive and unjustifiable arrogation of exclusive jurisdiction over an ocean of unmeasured extent; but a demand qualified and mitigated in its manner in order that its justice may be acknowledged and satisfied without soreness or humiliation on the part of Russia. * * * We negotiate about territory to cover the remonstrance upon principle. But any attempt to take undue advantage of this voluntary facility, we must oppose. If the present project is agreeable to Russia we are ready to conclude and sign the treaty. If the territorial arrangements are not satisfactory we are ready to postpone them; and to consider and sign the essential part, that



The Agricultural Possibilities of the Kettle River District—A Fruit Farm near Grand Forks.

which relates to navigation alone, adding an article stipulating to negotiate about territorial limits hereafter. But we are not prepared to defer any longer the settlement of that essential part of the question; and if Russia will neither sign the whole convention, nor that essential part of it, she must not take it amiss that we resort to some mode of recording in the face of the world our protest against the pretentions of the ukase of 1821, and of effectually securing our interests against the possibility of its future operations."

Mr. Stratford Canning, before proceeding to St. Petersburg, as plenipotentiary to succeed Sir C. Bagot was furnished with a royal diplomatic letter of introduction from His Britannic Majesty, King George IV., which doubtless had a beneficial effect on the success of his mission. The royal letter was as follows:

"His Majesty King George to the Emperor of Russia:

"Sir: My Brother,—In pursuance of your Imperial Majesty's invitation to nominate a plenipotentiary to assist on my part in the conference which your Imperial Majesty is desirous of holding at St. Petersburg for considering a plan of pacification between the Ottoman Porte, and the Greek Provinces, I have selected for that special commission, the Right Honourable Stratford Canning, a member of the Privy Council, late my envoy extraordinary to the United States of America, when circumstances which have no doubt been already stated to Your Imperial Majesty, by Your Imperial Majesty's ambassador at my court, and which will be more fully explained to Your Imperial Majesty by Mr. Stratford Canning himself—oblige me to hesitate in taking a part in those deliberations. Being, however, equally animated with a sincere desire to come to a complete understanding with Your Imperial Majesty on the important subjects to which these conferences have related, I have still determined to direct Mr. Stratford Canning to proceed to your court for the purpose of explaining to Your Imperial Majesty, with perfect frankness, my sentiments thereupon. He is authorized to conclude certain other negotiations which have been some time pending with Your Majesty's government, relating to the navigation of the Pacific and to the boundaries of our possessions on the northwest coast of America; and the experience I have had of his talents and zeal for my service, assure me that he will render himself agreeable to Your Imperial Majesty.

"I request that Your Imperial Majesty will give credence to all he shall say to you on my part, more especially when he shall reiterate to Your Imperial Majesty the assurances of my earnest desire to cement more and more the union and good understanding which have so long and happily subsisted between our two crowns.

"With sentiments of invariable friendship, I am, sir, my brother,

"Your Imperial Majesty's Good Brother,
MANU REGIA. GEORGE R.

Carlton Place, 8th December, 1824.

To My Good Brother, the Emperor of All the Russias.

Mr. Stratford Canning, on February 17th, 1825, forwarded a despatch to Mr. G. Canning containing the treaty which had been concluded and signed on the 16th of February. Very slight changes were made in the convention. "The line of demarcation along the strip of land on the northwest coast of America, assigned to Russia," Mr. Stratford Canning states, "is laid down in the convention agreeably to your directions. * * * The instance in which you will percieve that I have most availed myself of the latitude afforded by your instructions to bring the negotiations to a satisfactory and prompt conclusion, is the division of the third article of the new project, as it stood when I gave it in, into the 3rd, 4th and 5th articles of the convention signed by the plenipotentiaries. * * * The second paragraph of the 4th article, had already appeared parenthetically in the 3rd article of the project, and the whole of the 4th article is limited in its signification and connected with the article immediately preceding it by the first paragraph." Again, Mr. Stratford Canning states to George Canning: "You are aware, sir, that the articles of the convention which I conclude, depend for their force entirely on the general acceptation of the terms in which they are expressed."

The 3rd, 4th and 5th articles of the treaty forwarded by Mr. Stratford Canning are as follows:

"III. The line of demarcation between the possessions of the high contracting parties upon the coast of the continent and the islands of America to the northwest, shall be drawn in the manner following: Commencing from the southernmost point of the island called Prince of Wales Island, which point lies in the parallel of 54 degrees, 40 minutes north latitude, and between the 131st and 133rd degree of west longitude (meridian of Greenwich), the said line shall ascend to the north along the channel called Portland Channel as far as the point of the continent where it strikes the 56th degree of north latitude; from this last mentioned point, the line of demarcation shall follow the summit of the mountains situated parellel to the coast, as far as the point of intersection of the 141st degree of west longitude (of the same meridian); and finally from the said point of intersection, the said meridian line of the 141st degree, in its prolongation as far as the frozen ocean, shall form the limit between the Russian and British possessions on the continent of America to the northwest.

"IV. With reference to the line of demarcation laid down in the preceding article, it is understood:

"First. That the Island called Prince of Wales Island shall belong wholly to Russia.

"Second. That wherever the summit of the mountains which extend in a direction parallel to the coast, from the 56th degree of north latitude to the point of intersection of the 141st degree of west longitude shall prove to be at the distance of more than ten marine leagues from the ocean, the limit between the British possessions and the line of coast which is to belong to Russia, as above mentioned, shall be formed by a line parellel to the windings of the coast, and which shall never exceed the distance of ten marine leagues therefrom.

"V. It is moreover agreed that no establishment shall be formed by either of the two parties within the limits assigned by the two preceding articles to the possessions of the other; consequently British subjects shall not form any establishment either upon the coast or upon the border of the continent comprised within the limits of the Russian possessions, as designated in the two preceding articles; and in like manner no establishment shall be formed by Russian subjects beyond the said limits.

"IX. The liberty of commerce shall not apply to the trade in spirituous liquors, in fire-arms or other arms, gunpowder or other warlike stores, the high contracting parties, reciprocally engaging not to permit the above mentioned articles to be sold or delivered in any manner whatever, to the natives of the country."

(To be continued.)

VERBATIM EVIDENCE IN THE IRON MASK-CENTRE STAR LITIGATION.

HAVING been requested by many of our readers throughout the Province to publish in these columns a verbatim report of the evidence in the Iron Mask-Centre Star litigation, Mr. H. F. Evans, our Rossland correspondent, was enabled through the kindness of Mr. J. B. Hastings to carry out our instructions to copy the official report of the proceedings and evidence taken, and which are in consequence enabled to publish in serial form.

(Continuation of Counsel's Argument, from last month's issue.)

The Court—In ore?

Mr. Davis—In ore; not only in ore, but that it is a fissure vein, unquestionably a fissure vein. That we not only have continuous ore, and we will prove continuous ore to your Lordship every inch of that shaft, but we will also show that it is a fissure vein, and that the fissure can be traced there, the hanging and foot wall of the ore streak can be traced there. That, in short, it is as good a vein as can very well be found. We will show also that that vein coming down to the so-called flat fault has not only extent in depth but lateral extent, and we will show that in this way. We will first show that the Centre Star east drift—this green drift has been run 100 feet east from the inclined shaft and is all the way in ore and on a vein. In that way we have proved the lateral extent of that point 100 feet. We will also prove by means of some work which our friends, the Iron Mask, were kind enough to do for us, which we could not, of course, have done ourselves at this point—which is what we may call the brown cross-cut—that the vein from some 150 feet up from the bottom of the shaft is continuous to the east. That is, they have done this; they evidently honestly believed the evidence put in on the injunction motions by some of their experts: that there was no vein in that shaft, that it was all a mistake, an honest mistake, of course, but was a mistake, that there were only disconnected patches of ore in that inclined shaft and no vein at all and that these disconnected patches of ore were due to the vicinity of the vertical dyke. That being so, of course, they argued it out very logically that if they got 50 or 60 feet further away from that vertical dyke—that is at this point where the crown cross-cut is they would be out of the region of disturbance caused by the vertical dyke and this apparent vein would at that point disappear.

Mr. Davis—Now, having figured that out, they said we will put an end to this thing at once; we will run a cross-cut from our stope right straight back, which will necessarily in its course cut through where the Centre Star No. 2 vein must be if it has any lateral extent, and we will run the cross-cut 50 or 100 feet beyond where the vein should be according to survey, and then we will show from that that there is no vein. We will be able to take in mining engineers to that cross-cut, take them along the walls and satisfy them beyond all question that that cross-cut runs through no vein, and therefore the Centre Star people have no vein in the inclined shaft.

The Court—When was this run?

Mr. Davis—This was done since the trouble started, since the litigation. My friend, Mr. Galt, tells me it was since the matter was argued before your Lordship. This was not in evidence at that time—we did not know it at that time; it was done, I think, since then. Well, they ran it across, and just at the exact point where by survey that vein should be struck, they ran into a solid body of pyrrhotite ore. They evidently met something more than they had expected and they stopped. They had no further curiosity in connection with that cross-cut. Not only was a solid body of pyrrhotite ore found there, the same as is found in No. 3 shaft, but we find from the evidence apparent in that shaft that the vein is a very broad vein; we find an exterior wall of that vein back some 14 or 15 feet from the body of pyrrhotite, and it could, of course, extend naturally as far on the other side, so that that brown cross-cut shows that vein to be a very broad vein, probably 20 or 25 feet or so as it is shown to be in other points, or possibly broader, as one would naturally expect to find a fork of the War Eagle's vein which has been shown to be of almost enormous breadth in a great many places. Now, they ran from the green drift, I think I mentioned to your Lordship, a winze and we will show you that winze and we will show you that winze is in continuous ore from top to bottom and that the walls of ore are to be seen there, so that we have the lateral extent of the body of ore traced to this point 100 feet east of the inclined shaft. That having been stopped—and I referred to the apex before—I might say that at the time the matter was before your Lordship on the motion to dissolve the injunction it was not in the same position as it is now. The apex between No. 3 shaft and No. 2 shaft had not been sunk to the point where it now is; it has been run down a little ways, I believe, but that is all. In the meantime we had the apex stripped showing a continuous apex from No. 3 to No. 2. We then ran No. 2 down on the dip of this vein. Your Lordship will see the dip here shown by the line run across, and we find a continuous vein all the way down No. 2 to the bottom of the No. 2 shaft. This point here, this steeper rise, is a matter that will be explained to your Lordship by the experts when they come in. This No. 2 vein comes down here and we then trace it along this yellow level from the point which is called No. 4 raise to this point which is called No. 2 raise. We trace that vein continuously from there. We then ran this raise; this is all new work which was not done at the time your Lordship heard the other argument, and it was done for the purpose of elucidating this matter.

Mr. Davis—Yes, that injunction prevented us from going into Iron Mask ground at all; that hampered us in developing it, but we did what we could. You notice this raise is run up on the side line of Centre Star just as close as we can go, right on the side wall, and comes up there and over this way. This is run up in our ground; all this new work is in our ground. Of course, we cannot disclose it as we could, or anything like as well as we could, if we were allowed to work on Iron Mask ground, but so far as it can be from our own ground we have shown that vein on up and we have shown a continuous sheet of ore we have given, or will give, physical proof of a continuous sheet of ore all around here, down here, across here, up here, in there, and as a result of that it must be found that all this space between No. 3 shaft and No. 2 shaft is a continuous sheet of ore. Then having established that sheet of ore between these points, some three or four hundred feet in lateral extent, and over 300 feet in depth, we will put in evidence to show that that sheet of ore which must constitute a strong vein, so far as vein itself is concerned—which has

nothing to do, I might say with ore values, since you may have a very strong vein running very low in ores; it may do that for a vertical distance, and then the ore may increase in value, and you may have a very rich vein, where before it was perhaps very poor.

Mr. Davis—Now, having shown a vein of such extent, a vein which is broad, though it does not appear how broad, it may be the best thing is to consider whether or not the continuity of that vein is destroyed by this so-called flat fault. It would be remarkable if anything, as apparently immaterial as that so-called flat fault is, should destroy the continuity of a vein, but in order to be sure of it it was necessary to find that so-called flat fault at as many points as possible. We have made our development work as far as we could do development work to a great extent to elucidate the question of the so-called flat fault, with the result that we are now in a position to put before your Lordship evidence of the appearance of that flat fault at 11 different places; it will be quite sufficient to show the nature of the flat fault itself, and we will show your Lordship that instead of being a flat fault, as they call it, of any prime importance, it on the contrary, is a fracture which has had as little effect on veins or other fissures that it crosses as one could possibly find.

The Court—It has not displaced it?

Mr. Davis—It has not displaced it at any place. I might say that, in addition to showing this flat fault at 11 different places, we show intersections with veins at seven different places, and the largest throw or displacement which exists anywhere in any of the seven places is some foot and a-half—something in the neighbourhood of a foot and a-half. At other places it is less, and in other places there is no displacement at all, so far as can be seen. We will show that, as far as width goes, it is a thing that si only a few inches or so wide, that it is not a number of feet—10, 12 or 15 feet—as has been stated, and that as I say, it does not cut off and vein. We have in four different places that flat fault crossing our Centre Star No. 2 vein. In any instance we find the vein immediately below the flat fault. Of course, if you have a fracture there must be something between the ore—

The Court—Your number 2 vein is a vein that is in the—

Mr. Davis—Incline shaft.

