The Mining Record.

VOL. VIII. OCTOBER, 1901. NO. 10.

BRITISH COLUMBIA

MINING RECORD

Devoted to the Mining Interests of The Pacific Northwest.

PUBLISHED BY

THE BRITISH COLUMBIA RECORD, LIMITED

Advertising Rates on Application.

H. MORTIMER LAMB, Managing Editor.

Victoria, B. C., Office: Bank of Montreal Chambers.
London Office: 24 Coleman Street, E.C.
Montreal: Gray's Agency.
Denver, Col.: National Advertising Co.
San Francisco: Dake's Agency.

SUBSCRIPTION TERMS:

Canada and the United States, one year - - $2.00
Great Britain and Foreign, one year - - - 2.50

All communications relating to the editorial department of the British Columbia MINING RECORD to be addressed to

THE EDITOR, B. C. RECORD, LTD.,
P. O. Drawer 645, Victoria, B. C.

All communications relating to the business department of the British Columbia MINING RECORD to be addressed to the

BUSINESS MANAGER, B. C. RECORD., LTD.,
P. O. Drawer 645, Victoria, B. C.

THE MONTH.

FOR the year ending 31st December, 1900, the output of gold from the Klondike district of the Canadian Northwest was $22,275,000. During the present year it was confidently expected that it would fall below that figure both on account of the dry weather prevailing, and on account of the partial exhaustion of some of the very rich ground whose output had hitherto bulked largely in the total for the district.

THE KLONDIKE OUTPUT.

It may be surmised, although it is too early to make any estimate, that the dryness of the present season has had a serious effect upon the industry of placer mining in British Columbia. It is possible that there are counterbalancing circumstances which will prevent the output from showing any startling diminution. But it is certainly the case that the output of the British Columbia placers will not be nearly as large as it would have been had the supply of water been normal this season. The same factor has had an influence upon the gold industry of the Yukon Territory.

The second feature, namely, the exhaustion of rich ground is a much more serious one. It was freely stated in the early part of this summer that the Klondike had, in 1900, reached its zenith, and that although for many years it would show a large and important output of gold, still, that output would show a steady and continual decrease until in the end the Klondike became a closed chapter, a completed episode in the history of gold mining.

If that had been the case it would have had an unfortunate effect upon Canada as a gold-producing country. Canada has become, through the Klondike, a most important factor in the world's production of gold. But to do more than maintain its present position, it is largely dependent on the Klondike for some years yet. The growth in production from the quartz and hydraulic mining in British Columbia could not be expected in the face of a decline in the Yukon to do more than counterbalance that decline even if it accomplished so much. Canada, therefore, as a gold producing country, would have been obliged to face a practically stationary condition for some time to come.

In face of the actual figures of gold production this season it would, however, appear that the undoubted exhaustion of some of the richer ground, to which attention has been drawn, has given rise to a wrong impression of the the gold-producing capacity of the district.

During June, July and August, the sum of $18,643,000 in gold has been exported from Dawson. It was only with the first of June this year that a system of export certificates was inaugurated which enables a perfectly accurate tally of the gold shipped out of the country to be kept. In addition to this amount, however, some gold was shipped over the ice during the early months of the year, a considerable amount during May and no doubt not a little between the end of August and the close of navigation. There are other recording offices also in the Yukon Territory through which a certain amount of gold has been exported, the amount of which does not appear in the foregoing statement.

Everything considered, therefore, it does not seem likely that the returns this year will fall appreciably, if at all, below those of last year. At the same time it must be observed that there is a change apparent in the sources of the bulk of the gold, a change which will become more accentuated as time goes on. The gold tends less and less to come from very rich ground regarding which it matters little whether the conditions under which it is worked are extravagant or not, and more and more from poorer ground worked in larger

bulk where, of course, economy of production is a much more important consideration. The progress of the Klondike appears now to depend upon working a large gross number of yards of gravel of a poorer content in gold. Whether the Klondike is to increase in importance or diminish will be largely influenced by the extent to which the general conditions of mining in the district can be made to further economy of production.

In quartz mining, where, through the introduction of heavy machinery, the erection of local mills and smelters, and the cheapening of transportation, and so forth, a lower grade of ore is enabled to be treated successfully the gross output of metal always increases, nor does the general prosperity diminish, nor the gross value of the profits obtained. This applies equally to placer mining. The terms "pay ore" and "pay dirt" are purely relative terms, relative to the cost of production. Diminish that and their significance is changed. Under the circumstances therefore, and with the data available from this year's operations, there seems every reason to suppose that the Klondike is capable of maintaining a steady increase in gross output for many years to come. But upon the problem which it now presents, the factor of economy, or the want of it, in production, is of the most vital importance. Cheap goods, cheap railway transportation, and effective labour-saving machinery, are all essential to the future well-being of this most important district, and it is well worth the while of those who have been drawing large revenues from the Yukon trade to consider that from now on they must aim at less profit over a larger business, or run the risk of injuriously affecting the health of the goose which lays the golden egg.

MINING PROGRESS.

Some time ago when the situation in reference to mining was discussed in the MINING RECORD, in an article which attracted much attention at the time, we adopted the view that the reaction noticeable in the mining industry throughout this Province, was due almost entirely to the wild speculation which preceded it, and the lack of the business judgment with which many of the mines were handled, and not to the conditions, either imposed by Nature or law, under which mining is carried on in British Columbia. While we did not argue that all the laws and regulations of the Province were beyond criticism or amendment, we insisted most strongly that far too much stress was being laid upon their influence in bringing about, or their ability to remove, the hard times noticeable.

We think that our contention has been fully borne out by the events of the past two or three months. It is quite true that the reaction, in the sense we dealt with it, has not yet passed away. Those who were rich in their minds through the possession of mining shares of little or no intrinsic value are no longer rich, even in their minds, although they still possess the shares; and too many of them are in the position of being required to derate the fruits of their industry for a long space of time to recover what was lost during a brief period of inflated speculation. While those whom this animated speculation brought into existence, as it were, brokers and promoters and speculative prospectors, find that to a large extent their occupation is gone. Such an experience, as general as it has been throughout the country, could not but bring about hard times as bitterly real as the preceding prosperity had been false and illusory.

But at the same time it is satisfactory to note that there never was a time when more men were actually at work in the mines of British Columbia than at present; there never was a time when the output of ore was larger or more valuable; aud there never was a time when more capital was being legitimately expended in the purchase of mining property, the installation of machinery both for mining and treating ore, and the construction of railways for the service of mining districts. It is unnecessary to particularise here. Readers of the MINING RECORD must be familiar with the events to which we would appeal in support of this contention. The promising outlook for the coal, smelting, railway and iron interests of East Kootenay, the rapid recovery of the Slocan now in progress, the rehabilitation of the Silver King at Nelson, the heavy investments in the Lardeau, the increase in furnace capacity and railway development in the Boundary, and the promised inauguration of copper mining and smelting on a large scale on the Coast—all these things discover, to those of only ordinary observant capacity, a steady progress in the development of legitimate mining in the Province of British Columbia.

The point we wish to make at the present time is this, that these satisfactory features are entirely inconsistent with the hypothesis that the natural or legal conditions under which mining is carried on in this Province were responsible for the depression noticeable this spring, and still existent to a certain extent; while their appearance concurrently with this speculative reaction is proof positive that this reaction has nothing to do with the conditions under which mining is carried on, but the inevitable outcome of a largely foundationless boom. It is absolutely incredible if the laws of British Columbia were as bad as they have been made out to be, or if the resources of British Columbia were of the profitless character attributed to them in some quarters, that, in the face of reaction, gloom, and difficulty, such solid progress, investments of so large and beneficial a character, would have been made during the past few months, it is absolutely incredible that such far reaching and satisfactory developments would have been the promise of the immediate future.

Considerable dissatisfaction is being openly expressed at the practical working of the Act under which coal lands are acquired, and prospecting for coal carried on in the Province. The Act does not appear to accom-

plish what it was intended to accomplish, namely, the active development of coal lands by companies with sufficient capital at their backs, but to bring about the tying up of coal lands for a small money consideration to the Government, by parties who desire to hold those lands for purely speculative purposes.