The Court—The Iron Mask?

Mr. Davis—Yes, my Lord. We have four places where the mud seam crosses this vein.

The Court—Four different places?

Mr. Davis—Four different places of intersection and everywhere we find that the ore comes down to the top of what is called the mud seam, which is generally two or thre or four inches broad, perhaps a little more in some places, and in other a little less.

The Court—Four different places you mean?

Mr. Davis—Four different places laterally and vertically. We find it in upper levels and lower levels, the flat fault; we see it in eleven different places.

The Court—It is not exactly horizontal.

Mr. Davis—No it dips at about from 25 to 30 or 40 degrees.

The Court—It dips both ways.

Mr. Davis—It dips south; it runs east and west and dips south, and strikes our vein at about right angles.

The Court—I meant, if it ran due east and west, would it not strike at the same elevation throughout the different shafts that you have sunk?

Mr. Davis—No, it does not strike that. You see, they are in different places. That will be fully explained by the experts when they get on. I don't want to raise it too complicated just now, but the dip of the mud seam is something like this, and you will find an intersection in the Iron Mask, that is for instance on this level (indicating), and you will find it intersecting the Centre Star on another level there, and you will find an intersection at the bottom of this winze; you will find then an intersection over here in this No. 2 raise, and in the No. 4 raise, and so on. But I don't want to go into the details of these intersections at the present time but simply refer to them and state that our evidence will show that wherever you find those intersections, this, and this only, is the result. We have ore coming down to what we may call the hanging wall of the fracture, which has been called the flat fault; we the find from one to three or four inches of broken up matter. Of course, whenever there is a fracture there is apt to be some washing, and some fraction, and therefore there will be a certain amount of the stuff, whatever it may be, that was at the place where the fracture took place, ground up and that it is ground up and water comes through they make what looks like mud. We shall show your Lordship that in that very so-called mud there is ore to be found, wherever the mud seam crosses our Centre Star vein; that we have the one immediately above the fracture, immediately below the fracture and between, and connecting the two, what has been termed "mud," but it is and in some places country rock ground up firmly, that it passes there into mud. We will also show your Lordship that below the mud seam the Centre Star vein is to be found in a number of places—places where it should be, where we would expect it to be from the surveys. We will show your Lordship that at several places we have found intersections of the Iron Mask and the Centre Star veins, showing that beyond all question there are two veins there, and what they intersect by intersecting. I meant apparently, as far as we can show at the present time from the work done that they cross each other, do not unite; they come down. You see the dip is a little steeper, a good deal steeper, I may say, of the Iron Mask than the Centre Star. The Iron Mask comes down like this (illustrating). The Centre Star comes down like this (illustrating), and of course in time they are bound to cross, and we show where they do cross.

Mr. Bodwell—You mean the Centre Star passes through the Iron Mask vein.

Mr. Davis—So far as work has been done at the present time that is the opinion of our witnesses, that it passes through and emerges on the other side. I think the evidence is not as clear on that point as it might be, although that is not a thing that is in question here. The real question is not what happened, whether the two unite, or whether the Centre Star crosses and goes on on its own course, but whether or not we have an apex; we have a continuation then from that apex and whether or not the vein is cut off by the mud seam. Now, I think, my Lord, that that is all that I can say to your Lordship at this juncture with any good effect, and I will proceed after adjournment to put in our witnesses.

Thereupon the Court, after consultation with counsel, adjourned the case until 2 o'clock p.m.

AFTERNOON SESSION.

April 20th, 1899.

Trial resumed 2 o'clock p. m.

The Registrar—The case of the Iron Mask Mining Company (foreign) vs. the Centre Star Mining and Smelting Company (foreign) defendants.

Mr. Davis—In my opening, my Lord, I was in error when I mentioned the raise—it is in War Eagle raise No. 9 as being on the south fork of the War Eagle. It is on the north fork; that is, the vein which is in dispute.

The Court—The No. 2 vein?

Mr. Davis—The No. 2 vein. Possibly a misunderstanding mgiht arise from what I said with reference to the intersection of the Iron Mask and Centre Star veins. I stated that, in the opinion of our witnesses the veins intersected.

Joseph F. Ritchie sworn on behalf of defendants.

DIRECT EXAMINATION.

By Mr. Davis—

Q. You live in Rosslasnd, I believe? A. Yes, sir.

Q. Have lived here for some time? A. Yes, sir, since 1895.

Q. What is your business? A. Land surveyor.

Q. You have surveyed, I believe, a large number of the mineral claims on Red Mountain? A. Yes, the majority of them.

Q. You know the Centre Star mineral claim, do you? A. Yes, sir.

Q What is the official name of that mineral claim on the district plat? A. It is lot 558, group 1, West Kootenay District.

Q. What is the official name of the description of the War Eagle mineral claim? A. Lot 680, group 1, West Kootenay District.

W. What is the official name of the Iron Mask mineral claim? A. Lot 688, group 1, West Kootenay District.

Q. Have you surveyed those mineral claims as Crown granted? A. I surveyed the War Eagle and Iron Mask.

Q. The War Eagle and Iron Mask? A. Not the Centre Star.

Q. And the Centre Star? A. No, I have not surveyed the Centre Star; it is a Crown grant. I have surveyed the Centre Star though.

Q. No, but you don't understand what I mean. Have you made a survey of lot 558? A. Oh, yes.

Q. Which is the official description of the Centre Star mineral claim? A. Yes, sir; I have.

Q. When was that? A. In 1894 and 1895.

Q. That was subsequent to it being Crown granted? A. Yes, sir.

Q. Now, the plan which you have in your hand, does that show the three claims that you have mentioned, in accordance with the official description of those three lots? A. Yes, sir.

Q. And shows also, the proximate relationship to certain other claims here, the Virginia, the Idaho, the Nickel Plate and Le Roi? A. Yes, sir.

Mr. Davis—I will put this in.

Q. Which is the earliest location of these claims?

Mr. Bodwell—I object to that because that is not the way to prove it. That is not the best evidence. At least, I take my objection merely formally. There is no foundation yet laid for the reception of Mr. Ritchie's evidence on that point.

Q. Can you say, Mr. Ritchie, from the claims as they appear here, which is the earliest? A. Oh, yes.

Q. Which is it?

Mr. Bodwell—I object again, that that is not the best evidence. The best evidence would be a record, or the evidence of the person who located it.

Mr. Davis—The witness stated that from the plan which is produced here he can state which is the earliest of them, and I think I will ask him which is.

A. That, is according to the surveyor, mind you.

The Court—Of course, the objection is sound. It is not the best evidence.

Mr. Davis—I submit, My Lord, that it is the evidence of what I am showing.

The Court.—He may state the fact. I have no objection, but it is not the best evidence.

Mr. Bodwell—Your Lordship receives the evidence, then, subject to the objection?

The Court—Very well, then; that is the better way. You will not object to it by and by. The battle will be quite a different battle; it will be a battle on the record for that matter.

Plaintiffs ask and are granted an exception.

Q. What do you say from the plan is the earlier location? A. I would say the Centre Star.

Q. You might just give your reasons for it, Mr. Ritchie. A. Well, it is the oldest survey that is made in the camp.

Q. The Centre Star, as shown on the plan, is a full sized claim? A. Yes, sir.

Q. And all of the rest are fractions; that is correct, is it not?

Mr. Bodwell—We object.

Mr. Davis—He certainly can state; I don't understand, my friend to object to it.

Mr. Bodwell—Except it is a very leading question.

Mr. Davis—He has made the survey. The plan itself shows my claim. There is no need of splitting hairs.

Q. And the War Eagle as shown here is only a fraction? A. Yes.

Q. And the Iron Mask is a fraction? A. Yes.

Q. You know Roy Clark, do you not? A. Yes, I know him.

Q. Did you go over the survey posts of the Centre Star from which you made the survey recently? A. Yes, sir. We went over them together.

Q. You went over them together? A. Yes, sir.

Q. When was that? A. Yesterday.

CROSS EXAMINATION.

By Mr. Bodwell:

Q. In making your survey, Mr. Ritchie, you took the official posts? A. Yes, sir.

Q. I believe that survey for a Crown grant was made by Mr. Farwell? A. Yes, sir.

Q. You don't know anything about the location posts? A. Yes, I know where the No. 1 is, and that is the only one I know anything about.

Q. You don't know any of the others? A. No, I have never seen the other two.

Q. Were you here when the Centre Star was located? A. No.

Q. Were you here when the Iron Mask was located? A. No.

Q. Did you look for any of the original posts of the Centre Star? A. No, I never did.

Q. You simply intended to make a survey of the Centre Star as it was surveyed for the patent? A. That was all.

Q. Did you ever see the field notes of the Centre

Star as surveyed for a patent? A. I don't think I have.

Q. You say you know the No. 1 post? A. That is the only one I do know. I mean the one in the gulch; that is the No. 1, I think.

Q. Well, when did you first see that post? A. I think it was in 1895, in making a survey of the Iron Mask. I have got that located in my notes, and called it the No. 1 post.

Q. The Centre Star was surveyed before you began to survey the Iron Mask? A. Oh, yes, it was Crown granted, I think, long before I made the survey.

Q. What you saw there was the official post, put in by Mr. Farwell? A. That is all, and the No. 1 post.

Q. You saw the No. 1 post of the Centre Star? A. Yes, sir.

Q. As it was located then? A. As it was located then.

Q. You never saw it before? A. Never saw it before to my knowledge.

Q. Have you shown it on this plan? A. Yes, sir.

Q. Which side of the Centre Star gulch was that post? A. I could not tell you that very well.

Q. Did you see it yesterday when you went up there? A. Yes, I did.

Q. You did not know which side of the gulch it was on? A. It strikes me it was on the west side, I am not sure now—I did not take any particular notice, on the west side of the Centre Star gulch.

Q. How often have you seen it since you saw it first in 1894 or 1895? A. Not until, if I remember right, yesterday, it was pointed out to me by Mr. Clarke.

Q. Then you would not have remembered where it was to go to, unless Mr. Clarke had pointed it out to you? A. I could easily have located it.

Q. How could have located it? A. By my own survey. I have got the survey located. If the post had been destroyed, I could easily locate it from my own notes.

Q. You took a note of it at the time? A. Yes, sir.

Q. You did not take your notes yesterday to see whether that post was the same one you noted at the time? A. No, I did not.

Q. And you could not tell from location? A. Whether it was the same post or not, is that what you mean?

Q. Yes. A. Well, it was close to the cabin, but I could not tell you what side it was on. I remember the old cabin being quite close to the post. I did not take any measurements to the post.

Q. All you remember about it was that it was close close to the cabin? A. Yes, sir.

Q. Well, it was not necessary, then, for Mr. Clarke to point it out to you, was it. A. It was covered up.

Q. When was it covered up? A. The post was covered up with a little box around it.

Q. That would not have been difficult if you had it on your notes. A. Yes, but I was not looking for it as a matter of fact. Mr. Clarke said: "Here is where the No. 1 post was." That is all.

Q. Just happened to show it? A. Yes, sir.

Q. You marked it on your plan? A. Yes.

Q. Is there any object in marking that one post on that plan? A. I think no object.

Q. Well, were you requested to mark it out. A. I don't think I was.

Q. Well, you did not need it for the purpose of making the survey, the plan of which has been put in, did you? A. I don't understand you.

Q. I mean to say that the plan would have been perfectly clear without marking the No. 1 post. A. Certainly, it should not be there, as a matter of fact.

Q. Then you must have had some reason for putting it on the plan. A. I guess it was my own reason, putting it on. I don't remember anybody asking me to put it on.

Q. What reason had you for putting it on? A. none whatever.

Q. Why is it there? A. I don't know; it can be taken off if you wish it.

Q. Just an accident that it is there? A. Yes, purely an accident. I happened to put it on because I have not got any other stakes located on there.

Q. That is what induced you. You have not any other stake located on that plan except the No. 1 stake. A. That is the only one I know anything about as a matter of fact.

Q. Why was it necessary to put it on the plan? A. I say it was not necessary.

Q. You were not asked to do it? A. No, I was not asked to do it.

Q. You were making a plan here. Why didn't you put the No. 3 or No. 2 on? A. I told you before that I did not know where the No. 3 was or the No. 2.

Q. Then you must have had some reason for marking the No. 1? A. That settles it. I am not going to answer any more questions.

Q. You had no reason for marking that particular one post there? A. No. No reason whatever, except that I had it located on my notes. That is the only reason.

Q. Did you get this plan from your original notes? A. Yes, sir; from my original notes.

Q. Well, then, you went up yesterday to verify your original notes, did you? A. Not to see the No. 1 post.

Q. What is that? A. Not to see the No. 1 post.

Q. I did not ask you that. I asked you if you went up yesterday for the purpose of verifying your original notes? A. No, I went up to verify Mr. Roy's survey.

Q. Roy Clarke's survey? A. Survey of the portion of the ground.

Q. You did not need to do that; if you had your original notes, you did not need to go there, did you? A. No, I wanted to see the post that he started from.

Q. That was the No. 1 post? A. The No. 1. I don't know whether he started from that or not.

Q. You say you went there for the purpose of seeing what post he started from? A. Yes, it was the northern boundary of the Centre Star.

Q. To get get back to the question. You went there for the purpose of ascertaining which stake he started from? A. Yes.

Q. Did you find that stake? A. Yes.

Q. What stake was it? A. The northeast corner of the Centre Star mineral claim.

Q. Was it the No. 1 post? A. No, sir.

Q. What post is it. A. It is the northeast corner of the Centre Star mineral claim.

Q. The survey post? A. Yes, sir.

Q. You know where that was? A. Yes, sir.

Q. Put it in your notes? A. Yes, sir.

Q. Why did you need to go back to ascertain it? A. I wanted to see where he started his work from.

Q. If he had not shown you his work you could tell from your work whether he started from that point or not? A. Yes. I wanted to see for myself; I wanted to go on the ground.

Q. Why? A. For my information.

Q. But you had your own information, you had your own notes? A. Yes, sir.

Q. They were correct? A. How should I know that he started from there before or not without going on the ground with him?

Q. I am asking you, if he had not shown you his survey, whether you could not have told whether he started from that post or not? A. Yes, I could have.

Q. Then it was not because you wanted to know where he started from, was it? A. Yes, it was.

Q. How do you explain the two? A. Well, I wanted to know exactly what you did.

Q. But you did know if you had your own notes, didn't you? A. Yes, but I did not know that he started from those points until I went up over the ground with him, until he pointed the particular point.

Q. Did he show you his plan? A. No, I have not seen his plan up to to-day. The first time I saw his plan was to-day here in the room.

Q. Then you have to tell whether he started from that point by comparing his plan with this note; that is the only way you can tell him now? A. Yes.

Q. Then you did not go there to find out which post he started from, did you? A. Yes, I did.

Q. I do not understand. You say that from your notes you could tell whether he started from that post or not, and you had not seen the plan at the time. Now, if he had brought his plan here to-day, and you had looked at it, you could tell whether he started from that post or not, and you had not seen the plan at the time? Now, if he had brought his plan here to-day, and you had looked at it, you could tell without going on the ground whether he started from that point or not, couldn't you? A. No.

Q. Why? A. Without seeing his plan, how could I?

Q. No, I did not say that. You did not listen to my question. A. Remember, I had not seen the plan, so bear that in mind; I have not seen the plan up to to-day.

Q. I understand that very well. A. And I went up there for the purpose of finding out where he started his work, and he showed me where he started his work, and that was all I wanted to see. It is not necessary for me to see the plan afterward at all.

Q. Yes, it would be, because you can't tell whether his plan agrees with what he told you or not, can you? A. Yes, certainly I can.

Q. Without looking at the plan? A. Certainly. I have seen the plan. Yes, sir.

Q. I would like to know why you went there yesterday. I would like to know every reason why you went there. Have you any other reason? A. None whatever.

Q. Who requested you to go there? A. Mr. Davis.

Q. And you met Mr. Clarke? A. No. Mr. Clarke and I went together.

Q. And the first thing Mr. Clarke did when he got there was to show you the No. 1 post of the Centre Star mineral claim? A. We passed up the gulch right close by. I did not ask him.

Q. Was not the first thing that Mr. Clarke showed you the No. 1 post of the Centre Star mineral claim? A. Yes, that is all right.

Q. Then you went from there to what place? A. No, I will take that back. That is wrong.

Q. Well, what is right about it? A. He showed me—he pointed out the southeast corner of the Centre Star stake. He pointed out the southeast corner to me, and then we passed by the No. 1. We went to the northeast corner, and thence on up to the——

Q. (Interrupting.) Where did he start this survey? A. On the eastern boundary.

Q. What boundary, what point? A. The northeast point of the claim.

Q. He took you there and showed you that? A. No.

Q. He did not show you that? A. Yes, he showed me that.

Q. He did not take you there? A. Oh, yes. I was there.

Q. Did he take you there yesterday? A. Yes, sir.

Q. Showed it to you? A. Yes, sir.

Q. Showed you the No. 1 post on the way? A. I went up.

Q. What did he tell you about the No. 1? Well, he did not tell me anything about the No. 1. I knew more about it than he did. I saw it long before he did.

Q. Why did he show it to you? A. It was covered up as I said before.

Q. Is that all of the reason? A. I don't know what reasons he had in showing it to me.

Q. Did you run the line on this survey? A. On this Centre Star?

Q. On this plan, Exhibit 12; did you run the lines of this survey? A. Every line that is shown on there I ran.

Q. Some years ago. A. Yes.

Q. You did not run them over yesterday? A. No, I did not run a line over yesterday.

Q. Well, did you check with Mr. Clarke's survey. A. No.

Q. Well, then, you don't know whether this is the same as Mr. Clarke's or not? A. That is, who chained the distances. I don't know what his distances are.

Q. You have not compared his plan with this one? A. No, I have not.

Q. Then why did you want to know where he started from? Was it for the purpose of comparison that you wanted to know where he started from? A. From a certain distance, yes. I have compared certain distances with Mr. Clarke.

Q. What distance did you compare? A. From the northeast corner; just this one distance that I compared with him, from that corner to this.

Q. That cannot be taken down; that is from the southeast corner of the War Eagle to the northeast corner of the Centre Star. A. That is it.

Q. And from the northeast corner of the Centre Star to the southeast corner? A. The southeast corner.

Q. You compared no other lines? A. No, sir.

Q. Why did you compare that line particularly? A. Because that is all they required from me.

Q. That is all you were to do? A. That is all I was to do.

Q. Mr. Clarke had surveyed that before? A. Mr. Clarke had made the survey before me.

Q. Then what has the No. 1 post to do with it?

A. I don't know anything at all about the No. 1 post.

Q. Now, what would that No. 1 post have to do with this plan at all? A. Not all, except I had to put it there. I can take it off.

Q. You were only sent there for the purpose of comparing Mr. Clarke's survey of that line? A. Yes, sir.

Q. And the part of the north line? A. Yes, sir.

Q. And you put the No. 1 post on there? A. Yes, sir.

By the Court—Is that an old plan or a new one? A. It is from the old plan. I made the plan about 1895, I think it was.

Q. It is a tracing? A. It is a tracing taken from an old plan. It is not exactly on the same scale as that though.

Q. From the old one of 1895? A. 1895, I think it was made. Yes, I think it was 1895.

Q. (By Mr. Bodwell, resumed.) Can you tell without a scale; have you got any note to show what the distance is—what point do you call this? A. The east end line. I never saw that stake, you know.

Q. But from the Hub on the east end line of the Centre Star mineral claim, to the west end line of the Le Roi, in a straight line, on a line perfected straight from the centre line, could you tell what would be the distance; could you tell from the scale? A. No, it would be very roughly. If you have Mr. Farwell's notes I can tell you.

RE-DIRECT EXAMINATION.

By Mr. Davis.

Q. When you said that you were not sure which side of the Centre Star gulch that No. 1 location post was, did you mean Centre Star gulch in Centre Star Creek? A. Centre Star Creek.

Q. Centre Star Creek, which is in the gulch? A. It is in the gulch, yes. I meant the creek, not the gulch.

Roy Hughes Clarke: Sworn on behalf of the defendants.

DIRECT EXAMINATION.

By Mr. Davis:

Q. You are in the employ of the Centre Star Mining Company, I believe, or Gooderham and Blackstock? A. Yes.

Q. What is your business? A. Mine engineering, surveying principally.

Q. You are a mine surveyor? A. A mine surveyor.

Q. How long have you followed that profession? A. Four years.

Q. At what college did you take a course in surveying? A. In the University of California.

Q. What are some of the mines you have surveyed in? A. I surveyed in the Coeur d'Alene country, in the Bunker Hill and Sullivan, and I surveyed in all the principal mines around here.

Q. You have made the map which is the base of this model, I believe, or at least it was made from your survey? A. Yes.

Q. The map itself was drawn by Mr. Simons, I believe? A. Yes.

Q. Did you verify it? A. Yes.

Q. You gave him your notes. and then verified the map as drawn by him? A. Yes.

Q. Were you over the original survey posts of the Centre Star claim with Mr. Ritchie, as he stated. A. Yes, sir.

Q. Were those the posts from which you made your survey? A. Yes.

Q. I see this plan only covers a portion of the plan which was put in by him? A. Yes.

Q. So far as that portion goes, does this correspond with his plan? A. Yes, sir.

Mr. Davis—By the way, this model might as well be put in evidence now. I will verify the upper part of it later on. I want to prove the plans altogether. You may bring that large plan, Mr. Clarke.

The Registrar—This model is marked Defendants' exhibit No. 14.

The Court—Which are you putting in now?

Mr. Davis—The plan in the base of the model. The scale of the map put in by Mr. Ritchie is 120 feet to the inch. The scale of this map is 20 feet to the inch. When I say this map, I mean the map at the base of the model.

Q. You say this map is made from your surveys also? A. Yes, sir.

Q. Made by whom? Mr. Simons.

Q. Did you verify it after it was made? A. Yes.

Q. That is the same plan as the base of the model, is it? A. Yes, sir.

Q. What is the scale of that map? A. This is 12 feet to the inch.

Mr. Davis—I will put in evidence this plan now.

The Registrar—That would be Defendants' exhibit No. 15.

Q. Now, everything on that map is from your surveys with the exception of these numbers, the series of numbers running along there, is it not? A. Yes.

Q. And what is that? A. Those are numbers of values and width of ore samples taken along the outcrop of the vein and down shaft No. 3.

Q. Wherever they appear? A. Yes, sir; where they appear.

Q. That is, these numbers correspond to samples that have been assayed? A. Yes, sir.

Q. Who gave you the information from which you put those on the map? A. Mr. Hastings.

Q. Mr. Hastings? A. Yes.

Q. Was it Mr. Hastings or Mr. Edwards? A. The notes I received were handed to me through Mr. Hastings as the officer.

Q. Were the notes in lead pencil? A. Yes—no, they were typewritten.

Mr. Davis—We will have to put in Mr. Hastings' evidence on that, but they cut no figure now. Before we make use of them we will have him identify them and also the men that took the samples.

Q. Now, is everything else on that map and on this map marked correctly from your own work? A. Yes, sir.

Q. What is this map, Mr. Clarke? A. This map is a section through the line I-K, drawn on the same scale as the large map.

Q. Just tell what the line I-K is? A. I-K is the line drawn from the bottom of No. 3 shaft, north and south.

Q. From the bottom of No. 3 shaft to where? A. To the cross-cut, to the face of the cross-cut from the Iron Mask stope.

Q. To the face of the cross-cut of the Iron Mask stope? A. It passes through it; it passes through the place of the Iron Mask stope from the bottom of No. 3 shaft to the line of the east drift.

Q. And ends where? A. Ends at the bottom of the No. 3 shaft.

Q. Is it marked on this large plat? A. No.

Q. You had better put it on so that we can see? A. (Witness marks on the plat.)

The Court—What is that? A horizontal section?

Mr. Davis—Just explain that to the Court, Mr. Clarke. A. It is a vertical section, a vertical plane passing through that line.

Mr. Davis—We are only proving this now, my Lord; these will be used by the witnesses later; I am simply getting my material in evidence, and it is almost impossible to follow it now, because I do not want to take up the time of the court.

The Court—Yes, I see; it was rather a stupid question I asked; it must be vertical. This is the No. 3 shaft over here, is it?

The Witness—Yes, sir.

Mr. Davis—These will only be intelligible to your Lordship when the witnesses come to use them. All I can do now is to prove them.

Q. This is made from your survey? A. Yes sir.

Q. And you verified it? A. Yes, sir.

Mr. Davis—I will tender this—Defendants' exhibit No. 16.

Q. What map is this, Mr. Clarke? A. These are also vertical sections through the lines L-M and P-N.

Q. Take L-M first and show where it is marked on this big plan, which is defendants' exhibit No. 15? A. It is a vertical section through the line L-M as marked on the plat exhibit 15.

Q. What is the other section? A. The line P-N is a vertical section as marked on the plat.

The Court—That one plan shows both?

Mr. Davis—Shows both, my Lord. We tender this —Defendants' exhibit No. 17.

Q. Is it on the same scale as exhibit 15, the big map? A. Yes, sir.

(To be continued.)

THERMO-CHEMISTRY AND THE CALORIFIC POWER OF FUEL.

By A. A. Watson, B.Sc.,F.I.C., Provincial Assayer, Vernon, B.C.