The first step in acquiring coal lands in British Columbia is to place a stake at the corner of each 640 acres which an individual or syndicate may wish to prospect over. This simple act gives a vested interest in the land so designated for 60 days, during which certain preparations have to be made to take out a prospecting licence. The prospecting licence costs $50 for each section and is good for one year. That is to say, ten square miles of coal lands may be tied up for a year for a payment of $500 and small incidental expenses. The law, however, goes further. At the end of the year the holders of the licences have only to prove to the satisfaction of the Chief Commissioner of Lands and Works that they have looked for coal and have not found it, to have the licences renewed for another year at the cost of $500. As the Chief Commissioner of Lands and Works cannot be supposed to investigate the *bona fides* of every such application, we can only say that opening is left here for corruption on the part of subordinate officials, and for the evasion of the intention of the Act such as should not exist in any Provincial statute. We say this without making the remotest suggestion that in any particular instance it has been taken advantage of. This process of renewal may again be put in operation and the land tied up for a third year. This provision of the law seems to put a premium upon anything rather than the discovery and development of coal. It makes it possible to tie up coal lands for three years and two months, without any futher definition of their area than a post to each square mile, and without any obligation on the part of the licensees except that of perfunctory prospecting, with a distinct inducement to speculative holders not to discover coal.

If the coal, however, is so patent that it cannot be overlooked, then the licence holders may apply for a lease. Their lease contains stringent provisions regarding continuous working, and so forth, and runs for five years at a rental of ten cents per acre. There is, however, no *locus standi* for any third party to attack this lease if its provisions are not carried out, and it is unlikely that the Government would do so unless the ten cents per acre was not forthcoming regularly. Certainly before the lease is issued the land must be surveyed. But the upshot of the whole matter is, that anyone desiring to speculate in coal lands, may tie them up for a period of eight years for a comparatively small monetary consideration, compared with the interest involved, and the more perfunctory discharge of certain duties. If, during this period, someone happens to come along who wishes to mine and use the coal why then, of course, the speculators fortune is made.

Such is the law regarding the discovery of coal in British Columbia except, indeed, that if eight years are not long enough the land may then be tied up in perpetuity by purchase, subject to no taxation, except the Wild Land Tax of 25 cents an acre, unless the holder should be so foolish as to work the coal, when he would have to pay a royalty.

This law, like some others in British Columbia, seems to have been framed for the purpose of extracting a trumpery revenue from speculation in the resources of the Province, and without any regard for solid industrial development upon which alone prosperity and a satisfactory revenue depend.

It is not our business at the present time to suggest a specific change, but surely something could be devised a little less likely to attract a flock of land cormorants whose only occupation is to prey upon the capital which is willing, actually, to develop and work the resources af the Province.

From the report, published elsewhere in this issue, of the proceedings at the general meeting of the Tyee Copper Company, Limited, held recently in London, it will be noticed that resolutions were passed authorising the directors to take steps to increase the capital of the company from £120,000 to £180,000, by a further issue of 60,000 shares of £1 each. It was not expected, however, that the new issue would be placed without considerable difficulty, and in anticipation of this the following clause was inserted in the Company's Articles of Association :

"Upon any offer of shares to the public for subscription, the company may pay a commission at a rate not exceeding 60 per cent. to any person in consideration of his subscribing, or agreeing to subscribe, whether absolutely or conditionally, for any shares in the company, or procuring, or agreeing to procure, subscriptions, whether absolute or conditional, for any shares in the company. In addition to or in lieu of such commission in cash, the company may give to any such person a commission of the same or less nominal amount as the shares subscribed, or agreed or procured to be subscribed, payable in shares or debentures or debenture stock of the company, wholly unpaid or credited as wholly or partly paid respectively. The power by this article conferred on the company may be exercised by the board."

That a concern such as the Tyee company should consider it necessary to offer so large a premium as 60 per cent. in order to make a market for its shares, indicates that the directors fully realise the fact that the present attitude of the British investing public towards British Columbia is apathetic, if not antagonistic, and consequently their proposal to attempt to raise additional money for an undertaking which, though unquestionably promising, is still largely speculative, at so inopportune a time, appears somewhat impolitic. The chairman, however, in his address explains that one of the principal objects for which it is necessary funds should be immediately provided, is that the company may exercise its option in the acquisition of adjoining property at Mount Sicker, which at this stage may be secured upon exceptionally advantageous terms. The purchase, without delay, of the areas referred to is also strongly recommended by the company's consulting engineer, Mr. Wm. Thompson, in his report, and as this advise is based largely on technical grounds having re-

gard to the economic operation of the mine, the shareholders present at the meeting in confirming the policy outlined by the directorate were no doubt influenced by these considerations. Under the circumstances, the decision arrived at was doubtless the correct one, for if the option on the adjoining claims were allowed to expire, it is probable that in view of the recent satisfactory developments in the Tyee mine, the property could only be secured later at a much increased, if not altogether prohibitory price. Meanwhile at no distant date, judging from present indications, the Tyee will be in a position to commence a regular production of high-grade copper ore, sufficient to enable the company to earn very substantial profits.

In a recent leading article on the subject of British Columbian mining, *The Mining World and Engineering Record* of London refers to the ignorance prevalent in England of conditions in this Province and in the Yukon, and ascribes this lack of knowledge to the backwardness of the Canadian authorities in supplying, at frequent and regular intervals, general and statistical information upon which due appreciation of the mineral resources of these territories might be based. Our contemporary proceeds, pertinently enough, to remark that

"While voluminous annual reports are issued by the British Columbia Government, usually long after they have ceased to possess any current interest, monthly facts and figures of the kind supplied by the Australian colonies, for example, are conspicuous by their absence. When the vote for the establishment of the Agent-General's office in London was recently discussed in the British Columbia legislature, a representative of one of the mining constituencies complained of the lethargy of the Government in keeping the potentialities of the Province before investors, and the Minister of Mines, in reply, is reported to have stated that the Government was sending out circulars every month. If this is a fact it would be interesting to know to whom the circulars are being sent, for they have certainly not reached the London Stock Exchange, or the people who have largely interested themselves in British Columbian operations. It is much to be hoped that the existing Government, which appears to have the interests of the mining industry at heart, will at once initiate and carry out such a policy of frank publicity as will enable investors to ascertain authoritatively what is really taking place in the mineral development of the Province."

We can reassure *The Mining World and Engineering Record* on one point. The B. C. Government is not "sending out circulars" of the character described. But it may interest our contemporary to learn that preliminary steps have been taken. Mine owners and operators are now nominally compelled by law to make regular monthly returns of output and values. Laws may, however, be made with impunity, it is another matter to enforce them. Owing to this difference, the statistical bulletins, which would have had the effect of advertising in the most convincing manner possible the satisfactory recent development and growth of the mining industry of British Columbia, have not been issued. The British press should not be impatient. Such an attitude is indecorous to a degree. In Western Canada we are content to recognise the delight of anticipation, and among other things look forward to being officially informed in June or July of next year that during the early summer of 1901 there was a strike at Rossland. In order that no ill consequences may follow from the too sudden dessimation of information so startling, the public will be first prepared by the Education Department who will confide to it the intelligence that Queen Anne is dead.

The strike situation at Rossland does not appear to have undergone any material modification during the last month. It is not easy to declare with any certainty either the ultimate issues involved or the progress of the struggle. There appears to be an inclination in some quarters to interpret the Rossland struggle as an advance guard action between the forces of mining capital and trades unionism as such in the mining industry in British Columbia. But this would give an extended significance to the strike which we hardly think it warrants. Doubtless, should the Miners' Union meet with a reverse at Rossland it will be apt to weigh the cost of all its actions very carefully in the future, and in this sense of the strike probably has an important bearing upon the industry as a whole and upon possible future labour disputes in the Province. But that there is contained in it the nucleus of a movement to wage war on unionism as such in British Columbia we can hardly credit. Such a struggle if carried out to the bitter end would practically destroy all the capital invested in British Columbia mines and would lead to years of industrial anarchy. It would certainly seem to be as contrary to the interests of the mine owners as it would be hostile to the spirit of the age.

The struggle is being carried on with spirited reprisals on both sides. The penalties enforced against two of the striking miners have been followed by convictions obtained for breaches of the Alien Labour Act, and these again by suits for damages entered against the various unions engaged in the strike. These things really point to a new and hopeful feature in connection with labour disputes. People are becoming alive to the great waste and loss occasioned by labour disputes; they are beginning to realize that it may be possible to affix a legal responsibility for this waste and loss upon one side or the other, as well as merely to discuss the question of moral responsibility. In these civil actions we see a certain rudimentary effort to bring labour disputes within the regulating influence of universally admitted principles of law. That being so, there never was a crisis when the purity of our courts and the trust and confidence in them by all classes of the people were likely to afford a greater service to the well being of our society.