NOT only is it a matter of importance to the metallurgist to have at hand a simple method of estimating the temperature of his furnace and thus to be able to test the value of various kinds of coke in producing an intense heat when deciding upon using one kind in preference to another, but it is also some times important to know the calorific power of or amount of heat to be obtained from any given kind of fuel. In the first instance he wishes to know the intensity of heat to be obtained, in the latter case he wishes to know the quantity. To make this point clear we can consider the difference between a hard coke containing a high percentage of carbon and a coal containing a little less carbon but some hydrogen. A ton of the coke used in a furnace with a very strong draft would give a much higher temperature than an equal amount of the coal with only the same draft because the coal would take longer to burn, but on the other hand if we burnt a ton of each under boilers it would be found that by the time the coal was all burnt away it had evaporated considerably more water than the coke had and must therefore have given out a greater quantity of heat. An instance when such measurements of calorific power would be very useful would occur when a mine manager was installing a boiler and engine in a country where both coal and wood could be obtained as fuel. The simplest and most practical way he could adopt to measure the calorific power of the two kinds of fuel would be to weigh out a certain amount of coal and burn it in the furnace, having first noted the height the water stood in the boiler. Again note the height when all the coal is burnt. Next fill up to the original mark, take a measured quantity of wood and fire up with it until it had sunk again to the lower mark. A measurement of what was left and a simple subtraction would show the amount of wood used in obtaining the same effect as the coal. This method may appear crude but as a matter of fact it is more correct and of far more value for practical purposes than all the elaborate experiments that have been made for comparing the relative calorific efficiency of different kinds of fuel by analysis and calculation of the calorific value of the fuel under consideration. Another point to be noted is also that in estimating the actual thermal value in heat units of any fuel the values calculated from the amount of water evaporated by a given weight of fuel used on a large scale in a furnace are always very much higher than the results obtained by experiments done on a small scale in a calorimeter. The same rule holds good also with liquid fuels. Results obtained with the latter on a large scale have repeatedly upset all thermol calculations founded upon their ultimate chemical composition. When a theory is not borne out by practical experiment the true chemist considers that the theory must be defective, for chemical theory is all founded upon experiment and so it happens that while some chemists tried to explain away these discrepancies more have pointed out great defects in the existing scientific methods of measurement of calorific values. Two methods have been used, one the calorimetric method where a given weight of fuel is burnt in a calorimeter and the amount of heat evolved measured by the rise in temperature of the water, and the other method is by analysing the fuel and from the amount of carbon and hydrogen calculating the calorific value of the fuel by the known calorific value of these elements.

The calorimetric method is objectionable on account of the very small quantities of the substance tested, the gaseous products of combustion pass too quickly through the water to give up all their heat and again the space in which the fuel is burnt is so small that the combustion is incomplete. With regard to the method of calculating the thermal power of fuel by a knowledge of its chemical composition there is the uncertainty as to the value to be ascribed to the elements themselves. Favre and Silbermann found great difference in the calorific power of a gramme of different kinds of carbon as may be seen below:

	Calorific Power.
Wood charcoal	8080.0
Retort carbon	8047.3
Graphite	7796.6
Diamond	7770.1

It appears therefore that the physical condition of an element has an influence on its calorific power. Considering that the only form in which carbon exists by itself is as a solid and that all the experiments that have been made have been carried out on carbon as a solid and hydrogen as a gas, it is not surprising that the results obtained did not coincide with experience in the use of mineral oils where carbon and hydrogen

are combined together to form a liquid. Favre and Silbermann's calorimeter for measuring the calorific power of fuel consists of three cylinders, one inside the other having water between the outer and the one next to it and cotton wool round the inside cylinder of all. The calorimeter inside the cylinder is filled with a known weight of water, the fuel is suspended by two wires and ignited by electricity and oxygen is passed into the small vessel containing it. The hot gases pass through a pipe in the shape of a worm in the water. The increase of temperature of the water is noted. As we saw in considering the calorimetric method of estimating high temperatures, the increased temperature and the weight of the water heated up give a direct measure of the quantity of heat evolved.

Thomson's calorimeter consists of a glass jar and a copper cartridge case. The fuel is mixed with potassium chlorate and placed on a copper dish with the cartridge case clamped over it. The fuel is set on fire, a cylinder placed over the case and the whole calorimeter placed in a glass jar filled with water. The rise in temperature of the water is observed as before.

An approximate estimate of the calorific power of a fuel close enough for all ordinary purposes and useful in circumstances under which a large working test would be inconvenient can be obtained by a calculation based upon the amount of carbon and hydrogen contained in the fuel and the thermal value of each constituent. It is known that the calorific power of a gramme of solid carbon is about 8080 heat units, of carbon in combination with hydrogen 11214, and of hydrogen itself 34462. If we analyse any fuel and find the percentage of fixed carbon to be equal to C, the carbon combined with hydrogen to be C' and the hydrogen to be equal to H', then the total quantity of heat $Q = \frac{8080\ C + 11214\ C' + 34462\ H}{100}$.

Below are two examples of calculation of the calorific power of coke and anthracite.

The analysis of coke gave—

Carbon	95.51
Hydrogen	0
Ash	2.85
Sulphur	1.64
	100.00

Analysis of the anthracite gave—

Carbon	92.36
Hydrogen	3.66
Oxygen and nitrogen	3.98
	100.00

Calorific power of coke $= \frac{8080 \times 95.51}{100} = 7717$ heat units.

Calorific power of anthracite $= \frac{(8080 \times 92.36)\ (34462 \times 3.66}{100} = 8723$ heat units.

It might be thought at first sight that substances like lignite and wood containing more hydrogen than either coke or coal would have great calorific power but the driest wood contains 46% of oxygen and only 50% of carbon, and therefore nearly half its weight is useless as regards heating effect. Besides matter, which is indestructible there is another thing just as indestructible called energy. It appears in various ways as electrical energy, or heat, or kinetic energy or chemical energy, and this energy can be transformed in a definite amount as regards quantity from one to the other. Whenever energy in one form disappears a corresponding amount of energy in some other form must take its place. Chemical energy passes readily into heat and thus gives us an easy means of measuring it in thermal units. When carbon burns in the air part of the energy passes to the carbonic acid which is formed and the rest is transferred into heat. A thermal or heat unit is the amount of heat necessary to raise a gramme of water one degree centegrade. Now one equivalent weight of carbon combines with two of oxygen to form carbonic acid when carbon is burnt. The atomic weight of carbon is 12 and of oxygen 16. Therefore twelve parts of carbon combine with thirty-two parts of oxygen to form carbonic acid. When we burn twelve grammes of carbon in a calorimeter and measure the heat evolved we find it equal to 97,000 heat units. The reaction is represented in the following equation:

$$C + O^2 = C\ O^2 + 97000.$$

The amount of heat is called the heat of formation of carbonic acid and represents the difference between the energy of the compound and that of its component elements. But it is not only when substances are burnt that heat is evolved. When lead and iodine combine together to form lead iodide 39800 thermal units are evolved. When sulphur trioxide is mixed with water sulphuric acid is formed with the evolution of 41100 heat units. If we mix 80 grammes of sulphur trioxide with 18 grammes of water the proportion in which they always combine, we get enough heat evolved to raise 411 grammes of water from freezing to boiling point. The thermal equation is represented below:

$$S\ O^3 + H^2\ S\ O^4 + 41100.$$

Similarly when caustic soda is neutralized with hydrochloric acid forming common salt 13736 heat units are given out.

$$Na\ H\ O + H\ Cl = No\ Cl + H^2\ O + 13736.$$

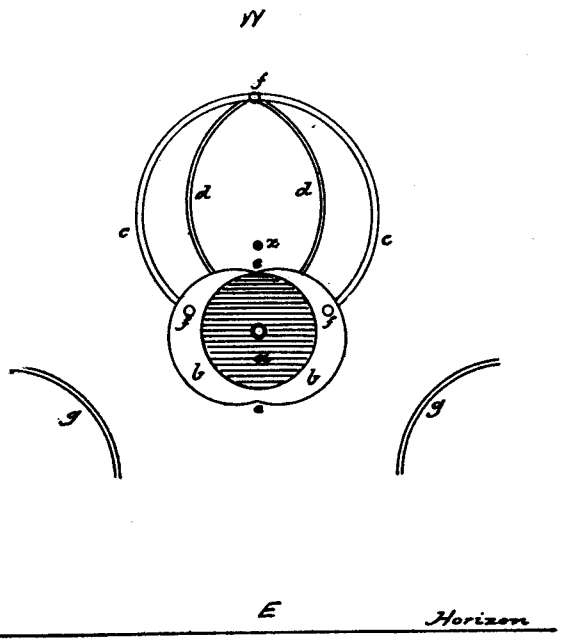
Just as when substances combine heat is given out so is heat absorbed again when the elements are separated. When sulphuric acid is heated very strongly under pressure it dissociates into sulphur trioxide and aqueous vapour and the amount of heat required to effect the dissociation is 41100 thermal units, exactly the same amount as was evolved in the combination. We see then that the amount of heat that can be obtained from any kind of fuel depends upon the difference between the chemical energy of the compounds formed by the combustion of the elementary constituents of the fuel and the elements themselves with the combining oxygen. As the compounds formed have the smaller amount of energy, the energy that is left shows itself in another way, namely, as heat.

LUMBIA.

(By W. M. KcKinnon, C.E.)

THE sun halos represented in the accompanying cut were observed at Sechelt, about 30 miles northwest of Vancouver, at about 10 a.m. on April 16th. The observer was unfortunately without means of making angular measurements, so that the phenomenon is only represented in diagrammatic form.

In the early morning the halos began to appear; they were at their brightest, and most perfect, about 10 o'clock and had disappeared by noon.



a. Halo concentric with sun, of brown colour.

bb. Eccentric halos, not so dark as (a), and slightly larger in dia.

cc. White bow forming complete circle.

dd. White bows, arcs of circles of apparently same dia. as (c).

ee. At these points prismatic colours were visible for some distance on each side of the intersection of the circles.

ff. Parhelia.

gg. Arcs of circles showing prismitic colours.

z. Zenith.

The following notation from "Elementary Meteorology," by R. H. Scott, F.R.S., secretary of the meteorology society, describes the conditions existent when halos are formed.

"Halos are the large circles seen round the moon and less frequently round the sun, when cirro-stratus clouds exist. Generally the phenomenon is colourless, presenting itself as a white ring, but occasionally prismatic colours are developed, the red being inside; the arrangement opposite to that of the corona"—and also the rainbow.

"The halos which are commonly observed are of two kinds; one, the more usual, of 22^2 radius, the other of 46°. Occasionally supernumerary circles appear, and near their points of intersection with the primary halo, the illumination is more brilliant, and what are called 'mock suns' (parhelia), and 'mock moons' (paraselence), are developed. The commonest position for these phenomena is on the same level as the luminary, and distant 22° from it on the east or west. By theory, the parhelia (for instance) differ in azimuth from the sun by an angle somewhat greater than the radius of the halo, except when the sun is on the horizon. Accordingly, except under the circumstances just stated, the parhelia lie a little outside the halo, and so much the more the higher the sun is. The same reasoning applies to the moon. Halos are due to refraction. They would be theoretically producible if the rays were refracted through minute crystals of ice floating in the air in all sorts of positions. As the level at which the cirro-stratus, the halo-forming cloud, floats is over 20,000 feet, and as at this level the temperature must be far below the freezing point, we are justified in assuming that these clouds are composed of minute ice spiculæ, not of droplets of water, and that the theoretical explanation of the production of the halo is correct. * * *

"Halos and their concomitant phenomena are more frequent in winter than in summer, and they are far more abundant the higher the latitude of the station. In the Arctic regions they are very commonly observed." * * *

RECENT PUBLICATIONS.

COPPER Manual, Copper Mines, Copper Statistics Copper Stores and a Summary of Information on Copper, Etc. Volume II., by D. Houston & Co., New York: 1899. Price $3.00.

The second volume of this work is immeasureably superior in every respect to its predecessor, and is now perhaps, the most comprehensive account of the United States copper mining industry obtainable. In addition, however, to concise information respecting the seventy principal copper mining companies in America there is much valuable data bearing on the industry in other parts of the world. As a result of the great demand for copper chiefly in the manufacture of electrical appliances, mining for this metal has gained in importance enormously in the last few years, and the value of the copper output of the United States now far exceeds the value of the gold production. Nevertheless, it is, as the publishers point out, a remarkable fact that about three-fourths of the total domestic copper production of that country is derived from eight or nine properties, thereby concentrating the control of the metal in the hands of a comparative few. But to show the profits of the industry it is stated that last year the copper companies of the United States paid no less than $25,000,000 in dividends. The present work contains many tabular statements showing the movements of copper, and the market prices for a number of years both in America and Great Britain. The illustrations, too, are excellent, and in addition a short account is given of American copper mines. We regret to note, however, that included among these is the Boston & British Columbia Copper Mining & Smelting Co., owning nothing more than mere "prospects" in the Standard Basin of the Revelstoke district. In the account of this concern the grossly exaggerated statements to which we previously took exception in the company's prospectus, again appears here.

The Gas Engine Handbook; a Manual of Useful Information for the Designer and Engineer; by E. W. Roberts, M.E., The Gas Engine Publishing Co., Cincinnati.

This is practically the first useful work on the gas engine published by an American author and treating of American practice and as such it certainly is deserving of a cordial reception. The book contains no descriptive matter relating to any particular engine, unless the engine is a type of itself, as is the case with the Diesel motor, and the illustrations are all original and specially designed for the work. The rules and formulæ are especially valuable, many of the latter being being new, and sufficient are given to enable any intelligent craftsman to design a gas engine without difficulty. We commend the book to the attention of engineers in British Columbia.

TECHNICAL PERIODICALS.

THE JOURNAL OF GEOLOGY.

A FEW months ago Van Hise drew the attention of his brother scientists to the necessity of revising the present system—if system it may be called —of rock classification.

William H. Hobbs in the present number adds some "Suggestions Regarding the Classification of the Igneous Rocks." While, in some respects, reiterating what was said by Van Hise he differs from him in regard to the basis of distinction. Van Hise, it may be remembered, advocated abundance as the primary distinguishing feature in the classification of igneous rocks; Hobbs emphasizes the importance of texture and chemical composition. The latter assures his readers that igneous rocks of granite texture, classified according to chemical composition form three progressive series, viz., Granite-nepheline series, Missourite—ijolite series, and Syenite—gabbro series.

Hobbs digresses from his subject to strongly recommend the use of graphical methods in the study of rock analysis. Seven plates are given to illustrate how the eye may assist the mind in establishing relations between the various species.

He unites with Van Hise in urging that the rocks families be few in number with simple characteristics such as could be distinguished by the field-geologist, whose work would thus be correct though necessarily incomplete. Specific and varietal classification must be the work of the petrologist.

The remaining articles in the number are:

"Detention of Some Devonion Fishes," by C. R. Eastman (illustrated).

"Ancient Alpine Glaciers of the Sierra Costa Mountains in California," by Oscar A. Hershey.

"An Attempt to Test the Nebular Hypothesis by the Relation of the Masses and Momenta," by T. C. Chamberlin.

THE ENGINEERING MAGAZINE.

The *Engineering Magazine* for May contains an admirable article by Mr. C. B. Going, the managing editor of that periodical, entitled "abour Questions in England and America." It is noteworthy but not extraordinary that much in this article might have been applied with equal force to the recent industrial situation in the Slocan district of British Columbia. Thus, "the demand which the men put most conspicuously forward * * * is that for reduction of the length of the working day." * * * * but "the demand for the eight-hour day in England, and less openly, perhaps, the strike for the nine-hour day in the United States, but served as a cloak for the actual body of the contention. The real substance of the issue, which united the employers of England—as it is certain to unite the employers of America—into a firmly-knit, finally-determined resistance, was the men's insistance upon the manufacturers' adoption of trade-union regulations in the operation of their works. After showing the injury likely to result to industrial effort in the United States from the tyranny of labour unionism, Mr. Going points out that while "trade unionism served good and much needed ends in opposing abuses of the employers' power," and has many excellent purposes still to be carried out, in its unwisdom it has undertaken measures in which it can be checked and corrected only by such an association of employers as shall not only be just and beneficient in its aims, but strong enough to make them effective." Other articles are "Manufacturers' Associations, Labour Organizations, and Arbitration," by H. W. Hoyt; "Railway Opportunities in the Orient," by W. B. Parsons; "Iron Ores of the Labrador Peninsula," by A. P. Low; "Works Management for the Maximum of Production," by J. Slater Lewis; "The Effective Lubrication of Journals," by T. W. G. Snook; and "Electrical Apparatus in Military Operations," by J. P. Wisser.

TRANSACTIONS OF THE AMERICAN INSTITUTE ELECTRICAL ENGINEERS.

The last number of the transactions of this society contains: Notes on Electric Traction under Steam Railway Conditions, by E. C. Boynton; Walt on cost of Arc Lighting with reports of discussions in New York and Chicago; Notes on Single-Phase Indication Motors, by C. P. Steinmetz; and A New Method of Tracing Attenuating Curves, by Fitzhugh Tornsend.

CORRESPONDENCE.

The Editor does not hold himself responsible for the opinions which may be expressed in this column. No notice will be taken of communications unless accompanied by the full name and address of the writer.

GOVERNMENT OPERATION OF DIAMOND DRILLS.

TO THE EDITOR:—I wish to draw public attention to the necessity in this province of government supported diamond (core) drills.

Having travelled considerably in various mining regions in other parts of the world. I can state from personal experience that properly designed drills are of immense service to a mining province like British Columbia, if owned and operated by the government.

It appears to me that here our main prosperity depends on our mines and while admitting the very great service rendered to the province by the Minister of Mines' department it cannot hope to furnish more than a superficial idea of our mineral resources with the present equipment.

There exists in British Columbia a large number of districts having perhaps one or more particularly good surface indications, and by surface indications I would include all workings less than one hundred and fifty feet below the surface. No great inducement offers in such cases for the investment of capital, because no precedent exists in such district to warrant the assumption that the ore goes down or if it does, that it maintains the surface value.

But let the government bore a series of holes on the deep level of the best mine in such a district and prove by exhibiting the core that payable ore exists at a depth of one thousand feet say. Then the whole conditions are changed, the lucky mine may safely install machinery, lay out future workings with a view to economical working, and easily raise capital to carry out preliminary works until the development will allow of ore shipments being made. This is not all; with such an example in a district properties on the extension, and similarly situated parallel properties, may safely raise some capital to exploit their mines with the probability of some success and a possibility of even greater results. Take the other side. A district having a good surface indicating mine or rather pro-

perty, a narrow ledge of, say copper, in a silicious gangue between walls of slate, the government drill bores a series of holes and in each case cuts into granite at a depth of three hundred feet. Subsequent boring prove the slate to be overlaying granite and in no case does the ore descend below the slate. Further capital will not be wasted in vainly trying to make a mine here, but will be diverted into other more promising regions.

We are also deficient in local geological knowledge and special tectonic conditions existing and influencing the deposition of minerals, as for example, in this Columbia and Kootenay valley, between the Rockies and the Selkirks much contortion of the pre-carboniferous rocks into deep synelines, makes it somewhat probable that by choosing a suitable locality petroleum might be discovered. Again, in this valley alluvial gold, probably occurs in old river beds, too deep to entice the individual to expend a large sum in sinking and dealing with the water necessarily to be encountered, but offering no difficult problem to a diamond drill. But once publicly announce the existence of a payable deposit and no difficulty would be experienced in finding capital, to say nothing of the enormous revenue to the government in claim recording.

When not otherwise employed the drill could be used as a means of scientific exploration and solving any geological problem.

I would propose, to put it in a practical form, to let the government purchase, say ten or fifteen drills exactly similar to allow of interchange of parts and able to bore to a depth of one thousand feet. Two other drills of larger size to bore to five thousand feet, and say five other small especially portable drills, to be capable of mule or horse transport and to bore to, say five hundred feet. All with Davis Carlyx crowns interchangeable with diamonds. These drills need not necessarily all be worked at the same time. Each drill in operation would require one man skilled in such work and he could hire one assistant locally.

Any locality having a revenue of $————per annum in recording fees and miners' licenses should be entitled to a drill; if the request was made to the Minister of Mines' department, for one to be sent. Under special circumstances a mine, not ranking as the leading property, should be entitled to have one or more holes put down at the cost of the mine owner, providing exceptional reasons were urged and found satisfactory to the Provincial Mineralogist.

The cores should be on view for one year at the local recorder's office and blanks inserted at such portions where core had been removed for assay by the department. At the expiry of one year the cores should be lodged in Victoria at the Minister of Mines' office or other suitable place and diagrams issued to the district recorder and posted in a prominent place in lieu thereof.

Trusting my lengthy letter may meet with your approval, I am,

Yours truly,
H. E. NEAVES,
Mem. Inst. M. E.

Peterborough, East Kootenay.

BRITISH COLUMBIA IN LONDON.

(From Our Own Correspondent.)

THE past month has been a very dull one in the British Columbian section, and business has been exceedingly limited. The changes in prices week by week of the most prominent issues are shown in the following table, which may be useful to many of your readers who are interested in the shares of British Columbia companies registered in London. I have not included any of the Canadian registered companies because to all intents and purposes there is no market for them at the present:

Name.	April 7.	April 14	April 21.	April 28.	May 5.
	£	£	£	£	£
Le Roi	6⅛	5¾	6½	6⅛	6 9-16
B. A. C.	15/6	15/6	15/6	14/6	13/6
London & B. C. Goldfields.	1¼	1⅜	1¼	1¼	1 5-16
Alaska Goldfields	1	1	1	1	1
Hall Mines	1/6	1/6	1/9	1/9	2/-
New Goldfields of B.C.	1 3-16	1⅜	1¼	1¼	1¼
Whitewater	¾	¾	⅝	⅝	⅝
Ymir	1⅜	1 7-16	1½	1 9-16	1¾

Business generally in the stock exchange has been exceedingly dull, the prolonged pause in military operations in South Africa, and the continued dearness of money keeping both investment and speculative business in check and causing prices to slip away on the approach of sellers. So far as the mining market generally is concerned the tone has remained on the whole remarkably steady, and it is anticipated that it only needs some decisive victory on the part of the British forces in South Africa to bring about a general advance in quotations generally, particularly, of course, in the case of the "Kaffir" market. As, however, the good effect of any such decisive military operations would largely benefit the whole list it is not at all improbable that British Columbians would share in the improvement, although at the present moment it must be confessed that business in this section is conspicuous by its absence. How limited is the interest at present taken in mining business generally may be gathered from the fact that the total amount of new capital raised in the United Kingdom for the first four months of 1900 on behalf of mining companies amounted to the insignificant sum of £1,146,000, £8,000 of which is classified under the heading of "Klondike." During the month of April itself it is said that only £12,000 was raised on behalf of mining companies. These figures will show you more than anything else how little is the interest which is being taken in connection with the flotation of mining companies in this country. Past experiences, however, teaches us that after these periods of restraint there usually follows a spell of activity, and on all hands it is believed that directly the war is over we shall see a burst of speculation which will carry everything before it, and those who should be in a position to know confidently assert that in such a period of excitement the claims of British Columbia will not be overlooked. The disorganized state of politics in the province are regrettable, but luckily happening at a time when the whole market is suffering from apathy they have not had the serious effect upon prices which they might have had had they occurred at a normal period.

The chief features of the month were the final stages

in connection with the re-construction of the Hall Mines Company; the meetings of the Goldfields of British Columbia group; the London & British Columbia Goldfields report and the revival of activity in Le Rois, the latter movement having attracted a good deal of attention in view of recent developments in connection with the property.

So far as the Hall Mines is concerned, a series of formal meetings have been held representing the different stages in connection with the re-organization of the company. Before the shareholders could be asked to ratify any scheme, the debenture and preference shareholders had to be consulted. After this the ordinary shareholders were called together, and they were practically unanimously of the opinion that rather than consider the offer made by the Canadian group whose proposals I mentioned last month it would be better to submit to an assessment of five shillings a share, wipe off the old indebtedness, and start with a clean sheet and a more businesslike board. On Monday last the final stage in connection with the re-construction was reached and the resolutions for re-construction passed on the 12th were unanimously adopted. It may interest some of your readers to know that after the proposals had been adopted the shares which had been on offer at 1 shilling apiece changed hands at 1s. 9d.; as this meant that the buyer would have to pay an assessment of 5s. you will see that the price of 5s. 9d. was equivalent to 6s. 9d. and represented a sharp recovery from the very nominal quotations marked in March. It is hoped that in its reconstructed form the Hall Mines Mining & Smelting Company, Ltd., will have a more successful career than it has done in the past. It is worth noting that the word "smelting" has been included in the title and that the company propose to pay increased attention to this side of their business in the future.

So far as the Goldfields of British Columbia group is concerned, these companies have so long been under a cloud that the scheme for the re-construction of the three companies, viz., the parent company, the Waverley, and Tangier Mines, has aroused but little attention in the market, and I am afraid that these companies which were heralded with such a flourish of trumpets will never achieve a tenth of the great things which were predicted of them by Mr. Grant-Govan when he and his friends asked the public to find the money to exploit the various properties acquired by the promoting syndicate. It will give you some idea of the way in which this group has been managed when I tell you that before Mr. Alexander Matheson made his speech to the shareholders of the Goldfields Company a Mr. Raphael called the attention of the chairman to the fact that the accounts for 1899 had not yet been passed. Equally significant was the demand of another shareholder that the directors should allow a "professional liquidator" to be appointed. The whole of the proceedings in connection with this group have been disappointing to use a mild word and it looks to me very much as if in consenting to the scheme the shareholders of the various companies are only throwing good money after bad.

The London & British Columbia Goldfields report naturally attracted a good deal of attention and it is satisfactory to find that this company has done fairly well during the past year, although some disappointment was expressed when it was found that the divident of 15 per cent. recommended by the directors was to be distributed in the form of fully paid-up shares in the Enterprise Company. So far as the price of the shares is concerned the report has had little or no effect, indeed, the tendency has been rather in the downward direction and the shares which at one time were up to nearly £2 are now no better than 15s. 16d. In the report it states that the profit made during the period dealt with amounts to £27,256, after writing off all expenditure in connnection with options which have been abandoned. The amount of £4,183 under the heading of general expenditure in British Columbia, includes the engineering and local administration expense in connection with the Ymir, Enterprise, and other companies, for which the amount of £1,608 has been received. The £2,040 for consulting engineers' fees represents principally the balance paid to Messrs Bewick, Moreing & Co. in accordance with their agreement which has now terminated.

THE MONTH'S MINING.

SHOAL BAY.

(From Our Own Correspondent.)