Practically there are two divergent lines along which labour disputes may be brought under the domain of law. One of these is to erect courts of jurisdiction to sit upon and decide such questions between capital and labour as may be brought before them. This is the direction which labour legislation has taken in New Zealand. It has obvious advantages in that it aims to prevent strikes altogether, but it has equally obvious disadvantages in that it brings all the details of industry into a continuous cycle of litigation.

The other alternative is to leave employees and employed perfect freedom of action to arrange their relations as at present, and in case of failure to do so, equal freedom to strike or lock out, as the case may be. But to affix upon the one party taking action of this kind actual and heavy responsibility for loss or damage sustained by the other in accordance with well recognised principles of law which regulate the civil relations of individuals. We hardly venture to hazard an opinion upon one of the most intricate and delicate of modern problems. But it would certainly appear as though the latter course were more in harmony with that development of law which has preserved the civil liberty of the individual without permitting it to degenerate into the licence to worry other individuals with impunity.

There can be no more satisfactory indication of the broad and solid foundation upon which the mining industry is being established in British Columbia, than is afforded by the amount of capital which it is contemplated to sink in the establishment and equipment of smelters within the boundaries of the Province. An individual mine here and there may at one time have a large supply of ore at hand, and at another, have its reserves depleted and its shipments interrupted. But a smelter depends for its existence upon a steady and continuous supply of ore. Unless that is guaranteed by the condition of the mines and district it is intended to serve the capital is not usually forthcoming to insure its construction. Without considering the increase in capacity both at the Granby smelter and at the Greenwood smelter, we find that, at the present time, no fewer than five new smelters are mooted in British Columbia. We would be far from committing ourselves to the opinion that all of these smelters will be immediately placed under construction, but this we will say, that there is not one of the projects which has not a certain amount of legitimate justification derived from the condition and prospects of the mining industry.

It is now a foregone conclusion that a copper smelter will be erected at some convenient point on Vancouver Island which will have the ore of the Lenora mine at Mount Sicker as its base of supply. In addition to the Lenora with its steady output of from 60 to 80 tons a day of first-class ore, and its possible average mine run, were a smelter convenient, of over 100 tons a day, the Tyee and Hayes mines have now reached the shipping stage, while the Marble bay properties are shipping an average of 1000 tons a month. There is not any doubt that the Coast mines can now supply a steady supply of ore for a copper furnace of moderate capacity apart altogether from the contemplated developments at Howe Sound, which will provide a problem in local treatment peculiar to themselves.

For the Boundary country two new smelters are contemplated, one in connection with the Snowshoe mine and one in connection with the Brooklyn and Stemwinder mines. The necessity and justification for these plants arise from the fact that all the great mines in the Boundary country can make an important saving in smelting profits by having their own plants, while the self-fluxing character of the ore does away with many of the difficulties encountered in operating a smelter in connection with an individual mine. Therefore the reduplication of copper furnaces in the Boundary district is only a question of the development of tonnage. It has also been decided to put a lead smelter in operation in East Kootenay. East Kootenay possesses all the requisites for a successful smelting industry in a more marked degree than any other portion of the Province. It is quite evident that a lead stack is not only justified in East Kootenay, but by affording a ready market for the output of less developed mines will have an important effect in forwarding the development of the district.

Some discussion has also arisen respecting the opportunity for a smelter on Slocan lake. We have frequenly referred to the very satisfactory progress of the mines tributary to Slocan lake and particularly of the remarkable development of the dry ore belt which is becoming an important contributor to the mineral output of the Province. But it is doubtful whether there is a sufficiently large and steady tonnage to keep a smelter in operation, and with regard to dry ores it is doubtful whether the premium offered by outside smelters is not more than sufficient to offset any advantages to be gained by treating them within the limits of the district in which they are produced.

However, not to include a smelter on Slocan lake, where there is certainly great activity and progress in mining, how can it be reasonably maintained that the mining industry of British Columbia is in any true sense in a decadent or backward condition in view of the contemplated industrial developments which we have here outlined?

The recent enquiry concerning iron properties in British Columbia on the part of capital or its representatives is not without significance. In our last issue we referred to the purchase in August, by a Montreal syndicate, of extensive hematite occurrences near Kitchener, and again this month we have to record a considerable transaction of a similar nature. The existence of large bodies of hematite ore near Bull river, in the Fort Steele Mining Division of East Kootenay, has long been known, but the claims were not staked off until April last, probably on the very obvious grounds that the property was not considered marketable. In fact, with one exception no iron properties as such were located in the interior of the Province until this year, although on Vancouver island and the Mainland coast the potential value of the large iron occurrences discovered was earlier appreciated. The areas at Bull river, which are now under bond for a consideration of $120,000 to a capitalist of Butte, Montana, comprise several claims through which the deposit has been traced, and it is es-

timated that there is a very large tonnage of ore exposed. The ore is similar in character to that met with at Kitchener, being a hematite of superior quality, analyses showing high metallic iron contents, ranging from 55 to 60 per cent. and an almost total absence of deleterious substances. It may be that the present investment in iron mines is occasioned by the anticipated development of the smelting industry in the Province, but even with the projected additions to the number of existing establishments the demand for iron as flux must be necessarily limited, and would hardly alone warrant any considerable expenditures in iron mining operations. The only other explanation, therefore, of the present demand for iron properties, is that capital does not foresee any insurmountable obstacles against the establishment later of iron manufacturing in Western Canada, and the present movement is the preliminary step in that direction.

The completion of the construction of the Yukon telegraph marks an important step in the development and consolidation of the vast territory known as the Dominion of Canada. It is to be hoped that it will result in closer relations between British Columbia centres of business and that wonderful outpost of the British Empire within the confines of the Arctic circle.

Commenced in April, 1900, the telegraph line has been built from Ashcroft to Hazelton, Hazelton to Atlin, Atlin to Dawson and Dawson to Fort Egbert on the Alaskan boundary line. Spur lines have also been run to Fort Simpson, to the Omineca goldfields and other points, making the mileage of line laid exceed the two thousand mile mark. The work has been carried on under the superintendence of Mr. J. B. Charleson, of Ottawa, brother of Mr. D. B. Charleson, of Vancouver.

The wild, unexplored country through which the line passes, has made its construction a most difficult and arduous piece of work. In places the construction party has been forced to work in snow five feet deep, and at an altitude of 3,750 feet. Between 75 and 80 experieneed telegraph construction men have been employed on the work, besides a large number of packers. With the exception of the section of the line between Ashcroft and Quesnelle, 225 miles, and the Dawson-Atlin section, the construction party had to cut its own trail, pack every pound of wire, tools and food, erect poles, and in fact, cut its own road and run the telegraph wire through a country practically previously untrodden by a white man. The line was started at both ends and the sections were built as follows:

Bennett to Dawson	540	miles.
Dawson to American boundary line, Fort Egbert.	90¾	"
Tagish to Atlin	95	"
Atlin to Telegraph Creek	241	"
Telegraph Creek to Hazelton	400	"
Hazelton to Quesnelle	405	"
Quesnelle to Ashcroft	225	"
Ashcroft to Vancouver	204	"

Over the last section the wires were not laid, it being the intention of the government to utilize the Canadian Pacific railway lines over this portion. The total distance of the line from Vancouver to Dawson is 2,173 miles. In addition to this, a spur line from Hazelton to Port Simpson, 198½ miles has been built, and is already in operation.

Through various causes the Canadian Yukon, although a large contributor to the revenue of the country, has not been of the advantage it might have been to the trade and commerce of the Dominion. These causes were inherent in the nature of the country and derived much of their efficacy from the fact that very many of the pioneers of the Yukon were American citizens, to whom certainly Canada owes a great debt of gratitude for the development of one of the richest assets of the Dominion. But by providing a market for the gold produced in the Yukon, and by establishing closer relations with the business community centered at Dawson, Canada is gradually overcoming these natural disadvantages and placing the Yukon in a position to confer and receive the benefits due from one integral part of a great country to the others.

Reports from the Slocan districts have lately been of a distinctly more favourable character, and while a depression is still felt in commercial circles, the mining outlook has undoubtedly improved and production is proceeding at a very satisfactory rate. The larger properties in the neighbourhood of Sandon have generally resumed operations, and though, of course, the margin of profitable mining has been and still is seriously affected by the decline in lead prices, the ores of this district are sufficiently rich to yield a fair return even with this additional strain, when operations are efficiently and economically conducted. The average price of lead in the last few years has been abnormally high rather than otherwise, and the existing London price is far from representing an exceptional low market value. If lead miners in British Cslumbia have been reckoning on the maintenance of prices ruling between 1891 and 1900, in order to continue the successful working of properties in the Slocan, it is really satisfactory to learn that this basis of calculation has now been abandoned. For the immediate future there is little likelihood of an improvement in the London lead market, and the probability of any considerable advance in the price of the commodity being exceedingly remote; on the other hand no appreciable further decline is to be feared. Meanwhile, the action of the America Smelting Trust in refusing British Columbia lead ores has had the beneficial effect of stimulating local smelting and the territory tributary to Slocan City directly owes its present prosperity and activity to this circumstance. As the lead ores are being treated at home, a considerable demand has arisen for the high grade dry ores from this belt and in consequence the production from the Slocan City and lake divisions has

already exeeeded by nearly forty per cent. last year's output, while one mine alone, the Arlington, which has quite suddenly come into prominence and now heads the list of Slocan producing properties for 1901, has put out more ore in the last eight months than the combined production of all the mines of the locality during 1900. It can only be a question of time before local smelting is supplemented by local refining, and when the marketing of our lead as pig or in manufactured form will be in the hands of the British Columbia producer. Such a consummation is devoutly to be wished.

It is stated, on apparently good authority, that operations at the Consolidated Cariboo Hydraulic Company's property, at Bullion, have been suspended for the season. If this information is correct all hope of a dividend distribution this year must be abandoned, as the returns from the two "cleans-up" will be little, if any, more than sufficient to defray the cost of working. These disappointing results, due to unprecedented scarcity of water, are the more regrettable as all the initial difficulties in connection with the equipment of the mine had been successfully overcome and shareholders naturally keenly anticipated the enjoyment of regular dividends to commence after the 1901 season, in consideration of a display of patient waiting extending over a period of five or six years. Under normal conditions these expectations would have been unquestionably realised, and although it is not likely that the difficulty occasioned by scarcity of water will again be experienced for a considerable time to come, some means will doubtless be found of dealing even with this exceptional drawback in the future. We confidently assert that the relatively unsatisfactory achievement of this year, will in no way influence shareholders in forming a less high opinion of the value of their property, or incline them to express less confidence in the management. The establishment of a reserve fund after this year, will no doubt be carried out, and thus enable the company to pay regular dividends even when operations are circumscribed by the incident of an unusually dry season.

The establishment of the Government Assay office at Vancouver has already been justified by results accomplished in the last two months, and the Board of Trade of that place is to be cordially congratulated on the success of its spirited exertions. A large amount of gold has been purchased by the office, deposits having been received not only from the Yukon, but from the interior of British Columbia, the Northwest Territories, including Edmonton, and also from so far away as Rat Portage, Ontario. While, however, the Assay office itself is doing an excellent business, and one object, that of inducing returning miners to bring their gold to a Canadian instead of to an American centre, is thus achieved, the institution as at present constituted is only partially useful. There is little advantage in merely refining the gold from our mines in Canada, if the refined product is immediately exported as bullion. We were given to understand that the establishment of an Assay office for the receipt of gold dust from the Yukon and other Canadian gold fields was but preliminary to the establishment of a Canadian mint, whereby Canadian gold would be actually retained in the country as coinage. This policy should immediately be put into force to render the work of the Vancouver Assay office really effective to Canada as a whole.

We are in receipt of a copy of the Anaconda *News*, edited and published by Robert Keffer, a young gentleman *aetat xi*, the son of Mr. Frederic Keffer, general manager of the British Columbia Copper Co. at Greenwood. This newspaper, though of Lilliputian dimensions, being but 5½ inches square, carries, we are glad tc note, a goodly proportion of advertisements, for two out of the three printed pages are occupied with trade announcements. The first page of the issue before us contains a most interesting account of the editor's visit to Knob Hill and Ironsides mines in Phœnix camp. As this report is quite as intelligible and as veracious, though not perhaps quite so voluminous (which is a decided advantage) as the majority of descriptive articles on the subject for which professional newspaper correspondents are responsible, we take the liberty of reproducing it *in extenso*:

"Recently the editor of the *News* took a trip to Phœnix, to visit the big Knob Hill and Old Ironsides properties.

"The first visit was to the glory holes on top of the hill. These are large quarries, in each of which a number of men are busy shoveling ore into mill holes that lead to the large tunnel below.

"After this we lost ourselves in the numerous passages and stopes of the Knob Hill tunnel.

"The editor was now too tired to continue explorations into Old Ironsides, and just took their word for it, that it was equally rich. After this we paid a visit to the office of the Phœnix *Pioneer*."

It is worthy of remark that our Phœnix contemporary has since published a detailed statement of the Ironsides and Knob Hill workings.

A journal published in Great Britain under the name of *British Mining* possesses, or claims to possess, a special correspondent in British Columbia whose headquarters are in Victoria. The correspondence published in this periodical from British Columbia, however, turns out upon closer examination to be taken word for word from the letter contributed weekly to the Victoria *Colonist* by a member of our staff. The wider that facts relating to the mining industry of British Columbia are dessimated the better, and no objection could be taken to utilising, in an English periodical, mining news appearing in the Victoria *Colonist*, or any other paper published in the Province. But to credit news so obtained to the efforts of a special correspondent appears to be a flagrant instance of unfair journalism.

Notwithstanding the low price of lead, exceptionally high transportation costs and other unfavourable conditions peculiar to the locality, a silver-lead mine in East Kootenay, the North Star, has been so successful-

ly operated this year as to enable distributions of profits to be made aggregating $117,000. A third dividend of three cents per share, on the issued shares numbering 1,300,000, or $39,000, was declared during September, and the mine has thus yielded in profits since its acquisition by the present company, a total amount of $237,000. By the last distribution the North Star takes the lead for the current year to date, as the most important dividend-paying mine in the Province. The ore mined from this property is of very ordinary grade, and success is therefore chiefly due to economy of production the result of systematic working and careful management.

Dredging operations are now in progress on the North Thompson river, if the prospects continue as bright as at present the success of the enterprise is quite assured. According to late reports rich pay gravel has been encountered at a depth of about 16 feet in the channel at the lower end of the claim, and the dredge is now working at this point with most satisfactory results. This month preparations were completed for the inauguration of another dredging undertaking on the Fraser river, and there is every reason to hope that by the introduction of New Zealand methods the difficulties which have stood in the way and interfered with the success of enterprises of this nature in the past will now be surmounted. Some of the streams, however, which it is proposed to dredge were thoroughly prospected in the early days of mining in the Province, and in many instances worked and wing-dammed, both by whites and Chinamen. In these cases it is not likely that dredging, even though the best methods are called into requisition will prove remunerative and a word of caution may therefore, not be altogether out of place.

DR. ROBERTSON ON THE YUKON.

THE opinion of Dr. Robertson, British Yukon inspector of mines, that the Klondike has an active life of at least twenty years still before it, and that no diminution of the output is to be expected for ten years to come is exceedingly comforting, the more so as it is based upon an exhaustive study of the district and an accurate knowledge of the conditions prevailing there. The following interesting interview with Dr. Robertson takes a sound view of the capabilities of the Klondike and fully bears out the attitude of the MINING RECORD in discussing the output for this season. We republish it from the Vancouver *Province*:—

"The opinion I have given as to the life and gold-producing possibilities of the Klondike, is based on a thorough inspection and study of the mining conditions of that remarkable camp. Improved methods of mining, cheaper transportation which means, necessarily, cheaper living, cheaper labour and many other things, are contributing to increase the production of gold and rendering the effort to get it more profitable. It has been demonstrated that the dredge can be successfully operated in the Klondike. When I left the district a few days ago they were working a dredge on No. 42 below on Bonanza. There it is proving a success. The claim could not be worked successfully from a financial standpoint by the usual placer method. But the dredge is giving good returns.