As there is at present very little being done in this district it may be of interest to some to know what has so far been accomplished. By Shoal Bay district I mean the islands of Thurlow, Channe and Valdez, and that portion of the Mainland lying between the Euclatan Rapids at the south, and Loughboro Inlet at the north.

There are in this district so far as is at present known three principal leads:

One.—The Dorotha Morton lead, extending from the northwest shore of Valdez Island across Nodales Channel to Channe Island through which it runs and from thence across Cardero Channel to the Mainland where it appears on the shore at the Alexandra, at the entrance to Phillips' Arm, and from here across the Mainland to Loughboro Inlet, running in a northwesterly direction. This lead is about ten miles long and varies in width from four feet to about sixty feet, and is composed of a quartz varying in colour from white to dark smoky blue, and impregnated with very fine iron pyrites, carrying from a trace to $50 or $60 in gold, and an ounce or two in silver to the ton. Some parts of the lead carry a few per cent. in copper. A large amount of work has been done on this lead, mainly as a result of the Dorotha Morton mine in Fanny Bay which has turned out since December, 1898, to the time of its closing down in October last $90,000 in gold and silver bullion. There were crushed in this period between ten and twelve thousand tons of rock which was treated on the company's property by cyanide, the gold extraction being from 80 to 88 per cent., and silver about 75 per cent. Three tunnels have been driven to tap the lead at various depths, and a considerable amount of stoping was also done. The combined length of the three tunnels is about 2,500 feet. Numerous other claims on this lead have been worked, notably the Alexandra on the beach, at the entrance to Phillips' Arm, and southeast of the Dorotha Morton, and the Champion and Consolidated, about two and a-half miles northwest of the Dorotha Morton. A large amount of work was done on the Alexandra, the Fairfield syndicate having established a compressor plant. Two tunnels were driven, both on the lead, aggregating about 1,700 feet. This same syndicate did also a considerable amount of work on the Champion and Commonwealth. It has been often asked why work on these

properties ceased when they were apparently doing so well, for the Dorotha Morton was turning out gold bricks regularly each month to the tune of about $10,000. I have never heard a satisfactory answer to this question and doubt if any but those immediately interested in the syndicate can, but it has been reported that the ore was becoming no longer susceptible to economical treatment by cyanide, there being too large a percentage of copper. Another claim on this lead, or I should perhaps say, supposed to be, on which quite a large amount was done, is the property owned by the Cuba Silver Mining Co., and situated at the north east of the Dorotha Morton, but it is understood that the ore here is not sufficiently rich to pay smelting charges, and carries too high a percentage of copper to be economically treated by cyanide.

Two.—The Blue Bells lead. This lead extends from the shore on the west side of Frederick's Arm, across the peninsular to Phillips' Arm, from thence across Phillips' Arm to Hewett's Point and from here it can be traced on over three claims, the entire length being about three and a-half or four miles, and in width varying from two to 100 feet. The vein filling is a glassy white quartz impregnated with pyrrhotite, and small amounts of copper-pyrites, zinc blende and galena. Very high values have been obtained from the Blue Bells mine, the principal property on the lead, which is situated just above the west shore of Frederick's Arm. A large amount of ore has been mined from this property, but so far none has been shipped, the owners confining their attention to development work. Two tunnels have been driven to cross-cut the lead, one at about 75 feet from the surface, in which two winzes were sunk, 15 and 30 feet respectively; the other to tap the lead at a depth of about 150 feet, in which an upraise was run to connect the two tunnels. This lower tunnel is about 200 feet long. Besides this there are several open cuts, and surface strippings exposing the lead on the surface for hundreds of feet. There are several other claims on this lead on which more or less work has been done, and on some merely the annual assessment work, but in nearly every instance where work has been intelligently prosecuted satisfactory returns have been had.

Three.—The Douglas Pine lead. This lead extends merely across Thurlow Island, or to be more accurate, from Nodales Channel on the east side of Thurlow Island, and runs diagonally across the island to Shoal Bay, a distance on the horizontal of about two and a-half miles. The vein filling is quartz impregnated with pyrrhotite and small amounts of copper pyrites, occasionally. The ore is massive unmixed with any gangue. The gold values in this lead are very high, especially on the Douglas Pine and Morning Star claims. The property on this lead on which most work has been done is the Douglas Pine, situated on the hills overlooking Shoal Bay. A shaft 125 feet has been sunk with several drifts extending from the same, and another about 50 feet, besides a considerable amount of "gophering." Seventy-five tons of high-grade ore have been shipped to the smelter across the line, and to Van Anda. Several other claims on this lead have been worked, giving good values in gold and silver, but so far no ore has been shipped from these.

There are several other properties in this district that merit attention. The principal of these is the Colossus, owned and being worked by the B. C. Exploration Syndicate, better known as Cobledick's, which is situated on the Mainland in Estero Basin. This property was acquired by the present owners in 1898, but work had been already commenced the previous year. It is a copper property of great promise, and from present indications bids fair to become the copper mine of British Columbia. The management have been endeavouring for the past two or three years to locate the lead in the lower levels, and lately have been successful in doing so, exposing a splendid lead of almost solid chalcopyrite. Two tunnels have been driven, the upper over 100 feet long, with crosscuts aggregating about 185 feet, and a 40 foot upraise. In this tunnel was encountered a lead 24 feet wide of quartz heavily impregated with copper pyrites, and carrying fair gold values; it is about 100 feet from the surface. The lower tunnel, 100 feet lower, is also over 100 feet long, and about half way in the lead of almost solid chalcopyrite above referred to was encountered. It is understood that it is the intention of the syndicate to install a compressor plant at an early date to further hasten the development of this promising property.

Then there is the Ajax mineral claim, situated on the west shore of Valdez Island, in Deep Water Bay, Discovery Passage, a high grade copper property. Several tons of high-grade copper ore (chalcocite) have been taken out running 40 per cent. in copper, and $12 in gold. A tunnel 65 feet has been driven in on the lead, besides a large open cut. It is strange that with the present demand for copper, that a property like this should be lying idle, for the owners have done nothing, except annual assessment work on it, for some time now. But the time will come when this claim will be amongst the big copper producers of British Columbia.

Just across Discovery Passage from the Ajax is another copper (bornite) property on which a great deal of work has been done by the owners, and which is showing up well, the Summit mineral claim. The owners deserve great credit for the steady and intelligent way in which they have gone about to develop this property, having worked continuously for the last two years. Two tunnels have so far been driven, the upper 45 feet in length, and the lower an 8x8 about 75 feet, in which two winzes have been sunk each 30 feet, and so satisfactory are the results of their work that they are about to drive another tunnel to tap the lead 100 feet lower.

KAMLOOPS.

(From Our Own Correspondent.)

A strong movement in Kamloops mining business appears to have set in. Last month I informed you of the consummation of two important mining deals and the successful organization of a local syndicate to develop the Tenderfoot mine. Of other deals which were under consideration one has materialized this month. The Iron Mask mine, from which nearly 100 tons of ore was shipped some time ago, has been bonded by the B. C. Exploring Syndicate of London, Eng., the purchase price being $40,000. The first payment was made on April 21st, the next being due in two months. This syndicate has now secured an extensive and promising area of mineral lands on Coal Hill and operations on a considerable scale will shortly be inaugurated.

THE BONDING OF THE IRON MASK

The enlargement and timbering of the shaft at the Lucky Strike is approaching completion, and development work is to be actively prosecuted in the near future. The Python continues working steadily, a strong vein of magnetite having been discovered recently on this property. Very strong veins of quartz are being uncovered at the Hill-Top mine. The working force has been increased and the property has a very promising appearance. Crosscutting at the 75 foot level at the Truth mine is showing up some fine bands of ore, of which some is of shipping grade. The cross-cut is now in 30 feet and will soon meet the contact of a second vein, which is expected to yield more good ore. Work is progressing well at the Wheat Tamar. The shaft is in a splendid ore body carrying three to eight per cent. copper. It is furthermore reported that much gray copper is being encountered. The gold and silver values are also uniformly good. A contract has been let for 100 feet of tunnelling on the Kimberley, which it is expected will cross-cut the large ore body. The tunnel is in 210 feet at the present time. A shaft will be commenced at an early date. The properties on Ten-Mile Creek, Nicola, are being developed and a large body of copper carbonates has been encountered with lenses of copper glance. A good deal of work is also being done with promising indications on other properties in this district.

RECENT HAPPENINGS

VERNON.

(From Our Own Correspondent.)

There is very little to say about mining matters as yet as regards this section of the country. People are passing through here on their way to Wauchope and Monashee Mountain, but it is a little early yet, as the snow still covers the higher levels.

The contract is let on the Silver Star about fifteen miles to the northeast of this city, to sink a shaft 200 feet, and with our present weather the work will be commenced next week. It will be remembered that this property was bonded for $30,000 to a wealthy gentleman in England, who paid this province a visit last year and was greatly delighted with the property.

I hear that Mr. Chambers has disposed of his claims on the west side of Okanagan Lake to a syndicate, but I cannot at present give further particulars, but understand that development work is to be carried on without delay.

The Klondyke property on Siwash Creek, owned by Mr. Goodchap and others is showing up splendidly in copper and gold. Still nearer Vernon are the claims the Rainbow, the Western Beauty and the Clayton, upon all of which a great deal of work has been done, with satisfactory results. On the Rex the shaft is down about 65 feet, the assays continuing very satisfactory.

Work is also progressing slowly on the Golden Sunbeam, and the owners feel confident as to the final result. A very great deal of work has been put into the Gladstone claim, of the Camp Hewitt Mining Co., as also on some of the claims of the C. A. Gold Mining Co., around Peachland, notably on the Silver King.

Once more attention is being drawn towards the Bon Diablo' Mining Co.'s properties just beyond our city limits, and there is every prospect of the property being taken in hand very shortly. I feel convinced from personal examination and from the reports of mining experts who have seen the property that there is a great future in store for the shareholders of this really promising property as soon as sufficient funds can be obtained to push on the work. The shares are quoted here at 25 cents.

BOUNDARY CREEK.

(From Our Own Correspondent.)

A month ago the outlook in the Boundary Creek district was not particularly encouraging as regards a resumption of work on some of the idle mining properties. Now there is an improvement in this respect, The Winnipeg is once more at work, and definite arrangements either have already been made or are in progress for resuming on the Morrison, Great Hopes and one or two other properties in Deadwood Camp, and on the Brooklyn, Stemwinder and other properties in Phoenix Camp owned by the Dominion Copper Company of Toronto, whilst the Republic group and the Golconda, in Smith's Camp, and the Jewel in Long Lake Camp, may be expected to follow suit during the summer. The Jewel was last month thoroughly examined for its English owners by Mr. Leslie Hill, C.E., who found that the mine had opened up so satisfactorily as to warrant him in recommending that a stamp mill be erected without further delay.

AN IMPROVED OUTLOOK.

The Mother Lode.—There were on the payroll of the British Columbia Copper Company's Mother Lode mine, in Deadwood Camp, about the middle of May some sixty men and fifty more at construction work on the company's smelter, near Greenwood. The numbers are being increased, as the further opening up of the mine admits of more being put on. Drifts are being run both ways from the main shaft at the 300-foot level. In the north drift good ore came in at about 30 feet from the shaft and at 60 feet the drift is still in it. In the opposite direction the drift started in poor ore, but by the time the 50-foot mark was reached there was a decided improvement. A noticeable feature of the better grade ore encountered at the 300-foot level is that it is more silicious than at the 200-foot level and carries higher gold values, thus adding to previous evidences that with depth the values increase. It was only to be expected that these drifts would be in poor rock until well away from the shaft, which is vertical and out of which the higher grade ore dipped at about 280 feet in depth. The north drift at the 200-foot level a fortnight since was in more than 700 feet from the main shaft and the face of the drainage tunnel, running south, at the same level, was about 200 feet from the shaft. The men coming in from the creek to connect with this tunnel were also in about 200 feet, so there was then but 340 to 350 feet to be driven to complete the tunnel. Two cross-cuts 150 feet apart have practically proved the width of the lode at the 200-foot level and have shown that about 90 feet of it is good ore. A third crosscut 100 feet nearer the main shaft is now being run and it is now in similar ore to that exposed in the other two cross-cuts. During four weeks to the middle of May a total of 449 feet of work in tunnel, drifts and cross-cuts was done, besides which a lot of surface rock was removed in cutting out a site for the large hoist expected to arrive at the mine shortly. Now that a cage is in use hoisting is so much more expeditiously done that underground development is progressing far more rapidly than was possible before it was put in. The ore bins are being constructed and it is anticipated that by the end of June the mine will be shipping ore to Trail. No ore outside of that mined in the ordinary course of development work will be shipped to Trail, but when the company's own smelter is ready to treat the ore, probably in September, stopes will be opened and the output of the mine will be increased. At the smelter the sample mill and ore bins are being erected. In the temporary absence of Mr. Paul Johnson, the smelter manager, who is visiting Europe, Mr. Rudolph Liden, assist-

ant manager, is supervising the work of completing the smelter buildings.

The Winnipeg.—Mr. D. H. Beecher has been appointed president of the Winnipeg Mining and Smelting Company in place of Mr. Duncan McIntosh, retired. A district newspaper states that Mr. Beecher has purchased Mr. McIntosh's holding of 200,000 shares in the company. Mr. John Mack, of Spokane, is named as the new manager of the company and Mr. David Oxley, who has had 30 years' practical mining experience, is foreman in charge of the mine,,with authority to employ as many men as he can with advantage find work for. From Mr. Beecher it has been ascertained that about 2,500 feet of work has been done to date. A depth of 300 feet has been reached, and some fine ore has been met with at that level. One vein is stated to be 50 feet in width. Nine carloads of ore were shipped to Trail a few weeks ago and the average value of this ore is stated to have been about $20 per ton. There are about 1,000 tons of ore on the dump and, as the railway spur has been extended to the mine, shipping regularly will shortly be commenced. Besides the ore occurring in the underground workings about thirty feet of solid ore has been exposed at the surface in cutting the railway grade, and this ore body is to be worked forthwith. The machinery and plant are in excellent condition and are equal to opening up the mine to the 500-foot level.

The Golden Crown.—No ore is being taken out of this mine at the time of writing, but dead work is being done at both the 100-foot and 300-foot levels. Before this appears in print, though, ore raising will have been resumed. There are some 2,500 tons of ore on the dumps and in the shipping bins. The rails connecting with the Columbia & Western Railway have been laid to the mine, but as yet no ore cars have been sent in. Two box cars were loaded on May 21 with ore that it was expected would average $40 to the ton. The general average value of the ore, the Golden Crown will ship is estimated at about $25. The ore is pyrrhotite with copper pyrites in a silicious gangue. More ore will be shipped as cars are received. Eighteen men are employed at the mine and it is stated that with this force two carloads of ore per day can be mined and shipped.

Old Ironsides and Knob Hill.—The rails have also been laid to the Old Ironsides mine, in Phoenix Camp. So much development work is being done in these mines and the adjoining Victoria, which is being operated with them, that particulars can not be fairly stated until after a personal visit has been paid to them, information received second-hand not usually being reliable. It is hoped, though, that a summary of the work done to date will be available for publication in next month's issue of the RECORD. It may be mentioned now that the writer this morning received from a mining man of considerable experience assurances that what he had lately seen of ore coming from the Knob Hill had quite removed his earlier doubts as to whether or not the ore from this mine would leave a margin of profit above cost of mining and treatment. At no previous time in the three years during which he has had more than a passing knowledge of the mines in Phoenix Camp had he felt a like confidence in their eventual profitableness and permanence. This is gratifying intelligence and the hope is sincerely expressed that it may soon be confirmed by good returns from the smelter.

B. C. and Oro Denoro.—For a like reason no details of operations on the B. C. and Oro Denoro, in Summit Camp, can be obtained in time for this month's letter. These mines will also be visited shortly and some particulars of work in hand and results to date will be supplied next month. In passing it may be mentioned that Mr. Leslie Hill, C.E., himself a mining engineer of long and varied experience and so fully qualified to give an opinion of value, after visiting the B. C. mine a few weeks ago, informed the writer that he found Mr. S. F. Parrish, the superintendent in charge of the mine, a competent mining engineer, educated to his work and carrying it out with such care and foresight as to promise the best results in the future. He (Mr. Parrish) had cosely studied the whole proposition from a mining engineer's point of view, laying out his plans, cross-sectioning and otherwise doing such excellent work as to make the B. C. one of the best laid-out mines in the district. This is the class of mining the district requires to adequately exploit and demonstrate the extent and value of its mineral resources, but whilst some of the mines have had the benefit of intelligent and skilled direction in the work done on them, it must be admitted that there have been instances where the ownership of a considerable interest in the property has been the chief qualification of the man directing the work, sometimes to the loss and discouragement of smaller holders and to the detriment of the good name of the district from the investors' point of view.

Placer Mining.—Publicity has been given in several of the provincial newspapers to the fact that some placer claims have lately been staked on the lower part of Boundary Creek. Whilst it is not unlikely some small patches of ground not previously worked may be found to yield a little gold, so much attention was given to this locality years ago, first by white men and later by Chinese, that the prospect of any considerable quantity of gold being obtained is not considered good by those who are familiar with the operations and results of earlier years. Present operations are very limited and they will scarcely be enlarged to any important extent unless some finds are made of much greater value than the few dollars' worth of gold recently obtained. Placer "fizzles" are not unknown in the Boundary country, and this seems likely to be another of them.

ROSSLAND.

(From Our Own Correspondent.)

AN INCREASING PRODUCTION.

Just a year ago the ore shipments from January 1 to May 20 amounted to 47,780 tons. From January 1 to May 20 of the present year the output of ore has amounted to 48,661 tons, so that there is still a few hundred tons more for this year as against the corresponding period for 1899. The Le Roi is now making phenomenal shipments. From Saturday, May 12, to May 19, eight days, inclusive, it shipped 4,030 tons, equal to 503.75 tons a day. During May, 1899 the daily output of Rossland mines averaged about 611 tons, but the shipments came from three mines, viz., the Le Roi, War Eagle, and Iron Mask. At present the only shipping mine here is the Le Roi, and the present indications do not justify the belief that the War Eagle will join the shipping list until midsummer, at least, but it is not unlikely that the Centre Star and the Iron Mask will very shortly resume shipments, and when this happens the output will be equal if not a little in advance of the corresponding period of last year. This output of 48,661 tons is made up as fol-

lows: Le Roi, 28,659; War Eagle, 10,603; Centre Star, 7,017; Iron Mask, 1,434; Evening Star, 356; Monte Cristo, 273; I. X. L., 245; Grant, 42; and Iron Colt, 30.

So far, and with the exceptions already named, there are no immediate prospects of any new producers increasing the list, but it is not at all improbable that the Nickel Plate, Josie, Columbia and Kootenay will be placed on the shipping list. These properties are owned by the British America Corporation and they are in a more or less advanced stage of development. The last named under the previous owners shipped about 2,700 tons and there is now an accumulation of ore that will sooner or later be sent to the smelters. The indications on the surface of the Nickel Plate and the Josie lead to the belief that the management intend to make shipments of ore shortly.

The closing down of Sunset No. 2 was unexpected by the Rossland public, but I am credibly informed that the shutting down must by no means be regarded as an abandonment. Mr. J. C. Drewry, the managing director, was some weeks ago taken ill with smallpox in Montreal, but is now convalescent. He will return shortly and I believe that the policy of his company will be to develop the rich galena properties the company own in East Kootenay. The Sunset at present is in charge of Mr. Andrew Drewry, and Mr. W. H. Jeffrey, the company's mining engineer.

May 15th was the monthly "pay day," and it is stated that a sum of at least $125,000 was paid out in miners' wages. This amount will hereafter steadily increase. The Le Roi is employing about 500 men, the War Eagle 60, the Centre Star 100, the Iron Mask 40, the Josie 30, the Nickel Plate 30 and other properties at least 100, so that at the lowest estimate between 800 and 900 men are at work in the mines immediately around Rossland.

The following summary of the different mines around and near Rossland denotes the progress that is being made:

The Le Roi.—The management is shipping from 400 to 500 tons daily.

War Eagle.—The management is carrying out an extensive plan of development on lines similar to those when Mr. J. B. Hastings first took charge of the property.

The Centre Star.—The hoisting engine is in place and the head works are practically completed. The development of the mine is going on by means of the smaller hoists. The new 40-drill compressor plant has not yet arrived from Quebec.

B. A. C. (Nickel Plate.)—The shaft is down to the 600-foot level, and further sinking will be discontinued. In the meantime arrangements to ship ore are being carried out.

Iron Mask.—Work is being done in both shafts and in the north crosscut a large amount of development work is being done.

B. A. C. (Columbia and Kootenay.)—The vertical shaft from No. 6 tunnel is down 281 feet and is still showing ore. In extending the breast of No. 6 tunnel a body of good ore was cut. The north cross-cut from tunnel No. 6 is approaching the north vein.

B. A. C. (Josie.)—The winze is being sunk from the 200-foot level is making good headway.

Evening Star.—The management is now using the Iron Horse compressor. It is intended to work two drills at once.

Velvet.—Drifting from the 200-foot level continues. A shaft is being sunk on the new lead which was found some days ago.

White Bear.—Drifting continues to the northeast.

California.—Development work on the old shaft continues.

Other properties.—A number of other properties are being developed, but it is yet too early for substantial results.

The general outlook of the Rossland mines was never better than it is at present.

SLOCAN.

(From Our Own Correspondent.)

Readers of the RECORD have doubtless all heard of the dire calamity which has befallen the city of Sandon since I last wrote, an occurrence which though painful and far reaching in its consequences will furnish an opportunity of proving to the world that the residents at any rate still have firm faith in the resources of the district. With the possibility of a repetition of such a disaster always before them it is doubtful whether the town will ever re-build quite so substantially; this however, it must be clearly understood is due entirely to natural obstacles and will it is hoped, in no way affect the future volume of business transacted. The spontaneous manner in which all the neighboring towns contributed to the relief of those concerned is typical of the open handed generosity of mining communities and the fortitude and stoical indifference displayed by all under exceptionally painful circumstances is no less characteristic of western life. We wish them all success in a speedy upbuilding of the town, and pray that they may long be spared from such another misfortune.

Political matters to a large extent have been engrossing our attention during the month and as the day for election draws nearer the uncertainty of the situation becomes more apparent. One thing however seems clear, that while the recent settlement of the eight hour dispute does not give unmixed satisfaction, more especially to the mine owners, who claim that all possibilities of profit making have been wrested from them by the arrangement, there is a mutual desire to let matters stand as they are rather than re-open the discussion at this juncture, it being conceded that the loss to the province is more than compensated for by a definite knowledge on the part of investors as to what they may expect. As a result, each of the candidates in this constituency is sworn to uphold the enactment, so we may rest assured that for the present at any rate eight-hour shifts have without doubt come to stay.

The general mining outlook continues good, though casual reference to the shipping would hardly seem to bear out the assertion.

THE MINING OUTLOOK

The Enterprise has risen to second place with a comparatively paltry 560 tons to its credit, but there are other factors in the situation which will come to be recognized better as time progresses and must not be ignored. The Minnesota Silver Co. owners of the Ivanhoe, are about to erect a very complete concentrating plant in connection with their mine which will necessitate the construction of an aerial tramway a mile and a half long, having a vertical drop approximating 2,600 feet. As at present designed it should be the largest as well as the most complete and efficient mill in the province, its daily capacity being estimated at 150 tons of crude ore.

A transfer of considerable magnitude was effected a short time since when Frank Woods, manager of the Last Chance sold his tenth interest in that property to Dr. Hendryx, another heavy shareholder, for something approximating $100,000, the exact figure being unobtainable. It will thus be seen that despite the present small output of the mine its cash value is estimated at a round million.

In the neighborhood of New Denver everything is progressing satisfactorily, operations have been resumed at the California, the second payment has been made on the Hartney bond, and the Bosun has commenced to drive a fifth tunnel nearer the Fidelity ground which it incorporated last year. From Silverton we are glad to hear that the Wakefield mill, unlike some others, is proving its thorough adaptability to the ore which it is required to treat, a result of careful and systematic preliminary investigation on the part of those responsible for its success or failure. The Vancouver too has lately been added to the list of working properties on Four Mile and as a mark of confidence, the first payment has been made on the Hewett, a mine which gives excellent promise for the future. Talk of again starting the Galena mines is once more current, a 20 ton trial shipment having recently been made for purposes of experiment it is believed. Extremely favourable reports are being received from the Arlington of late, and this coupled with the knowledge that 300 tons of ore from this property has reached the smelter this year ought to put a better complexion upon matters in that vicinity.

REVELSTOKE.

(From Our Own Correspondent.)

More interest seems to be shown over the forthcoming election than in mining matters, and indeed between the South African war and the British Columbia elections mining men seem to have been relegated to a back place. In any case, however, there are very few properties working full strength, as just now nearly every mine is so wet from melted snow soaking in from the surface that it is very difficult indeed to keep things going as they should be.

There is very little to report from the Big Bend; but none of the properties are altogether idle. Some little steady work is being performed on all of them though not much more than has been done throughout the winter, and it is satisfactory to know that none of them show any deterioration but quite the reverse. The rather notorious Boston and B. C. Copper Co. has been resurrected as the Prince Mining and Development Co., and on very high authority it is said that the original promoters are out of it altogether. There are good grounds for hoping that the coming season's work will show up a body of ore that certainly exists, unless all indications and experience are to count for nothing. If all goes well there, it will be a great help to the neighbourhood, as there are other very promising claims near to the Standard Basin group.

THE BOSTON AND B.C. CO.