"In comparison with what profitable mining there is ahead, in view of these improved conditions, one must realize that they have only begun to open up the Klondike. Yes, the output will continue large. There will be no perceptible decrease in the yield for ten years.

"I expect to see great things accomplished in the Klondike by steam shovel and hydraulic operation. The latter, of course, requires a lot of water, the supply of which, when exhausted in the creeks, I think will be the Klondike river.

"There is now one steam shovel in successful operation on Lower Dominion, and Dominion is a great creek. There is any amount of rich ground. One firm alone, Dougherty & Stiles, owns a mile of hillside on the left limit of Lower Dominion, beginning at 133 below Lower Discovery.

"One of the best indications that the Klondike is to be long lived is to be found in the permanent and very expensive public improvements. The new administration under Gov. Ross in the Yukon is making wonderful improvements. The expenditures for roads alone this season exceed $250,000. Good roads are being constructed to the mines. They are being built along the creeks and not over the ridges as formerly. The road that follows the creek is the one that gives the miner real service. The cross-country roads, experience demonstrated, were not much genuine benefit.

"The government municipal improvements are many. The administration buildings in Dawson would be a credit to almost any city.

"The reduction of the royalty from 10 to 5 per cent. with an exemption of $5,000, has been a material factor in bringing about an increase in the annual output of the Klondike. And within a twelvemonth I look to see the royalty abolished altogether and an export duty of 2 per cent. substituted. This will force the establishment of an assay office in Dawson.

"In considering the fabulous yield of the Klondike since its discovery five years ago, one naturally begins to speculate on the life of the camp and say it will soon peter out. Eldorado creek has been developed up to claim No. 40. There is but little ground in that distance that has not been washed in some shape. But all of this creek will be rewashed. Even the tailings will be gone over again and a hydraulic application will produce a vast amount of gold from the 35 or 40 claims that now appear to be worthless. The miners have demonstrated that Eldorado is susceptible of hydraulic. The placer mines on this creek long ago successfully used small force pumps and also pulsometer pumps for cutting down the frozen gravel instead of using the steam points for thawing purposes.

"Bonanza creek, which, when finally worked out, will probably have produced as much gold as the celebrated Eldorado, is not now more than one-third worked out. Many of the smaller creeks of the district regarded as worthless from the standpoint of the primitive placer method of development, are paying well where machinery is employed. Think of the possibilities of the hillsides and benches! Very little, in comparison with what there is open for development, of this character of ground has been worked. In fact there is very little soil within the confines of the whole Klondike district that does not carry gold.

"This season good strikes have been made on Montana and Montreal creeks, tributaries of Indian river, which is practically part of the Klondike district. These and many other unworked streams will doubtless demonstrate that they carry good pay ground. For, as I said before, gold seems to be everywhere in the Klondike. It runs from the surface to bedrock."

THE SO-CALLED "SAND CARBONATES" AT THE PARADISE MINE, WINDERMERE DISTRICT.

By Chas. F. Nicholson,
Certificated Provincial Assayer at Peterboro.

THE Paradise mine in the Windermere district of East Kootenay, was located in August, 1899, and bonded in June, 1900, to Messrs. H. C. Hammond, Toronto, and R. Randolph Bruce. What is now No. 4 tunnel had been driven some seventy feet during the winter of 1899-1900, but development work proper was not commenced until June 11, 1900. By the following March nearly 1000 tons of ore had been conveyed, for the first five miles from the mine, by rawhide, thence eleven miles by sleigh to the Columbia river at Peterboro. In the spring, upon the opening of navigation, the steamer Duchess conveyed the ore to Golden, whence it was shipped to the Trail smelter via the Canadian Pacific Railway. A remarkable feature of this achievement is that the product was taken from the mine by pick and shovel. Not a stick of powder was used.

The mine is reached from Peterboro, on the Columbia river, by a wagon road constructed by the government in the summer of 1900, and follows the valley formed by Toby creek. This wagon road was one of the first constructed under the direction of the newly created inspector of trails and roads. The heaviest adverse grade against them is two per cent. but it is for a short distance only. The road is an excellent one in every respect. From Toby creek to the basin in which the Paradise is situated a good rawhide trail was constructed. The grade of this trail for a great part of the distance is 110 to the mile. It is well constructed and answers all purposes for taking in supplies and bringing out ore.

The development work on the property consists of three tunnels. No. 1 tunnel is in the ore shoot from which the shipment was made. The ore consists of a friable substance which reacts for lime with acid, and is readily distinguished as pay dirt by its specific gravity. The pay dirt has been given the name "Sand Carbonates" and carries as a usual thing about 50 per cent. lead and 60 oz. silver. In this district the dip of the strata is to the west, and the strike north 20 west, magnetic. On the summit of the mountain on which the Paradise is located and about 1,000 feet from the workings, the dip and strike of the upturned strata is as stated. But in the different workings on the Paradise the dip is shown to be northward and the strike east and west. The ore body is between a contact of slate and lime, and has a dip of 35 degrees. A tunnel was driven in for 30 feet in the ore which at that point was encountered in considerable body. About 500 tons of ore was sacked from this deposit. The pay dirt was found to lead from the north side of this deposit and has been followed by an inclined shaft for 180 feet, at an angle

Paradise Mine.—(1). Boarding House. (2). Bunk House. (3). No. 4 Tunnel. (4). No. 2 Tunnel.

of 35 degrees. The floor of this incline is the footwall and the roof the hanging wall. That is, it is assumed that the floor is the footwall, for as a matter of fact the hanging wall has been followed closely, and as the timbering is in ledge matter, it is assumed that the ledge may be wider than the excavation on the incline shows. No work has been done to establish that point. At one point only was the excavation made wider than required.

No. 2 tunnel had been driven, at the time of my inspection in August, 182 feet. It is 125 feet vertically below No. 1 tunnel but some little distance to the east, and is a crosscut to the lead. The management is of the opinion that the paystreak, between the slate and siliceous lime, will soon be reached. It is the intention to then drift 500 feet which will bring them under the ore shoot in No. 1 tunnel.

THE MANAGER, MR. R. RANDOLPH BRUCE.

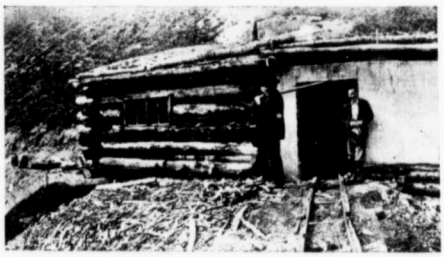
THOS. JONES, DISCOVERER AND LOCATOR OF THE PARADISE.

PARADISE MINE.
No. 1 Tunnel from which ore was taken, and upper end of Paradise Basin.

At that place the incline was widened to probably 20 feet. It was at this point the accompanying photograph of the underground workings was taken. The first ore was sacked in September of last year and all the ore, with the exception of about two tons, comprising the shipment to the smelter, came out of the deposit of "Sand Carbonates."

No. 4 tunnel is the oldest working on the property, and with its crosscuts and drifts, aggregates 526 feet of work. This tunnel is in a ledge which development has demonstrated to be 40 feet wider. About 300 feet from the entrance a crosscut was made when ten feet of concentrating galena was encountered. The ore taken out in tunneling through this shoot was sorted and ten tons

sacked and sent to the smelter. The ledge matter is well oxidised. Originally it was probably carbonate of iron with stringers of galena. In tunneling, stringers of galena were encountered at frequent intervals. Further crosscutting may discover other ore values similar to that mentioned. No work has yet been done to determine the extent of the ore body referred to. At present the extremity of the tunnel is in a very hard rock seamed with small fissures of quartz.



PARADISE MINE.—No. 4 TUNNEL.
Mr. Bruce, Manager, to right; Mr. McMullen, Superintendent, to left.

PARADISE MINE.—MINERS OFF SHIFT.

trough, but as already stated the deposit has not been sufficiently explored to show its nature and extent. It is a conundrum that can easily be solved by continued development and investigation.

PARADISE MINE.—UNDERGROUND VIEW INCLINED SHAFT.

For a few months following ore production from the mine work was suspended. But in August the manager, Mr. Bruce, resumed operations, Mr. J. J. McMullen, an experienced mining superintendent being placed in charge of the work. The present quotations on lead and silver do not offer an inducement to take out ore for shipment under conditions of present freight and smelter treatment charges, but provision is being made for the continuation of development for a year's operations it being the intention of the management thoroughly exploit the property and and solve the problem of the somewhat remarkable ore occurrences.