The same quietness that exists in the Big Bend district occurs also to a less extent in the Lardeau, though on the whole that locality is busy enough. The Nettie L. is working with a less staff than usual on account of the workings being so very wet, and also because the long lower tunnel is practically completed, but it is the intention of the manager to ship ore as fast as it can be hauled to convenient transportation. The Silver Cup reports striking their vein at the lowest level, which shows its continuity, and the innumerable other claims and groups of claims in that district will all be duly attended to during the coming season. Fish Creek, also, will be the scene of much activity, some very remarkably rich veins having been uncovered, not only in galena and gray copper but in free-milling gold (notably the Pontiac group), which should cause still further attention to be paid to the locality by capitalists. But after, all, the supreme need is good roads, and while the Trout Lake waggon road is at last receiving the very necessary repairs, yet there are others equally important as outlets for the mineral in their respective vicinity which also require to have money spent on them to keep them always in decent condition; and considering the amount of revenue derived from West Kootenay by the government, it seem hard that we should have to put up with such wretched apologies for roadways as we have. Most sincerely is it to be hoped that the new government, whatever it may be, will try and improve the country that pays them so well and not hamper the mining industry with unconsidered and mischievous legislation.

QUESNELLE FORKS.

(From Our Own Correspondent.)

The men working on the Gold-flat claim took out very good pay as a result of the winter's work. This company drifted into the old workings of the Dead-broke which paid well in the "sixties." The ground joins the upper end of Sebastopol Point, noted in early days for the amount of gold found there. Its locator, a Russian Fin, known as "Sebastopol," was also a noted character in those days. Keithley Creek has been worked for over forty years, during which time a large quantity of gold has been extracted from its placers. On this creek was formerly a large white population, but most of the paying claims have now got into the hands of Chinamen who still earn very fair pay every season.

KEITHLEY CREEK.

Spanish Creek.—On this creek the Moore Company drifting in the hill have been doing very well for some time, taking out from three to eight ounces per set of timbers. This ground has been bonded to an English syndicate for $25,000.

Dancing Bill Gulch.—The Consolidated Cariboo Hydraulic Mining Company have resumed work for the season with a large force of men and everything promising a prosperous season, provided there is no shortage of water, which, however, is possible, as the snowfall last winter was very light.

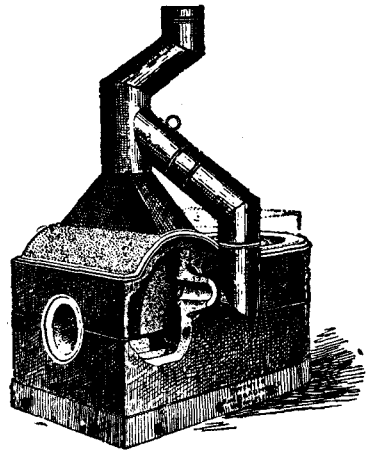
A NEW ASSAY FURNACE.

THE "L. & C." patent combination furnace, owned and manufactured by F. W. Braun & Co., Los Angeles, Cal., (The B. C. Assay and Chemical Supply Co., Vancouver, agents) is the result of a close study of the requirements of the practical assayer, and, with the patent muffle ventilator attachment—one of its special features—is the most efficient and satisfactory furnace ever placed on the market.

By reference to the accompanying illustration it will be seen that it has the novel feature of a muffle lying transversely to the melting compartment, which arrangement is adapted to the application of the patent ventilating flue to a furnace performing simultane-

ously the double office of melting and cupellation. The ventilator promotes rapid oxidation throughout all parts of the muffle, carries off the fumes of cupellation and enables the operator to work with a degree of comfort not possible heretofore with this class of furnaces.

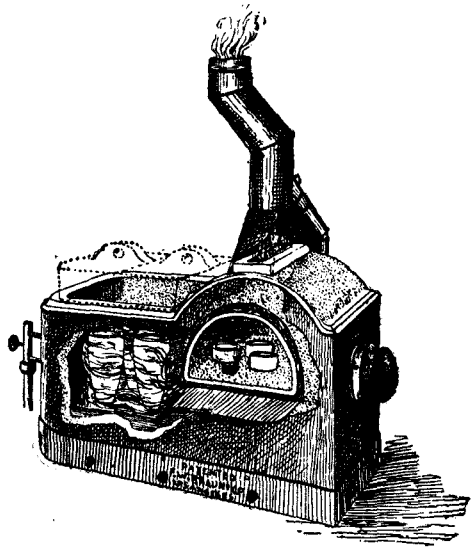
The ventilator referred to is a separate outside connecting pipe between the muffle and the stack, as



shown in the illustration. The heat arising in the main flue creates by induction a forced draft throughout the entire length of the muffle, the fresh air thus supplied furnishing abundance of oxygen, so that cupellation is both rapid and complete in all parts of the muffle.

The furnace is supplied with a centre pivot, by which it may be revolved, thereby enabling the operator to introduce the flame at either end at will from the one burner.

The melting compartment has a hinged bottom, which is covered with a mixture of coke and fireclay.



In case of a bullion spill the trap can be opened and the bottom removed without disturbing the brickwork of the furnace.

The standard size takes a muffle 6x10 inches and has a melting compartment 7x7x7 inches which will hold four crucibles, each with a capacity of two assay tons of pulp, and weighs complete about eighty pounds.

With this size furnace it is possible to make 100 assays in a twelve-hour run.

Since coming into the hands of the present owners, the "L. & C." furnace has been greatly improved in effectiveness as well as general appearances, changes having been made that render its working perfect in all its parts, so that its convenience, compactness and economy of operation appeal to every practical assayer.

The patent draft feature is also applied to single muffle furnaces of various sizes. The Combination Melting and Muffle furnaces are made in a variety of sizes.

In the illustrations Fig. 1 is a view of the furnace showing the oxidizing bonnet and muffle draft; Fig. 2 shows melting and cupelling carried on at the same time. In both views the front is broken away to show the interior construction.

PRODUCING MINES.

ROSSLAND.

OUR Rossland correspondent telegraphs: "Ore production from this comp for the five months ending May 31st aggregate 50,000 tons gross, valued at approximately $850,000."

NELSON.

The returns from the Nelson customs for April show the value of the mine products exported as follows:

	Value.
Coke, 2,258 tons	$6,718 00
Ores, 1,517 tons	99,018 00
Gold bullion	37,626 00

LILLOOET.

The returns from the Ben d'Or mine give a result of 400 ounces of retorted bullion as the result of 25 days' and 21 hours' crushing.

COAL EXPORTATIONS.

THE following shipments were made in April:—

	Tons.
New Vancouver Coal Co.	36,379
Union	13,795
Ladysmith (Extension)	22,873
Total	73,047

For the three weeks ending May 20th the New Vancouver Coal Co.'s foreign shipments were as follows:—

Date.	Vessel.	Destination.	Tons.
1	SS. New England	Alaska	40
3	SS. Mineola	Port Los Angeles	3,439
3	SS. R. Adamson	San Francisco	4,501
8	SS. New England	Alaska	40
9	SS. Titania	Port Los Angeles	5,882
10	SS. Ruth	Skagway	178
14	SS. San Mateo	Port Los Angeles	4,472
15	SS. New England	Alaska	10
16	SS. R. Adamson	San Francisco	4,527
20	SS. Aztec	Port Los Angeles	5,385
	Total		28,474

THE METAL MARKET.

Compiled from special telegraphic quotations to the B. C. MINING RECORD from the *Engineering & Mining Journal*, New York.]

COPPER.

THE market remains dull and quiet, and prices have fallen somewhat during the month. Manufacturers appear to be covered for early deliveries and consequently transactions have been few. The latest quotations are Lake, 16½@16⅝c; cathodes, 16@16⅛c; casting copper, 16¼c.

LEAD.

The price of this metal has declined to 3.95 to 4c. in New York and 3.80 to 3.85c. St. Louis, or a falling off of $14 per ton in less than two weeks. The New York *Engineering and Mining Journal* attributes this rapid decline to the fact that production is in excess of consumption, while the *Mining and Scientific Press* of San Francisco thus comments:

"A drop of nearly 1 per cent. per pound in the price of lead during the month is noticeable. While the present price is considerably better than that of August 2, 1896, when it was $2.50 per hundred pounds, yet its sudden tumble from $4.75 of a few weeks ago is dispiriting to producers. The cause of the drop is purely arbitrary; it is done solely because the controlling trust has the power to put the price up or down at the will of its directors. It is now characteristic of the managers of any of the great trusts to use their power to affect stocks, as in the recent case of J. W. Gates of the American Steel & Wire Co. There is no legitimate trade reason for the drop in lead. There is a steady demand, and the uses to which it is adapted are multiplying. Tariff protection is a good thing, but its good effects should be extended to the ore producers. When the smelter combine was formed one of the arguments used was that it would reduce the cost of the consumer and permit the miner to get more for his ore. The result is just the reverse—the consumer is paying more, the miner getting less. The import duty is a help, but its helpful effect should be more mutual Just now it is decidedly one-sided."

SPELTER.

A fair business is reported at 4.55c. New York, and 4.40c. St. Louis.

THE LOCAL STOCK MARKET.

THE stock market is gradually recovering as regards the volume of business, but prices still continue low. Athabasca has been in good demand and considerable stock sold at 25 cents, but on Saturday it weakened off and sold as low as 21 cents.

The Dardanelles Company is calling a meeting for June 20th for the purpose of raising more funds, either by making the stock assessable or by issuing debenture bonds. The money will go to pay present liabilities, amounting to about $11,000, and to again open operations on the property.

Van Anda still holds at from 3 cents to 3¾ cents and is being picked up whenever offered under the 3 cent mark. The smelter is working night and day, and the company is now said to be making money steadily every month. Both the Copper Quarry and Cornell are looking well, and work is being steadily pushed on both properties.

Payne, Republic, Virtue, Montreal & London, War Eagle and, in fact, all the higher-priced stocks have weakened off considerably in the last few weeks. Some of the banks which have been loaning on these stocks were compelled to realize on the securities, as their clients failed to keep up their margins, and on account of the stock being thrown on the market, prices are considerably affected.

Rossland shares have not been very active lately and glancing down the list of sales daily reported to have been made on the Rossland stock exchange it is noticeable that the majority of these sales are stocks in mines in other camps in British Columbia. There has recently been a demand for Giant as a result of a reported sale of majority stock to Philadelphia capitalists. Giant advanced from 2½ to 4. Several blocks of Novelty have been selling at 2, and White Bear at 2¼, Evening Star about 10, Iron Mask 37 to 40, Monte Christo 3½ to 4.

Noble Five recently resumed work and the stock has been very active. The price has advanced from 2½ to 7; Athabasca dropped to-day in Toronto to 18 cents; Dardanelles has been selling at 2½ to 3, and Payne dropped from $1.20 to 99 cents, but rallied quickly again to $1.12, to-day's quotation.

Fairview Corporation has been very active and large orders have come from the east for this stock owing to reported placing of a large block of treasury stock in London, Eng. The price has advanced from 4 to 8.

The Winnipeg has resumed operations under new management, and shares have been in good demand, having advanced from 12 to 15. A number of other mines in the Boundary district are resuming work. Knob Hill has fallen from 75 to 58, and Rathmullen from 4 to 3.

The Waterloo mill has resumed crushings and shares have been very active, selling as high as 5¼. Several large blocks of Cariboo changed hands at 95 to 97.

Sullivan has been an active stock at 11 to 12, and Crow's Nest has been selling around $37.

MACHINERY CATALOGUES.

WE shall be pleased to mail catalogues of any of the undermentioned firms to our readers free of charge, on applciation:

Ainsworth & Sons., Wm., fine balances; Armstrong & Morrison, riveted steel pipe ore cars, etc.; B. C. Assay & Chemical Supply Co., assayers' supplies; Braun & Co., T., assayers' supplies; Beatty & Sons, M., cables and tramways, dredges, pumps, etc.; Bennett & Co., Wm., fuse safety couplers, etc.; California Wire Works, cables and tramways; Canadian Rand Drill Co., drills and compressors; Canadian General Electric Co., electrical plants; Cooper Mfg. Co., The James, compressors, power and hand drills; Denver Fire Clay Co., assayers' furnaces, etc.; Fraser & Chalmers, mills, pumps, hoists, engines, etc.; Fairbanks, Morse & Co., steam and gas engines, compressors, etc.; Gates Iron Works, engines, boilers, crushers,

etc.; Hamilton Mfg. Co., The Wm., crushers, mills, hoists, etc.; Hendy Iron Works, Johsua, modern mining machinery; Hinton & Co., Geo. C., electrical supplies and machinery; Hearn & Harrison, engineering, mining and surveying instruments; Hamilton Powder Co., explosives; Howells Mining Drill Co., drills, all kinds; Jeffrey Mfg. Co., elevating machinery; Jenckes Machine Co., hoisting and milling machinery, Krupp, Fried, Grusonwerk, mills, engines, pumps, etc.; Lexow, Theo., carbons; Link Belt Machinery Co., conveyors, elevators, etc.; McLennan, McFeeley & Co., belting, etc.; Mitchell, Lewis & Staver, compressors, drills, hoists, etc.; Perrin & Co., Wm., filter presses; Royal Electric Co., electric power, all kinds; Robertson & Co., James, wrought iron pipe, paints, etc.; Sturtevant Mill Co., ore breakers and mills; Stilwell—Bierce & Smith-Vaile Co., water wheels; Taylor & Co., John, assayers' supplies; Trenton Iron Co., cables and tramways; Taylor Air Compressor Co., drills, compressors, etc.; Union Gas Engine Co., gas engines, hoists, etc.; Whitstock, P. & R., mining engineering and surveying instruments; Wilfley Ore Concentrator Co., Ltd., concentrators.