PARADISE MINE.—FROM NO. 4 TUNNEL, OVERLOOKING PARADISE BASIN AND CAMP BUILDINGS
This view shows double anticline to right.

The theory of the best authorities who have examined the property is that the deposit of so-called "Sand Carbonates" was originally galena. Nuggets of galena were encountered in the workings enclosed in concretionary rings of high-grade carbonates. There are indications that the "Sand Carbonates" is a V shaped

The smelter returns give about 50 per cent. lead and

41 of silver, which the cost of mining has been comparatively light, the transportation and smelter charges are such that the margin of profit is small. Although the ore, with the exception of the small quantity of galena, is free from sulphur, the best freight and treatment quotation that could be obtained from the smelter was $19 per ton from Golden. The cost of transportation from the mine to Golden was about $9 per ton.

With the the exception of two cars of $150.00 ore shipped from the Delphine mine in the spring of 1900, the shipment from the Paradise mine was the first from the Windermere district. The Macdonald mine formerly known as the Red Line will, it is stated ship several thousand tons this winter. A wagon road is now in course of construction to that property.

LOSSES IN COPPER SMELTING.

By Ronald C. Campbell-Johnston, M. I. M. M.

THE brokers on the London Stock Exchange when asked to handle a mine with smelting ore, invariably reply "give us a gold mine." The reason of this reply is that the British public are afraid to invest in a mine, the working of which they are unfamiliar with. Crushing with stamp mills is a mechanical treatment, and if one manager goes wrong a hundred can be promptly found to put in his place. Not so with a smelting proposition. This requires a man with a thorough knowledge of chemistry, and with a wide experience in conducting smelting operations ; and these men are scarce.

It is to the advantage of the fraternity of mining engineers to try and educate the man in the street with the salient facts of what to expect, for example, in a copper smelting concern. If we can teach the public what is being done, what standard of excellence is expected in the management, and what is wrong when this standard is not being attained, then the public will be familiar with the subject, and more ready to invest in mines with smelting ores. The correspondence that has been written in the London press re market value of the Le Roi ore is typical with this unfamiliarity with smelting matters. As Cornwall has taught the present age the art of mining so Swansea, in Wales, has taught the art of smelting.

Let us see, then, what loss of copper they allow in their works, and later how far their more perfect methods are adaptable to other parts, or wisely to be modified to local conditions where from higher costs a greater loss of copper in the slags is justifiable. There is a perfect mixture, as a flux for smelting, of lime, iron and silica, (quartz) added to the copper ore that will minimise the loss of copper in the slags formed to about one-tenth of one per cent. in the short ton, that is two pounds of copper. Suppose for argument that the ore is half the burthen of the furnace, and the fluxes are the other half of the burthen. Then the loss on the ore is double what it is on the slags. This one-tenth of one per cent. is the acme of smelting, so as well as the mixtures having to be correct, the furnace has to be in good running order, and the furnacemen to be skilled in order to attain it.

Therefore this acme is seldom attained, and modifications are adopted. First, the cost of smelting worthless fluxes is high and another ore with some values in it resembling the fluxes in constituents is used. This not being quite the acme raises the loss of values in the slags. Then the furnacemen when not on contract have been known, during the night shift, to shut off the blast and take a siesta by which proceeding the manager's mixtures are knocked endways. At Swansea, from the outer hearth of the furnace, the slags are tapped with an upper launder into slag pots of a conical shape and the copper matte is tapped from a lower hole into sand moulds. When the slag in the pots is cooled off, these are dumped on a slag floor. A man is kept to daily sample and examine these cones of slag. He spots any matte showing at the top of the cone where it has settled in the cooling, breaks that top off and sends it back to the furnace ; also the last six pots, before the blast is shut off and the matte tapped, he invariably returns to be put through the furnace again.

Columbia River Valley in which the Paradise is Located.

Outside of these slags returned to the furnace he takes an average sample of the run of slags for the 24 hours. This sample is assayed by Parkes' wet assay ; the general practice is to pass slags as clean containing eighteen-hundredths of one per cent. copper, equal to three and six-tenths pounds of copper on the short ton. Two-tenths or more of one per cent. are called four slags, and the whole run is by degrees remelted again. This loss in producing the first metal is the only loss in the whole process, since the slags, crumbs or skimmings, from the roasting (not calciners, called roasters on this continent), running down, converter, and refining furnaces are remelted.

A mining engineer reporting on a mine with smelting

ore, should make trial tests of the ore in the Cornish assay furnace to determine the fluxability and should state the proposed mixture for smelting and estimated loss of values in treatment, so enabling the public to know what loss to expect, and to later ask the reason why this standard is not maintained.

These Swansea methods are the most perfect employed in copper smelting, but in new countries where labour is high they have to be modified, resulting in a greater loss of values in the slags. First, the slag from the furnace runs into a stream of water, is granulated, carried away and lost. Correct sampling is impossible, and accidental losses have to be pocketed against the less cost of handling. Secondly, too much blast is driven into the furnace and the amount daily smelted is larger in tonnage, but the loss in slags and fumes is heavier. Again automatic feeding of the furnace is resorted to.

Should the tuyeres (the apertures in a furnace through which the blast enters) become chilled, and a snout of black burthen form on one side, showing that the furnace is out of running order, then by automatic feeding the furnace cannot be humoured by feeding coke to that side to raise the heat, etc., and so be brought back into condition. This makes loss in slags, but still is compensated for by saving cost of labour. Ores have to be made self-fluxing by tricks in the trade, perhaps by using more coke, or methods of mixing green unroasted ore, or fluxing with first metal back again. The mixture not being up to acme, creates higher losses.

All these modifications are adaptations to local circumstances, and probably pay in the long run. What then is the loss of copper in the slags under these modifications?

In Sudbury, Ontario, under the direction of Mr. Merry, at the Murray mines, three-tenths (.3) of one per cent. was the highest loss passed, though the slags generally went less. Here by using hot blast, so utilising the sulphur contents of the ore as fuel, and obviating heat roasting, in an ore containing over forty (40) per cent. sulphur, the consumption of coke was reduced to five (5) per cent.; on over twenty (20) per cent. sulphur to seven (7) per cent. of coke. I have not heard of this being adopted to cheapen the treatment of Rossland ores. Ore at the Murray mines were made self-fluxing.

In the Boundary where the gangue of the ore is a favourable natural mixture one smelter manager told me their loss was four-tenths (.4) of one per cent. or eight (8) pounds of copper per short ton.

These facts about smelting are given to teach the public what to expect and enable them to see that they get it, or ask the reason why; so to familiarise themselves with smelting propositions, and not jibe at investing.

The public will promptly ask why do custom smelters only pay for ninety (90) per cent., pay the market price less six cents per pound, use dry, electric and other methods of assay then used to estimate their slags, and other leading questions?

These are the business of a custom smelter; if a company does not like it, let them put up their own smelting works and keep the profit in their own pockets. A nod is as good as a wink to a blind mule.

OVER-CAPITALIZATION AND THE MINING INDUSTRY.

IN view of the discussion raised by a leading article in our July issue, wherein an attempt was made to analyse the causes contributing to the present alleged depressed condition of the mining industry in certain sections of British Columbia, the following article from the current number of our excellent contemporary the Canadian *Mining Review* is singularly appropriate:

"Considerable interest is aroused in British Columbia by the announcement that the Granby smelter people contemplate an increase in their capitalization, raising it from fifteen million to twenty million dollars, and those who are best able to judge consider the proposal a farcical one in view of the past history of the company. In a thoughtful and very able article which appears in the British Columbia MINING RECORD of last month argued that among the many causes which had contributed to the present depression in the Province, possibly the most important was over-capitalization, a contention which is emphasized by the enormous increase in values shown by present market quotations on British Columbia Mining Stock, compared with those of a year ago. It has been the custom in the east to attribute this loss chiefly to the failure of mining propositions to realise the expectation formed as to their productiveness, but the writer of the article referred to shows very clearly that the number of failures under this head is small, and that mining ventures have been wrecked chiefly by the cupidity of eastern promoters. Of course this Province, like every other, has had its share of wild-cat schemes and the usual proportion of valueless mineral prospects, but in the main, whenever mining has been conducted under capable management and with due regard to economy, success has been attained. There are to-day in the Province a number of mines working under the latter conditions which would be a credit to any of the oldest camps in the United States, which are furnishing steady employment to a large body of workmen and paying regular dividends to the fortunate shareholders. The disappointing mines are those which, instead of being worked upon legiti, mate lines as a permanent investment, and for the purpose of yielding moderate but continuous dividends, have been simply manipulated for gambling purposes by speculators or promoters, who cared nothing for the ultimate result, and stood only to enrich themselves at the earliest possible moment at the expense of the investing public who were ignorant of their policy. One of the commonest methods of attaining this end has been by over-capitalization, which has placed at the disposal of promoters an inordinate number of shares and thus enabled them to take advantage to an undue extent of any increase in value, which by skillful scheming they were able to create on the stock market. Without suggesting that this is the case with the people who are responsible for the management of the Granby properties it is an undoubted fact that the present capitalization of fifteen million dollars is enormously in excess of the value of the property, and to raise it still further will only tend to accentuate an evil which has already been productive of great loss to the Province. It is a well-known fact that the total expenditure in cash both for purchase and development of all the properties in the Granby smelter group, including the smelter itself does not exceed one million dollars, and when in the early months of this year the representatives of this company, Mr. J. P. Graves and Mr. A. L. White, were in New York negotiating for the sale of the property, or at any rate exchanging *pour parlers* with the Amalgamated Copper Company having that object in view, the latter could not be induced to give as much as two million dollars for the property, and they are probably as good judges of its value as it would be possible to find. How, in face of these two facts, a capitalization of twenty million dollars can be defended passes the comprehension of mining men in British Columbia, who feel that it is only inviting a catastrophe

to take such a step. It is further urged that there are certain circumstances connected with the Granby company which are not calculated to inspire confidence, and which, in fairness to their own shareholders at any rate if not to the investing public, should be explained. The first is, that no authoritative statement has yet been given as to the average value per ton of ore treated, although the smelter has been in operation since last year. Repeated applications have been made to the company by shareholders for this information, but it has been refused for motives of policy. In view, however, of the present proposal it can hardly be withheld any longer, and if, as is currently believed by those in the best position to judge, the average gross value of the ore does not exceed five dollars, it is doubtful if operations are not being carried on at a positive loss, in which case further increase in capitalization would be indefensible, and the present quoted price of Granby stock far in excess of its actual value. British Columbia has already suffered sufficiently from misleading reports made by directors of leading mining companies to their shareholders, and it is hardly less culpable on the part of the directors of the Granby company to withhold important information, without which it is impossible to estimate the value of the stock which they are apparently bent on increasing and which, in any case, they are offering the public as an attractive investment.

NOTES ON DRY AND WET CRUSHING.*

By Frank Merricks, M. Inst. M. M.

THE subject of dry *versus* wet crushing has recently been so prominently before the minds of mining engineers, that the author has been prompted to bring it before the members of this institution, with a hope that they will contribute their views on the matter, and thus perhaps be the means of saving many a manager much worry and expense in deciding whether he should adopt dry or wet crushing for the treatment of the particular class of ore he has to deal with.

The author is fully alive to the fact that a process or plant ought to be adapted to the ore for its proper treatment ; but in this respect mistakes have occurred, and are often duplicated in the same district, by one company following the mistake of another.

The physical conditions obtaining in any particular district have also to be seriously considered in deciding on any ordinary or special treatment of ore ; and perhaps, in certain cases, the process best adapted to the ore has to give way to one less suitable, as regards treatment, owing to existing conditions.

A great impetus to dry crushing was given by the introduction of rolls and ball mills, which, in many of the best designs, are ill adapted, or totally unsuited to wet crushing. The merits claimed for this class of mills are :—

They cost less, are easier and more quickly erected, produce a pulp of a more even consistency, and require less power than stamps.

These merits are probably well deserved and applicable in some districts and with certain ores, but, in the long run, it is a very open question if they are more economical than stamps, even as dry crushers.

Dry stamp crushing has been carried on on an extensive scale at several of the mines in the Upper Thames district of the Hauraki Peninsula, New Zealand, and so far as the extraction of the bullion is concerned, with fairly satisfactory results. The percentage of extraction of the bullion by the ordinary amalgamation process was so small, that to use this method was hopeless ruination.

A short outline of the processes tried and results obtained, and the eventual adoption of dry crushing and cyaniding at the principal mine, the Waihi, may be of interest.

The first two tons of ore from this mine were wet crushed (about 1880), and amalgamated on copper plates, the bullion saved being 35 per cent. of the original value of the ore (£4, 4s.). During seven or eight years after this, 18,000 tons of ore were treated by wet crushing and amalgamation for an average return of 13s. 6d. per ton. The author does not know what percentage of the total bullion contents this represents.

During some four years later, 1890-94, a series of experiments were made. The ore was treated by pan amalgamation, and both dry and wet crushing were resorted to, with the result that in the former case 70 per cent. of the gold and 45 per cent. of the silver, while in the latter, 60 per cent. of the gold and 25 per cent. of the silver, were saved. It is reported that the duty of the stamps in each case was practically the same, but by wet crushing the calcined ore, the output was increased 30 per cent., while the extraction still remained 10 per cent. in favour of dry crushing. In 1894 pan amalgamation gave way to cyanide treatment, the ore being dry crushed, with the result that an average extraction of 90 per cent. of the gold and 50 per cent. of the silver was effected.

These results, corroborating those obtained at the Crown Mine in the adjoining Karangahake district, were considered so satisfactory, that the companies in the surrounding districts, where the ores are of a somewhat similar nature, adopted this process, without for a moment considering the advisability of trying raw wet crushing and cyaniding, or even attempting any modification whatever.

A move in the right direction was made about 18 months ago, at the Crown mine, where wet-crushing experiments were carried out with cyanide solution passing through the mortars.

The method of handling the slimes and the results obtained are not yet made public, but they may be considered satisfactory, since the whole plant has been converted to wet crushing.

The question of converting mills from dry into wet crushing is often attended with difficulties, i. e., in mills where it is intended to run the pulp direct from the mortar to the vats, as, in some cases, the top of the vats is higher than the discharge of the mortar.

At the Waihi mine the stamps weigh 900 lb., and with a 6-inch drop, and 90 to 94 drops per minute crush, through a 40-mesh screen, about 1¼ tons per stamp per 24 hours.

These figures and results are those generally obtaining in the district.

The low results obtained by ordinary amalgamation are accounted for by the fact that the gold is in an extremely fine state of division in the ore, and that the proportion of silver to gold in the bullion is excessively large, the fineness being about 640. Very rarely can any gold be detected by the naked eye, or even with the aid of a magnifying glass, or in panning.

The differences in the above results, both as regards dry and wet crushing, and the extraction returns of such, by treating the ore by the cyanide method, call for more serious comment. It is generally admitted that drying the ore previous to crushing renders it more amenable to the cyanide treatment, probably owing to

* From a paper read before the Institute of Mining and Metallurgy.

the fact that, although the pulp is reduced to such a fine state of division in crushing, it is of a more porous nature, which is mainly brought about by the dehydration of the ore. This may partly account for the difference of 10 per cent. in the extraction results, although the author is inclined to the belief that it may also be due to the floating away of some of the sulphide of silver, and of the fine gold, and also to the want of a proper method of sampling.

The increase in the output by wet crushing of only 30 per cent. over dry crushing is rather remarkable ; probably this increase was looked upon as the maximum duty of the stamp which, combined with the fact that the increase of 10 per cent. in the extraction in favour of dry crushing, was considered so satisfactory that wet crushing entirely gave way to dry crushing.

Since the matter of wet crushing has been so seriously taken up by the Crown company, most of the other companies are following its example, and although in some cases, the results are said to have been indifferent, there is every indication that during the next year most of the ore will, and ought to be wet crushed.

The author is of the opinion that the improvement effected at the Crown mine should be completed by adopting wet crushing, amalgamation and cyaniding in its entirety. By this means the output would be increased, say to three tons, for a less cost than at present dry crushing 1¼ tons, and supposing the percentage of extraction is a little less by wet crushing, it would be more than counterbalanced by the increased output.

The bulk of the Upper Thames ores present no greater obstacles to wet crushing than did those of the Rand. Dry crushing has been repeatedly tried at different mines in the latter district, but has been abandoned in favour of wet crushing ; in fact, were it not for the high stamp duty, it is very certain that the greater part of these ores could not be profitably worked.

In drying the ore in the crudely constructed kilns, excessive heat often becomes localised, and occasionally the bullion gets melted, which, in the form of small pellets, is not dissolved by the weak cyanide solution.

At the present time a great divergence of opinion exists as to whether dry or wet crushing is the better and more economical for treating the Kalgoorie ores, West Australia, and in the author's opinion this problem is not yet solved.

In the early days of this field, when the surface or oxidised ores were treated, wet crushing and ordinary battery amalgamation were principally resorted to for extracting the gold, but owing to the fine state of division in which a great percentage of the gold existed in these ores, together with a short supply of water for battery purposes, only a poor extraction was effected, thus leaving the tailings very rich, many of which have been and are now being, treated by cyanide. As depth was attained and tellurides, carrying a high percentage of gold, were met with, combined with the paramount water question, serious obstacles were presented in devising the best methods for the most efficient and proper means of treating these somewhat rare and complex ores. The most prevailing idea, at present, appears to be that they ought to be dry crushed, roasted or *vice versa*, and then subjected to cyaniding.

Great difficulties, however, are met with in adopting this course, the first being the coarse gold, while in roasting, the gold in the rich telluride forms into pellets, in both of which cases the gold will be left in the tailings after cyaniding, and to extract it, a further treatment will have to be employed.

In roasting there is the risk of loss of the precious metals by volatilisation, and in cyaniding, any tellurium left in the ore will be dissolved by the cyanide and precipitated by the zinc ; thereby causing a further loss of gold by volatilisation in roasting the precipitate.

Taking into consideration the general characteristics of these ores, notably their friable nature, their free gold (often coarse) contents, which extend below water level, and their association with rich tellurides, it would appear that the above treatment is somewhat involved, necessitating much extra handling of the ore and very careful manipulation in connection with the roasting, and consequently rendering expenses somewhat high.

The method which suggests itself as being the best and most suitable for handling and treating of these ores is, first to handpick the rich tellurides and to bag such for smelting. In regard to crushing, to break down the ore to a small size by means of crushers, and then to stamp wet, and to guard against sliming crush as coarse as possible consistent with economical working and general conditions obtaining and to collect as much gold as possible by ordinary amalgamation ; then to concentrate the tellurides and bag for smelting ; the tailings, if carrying sufficient gold, being treated by cyanide, and the slimes collected by, and treated in, filter presses.

LEAD PRICES AND PRODUCTION.

ACCORDING to London advices, in sympathy with other metals, and with the easier conditions of trade generally, the price of lead has tended recently to decline. Last year as much as £18 per ton was touched for soft pig, and at no time during the 12 months did the quotation fall below £16 1s. 3d. These were exceptionally high quotations, and they compare with £11 10s. and £10 17s. 6d. respectively in 1896, and £12 12s. 6d. and £11 5s. in 1891. They were the outcome of the "boom," when all prices rose appreciably. To-day, soft foreign pig is obtainable at £11 10s., and English pig at 5s. more. Lead is employed so extensively in engineering and allied trades that the reduction in prices is a material aid. It is improbable, however, that there will be any early return to the very low figures of five or six years ago, because of the tendency of consumption to keep close to the heels of production, and because, further a lead combination has been formed in America on the lines of the copper consolidation. The United States is not quite so powerful a factor in lead as in copper, for the reason that it does not contribute so large a portion of the whole, its share of the world's lead output being about 25 per cent., and of copper over 50 per cent. But it is still one of the two largest individual producers (Spain being the other), and it counts in the regulation of values. It is suspected in the metal trade, we are told on high authority, that the American combine has been squeezing down the price in order to compel the outside interests to come into the family party ; and that as soon as they have succeeded in acquiring an overwhelmingly large proportion of the whole, the syndicate will put up the price again. It remains to be seen if there is any truth in all this, and the suggestion is worthy of notice as pointing to the possibility of an early recovery in prices.

The production of lead has increased to a material extent during the last decade. In 1890 the estimates of the Metall-Gesellschoft, of Frankfort-on-the-Main, indicated a grand aggregate of 540 000 metric tons. By 1899 the total had grown to 775,000 tons, and for last year it is computed at fully 900,000 tons. Spain, which has two or three times before outstripped the United States, is at present first with close upon 350,-

000 tons for 1900, compared with 308,660 tons in the preceding year. The American yield was 230,000 tons, or 13,000 tons more than in 1899. The restoration of law and order in "Cœur d'Alenes" permitted the active working of the great silver-lead mines of that region while the mines of Montana and Colorado did their full share, and the soft-lead region of Southeastern Missouri made substantial progress. Besides treating their own ores, the American smelters refined some 80,000 tons from Mexican and Canadian ores and base bullion. Practically all of this imported material was refined in bond and re-exported. The Joplin fields of Missouri have come very much to the front in the last few years, and from all accounts they are equal to a very considerable increase on present totals, with the introduction of more capital and modern appliances. The deposits have been discovered, and have been worked almost exclusively, not by prospectors, miners, and engineers of experience, but by the native Missourian, who knows very little about mining. There are thousands of mines and prospects still being worked with the old hand-jig process—all hand-work except for the work of the feet of the poor old horse who walks around all day, winding and winding his spool of rope and chain, called a hoist, which pulls the tub up and takes the miner down. Driving through the country one sees dozens of small mines — single-shaft — worked in this way; some still have the old common suction pump, just a little ahead of the old oaken bucket. Full details of the production of Spain last year are not likely to be available for many months to come; the figures for 1899 were only published in our Foreign Office report last month, and in this connection they are of interest. Of non-argentiferous lead the quantity obtained was 123,750 tons, of which 101,907 tons come from the province of Jaen; and of argentiferous lead the quantity was 184,906 tons, towards which the mines of Murcia contributed 133,582 tons. There is much lead-producing ground as yet untouched in these provinces, and in Almeria, Ciudad Real, Tarragona, Badajoz and Cordoba; but the foreign demand is not on such a considerable scale as to attract the requisite capital for full development. But something is being accomplished even in this way. The "Revista Minera" told us recently that a French syndicate had acquired the Culebrina lead mine for 3,200,000 francs, and proposed to produce on a large scale. The Guindo lead mine, in the Linares district, is being energetically developed. The Escombreras-Bleyberg Company has decided to start the Castuera lead mine in the new and important metalliferous district of Villanueva, and contemplates erecting smelting works in Cartagena for the treatment of mixed ores. An important vein of argentiferous galena has been discovered at Santa Marta (Badajoz), and has been taken in hand by a wealthy syndicate. These are indications that Spain is equal to the production of much more lead (as of other metals) than it can at present boast. As it is, the better part of the output is consumed in the country itself.

The metal happens to be of more generous distribution in the manufacturing countries of Europe than are copper and tin, and this militates against any great development in the Spanish lead-mining industry, although there is a steady consumption up to a certain point. In Germany, the yield last year is computed at 145,000 tons, as compared with 129,200 tons in 1899, and 93,600 tons in 1885. Developments of importance in relation to the growing requirements are taking place in the Upper Hartz. In Great Britain the mining of lead does not progress at a uniform rate, and, by reason of the importation of foreign metal, our own production tends to decline. In 1899 we mined 41,500 tons, which is certainly more than in any preceding year since 1891, but which compares indifferently with the annual average of about 75,000 tons for the decade 1871-80. Of ore our imports are relatively insignificant, the bulk of the lead received from abroad coming here in the shape of pig or sheet. The other European countries which produce considerable quantities include France, Belgium, Italy, Greece, and Austria-Hungary, while Canada is making big strides in this way, in connection more particularly with the argentiferous galena of British Columbia. Mexico turns out about 80,000 tons in a year, and would do much better if the home demand were on a better scale, or if the United States were a larger purchaser. Australia also suffers from the lack of foreign outlets, and it is not a big consumer. The Broken Hill mine, however, finds a regular market, and the report for the six months to November last spoke of a production of 21,855 tons, against 15,472 tons for the half year before, and of an increase of 15s. 10d. per ton in the price obtained. There is no doubt that in Australia and elsewhere an improved demand and a wider margin of profit would mean a rapid rise in the world's output, and the wider margin at least promises to be assured by the formation of a trust in America. But whether the Americans will be able to control the strings as effectively as they have done in the case of copper is a matter of much doubt. The conditions are different, lead being so much more plentiful.

THE DETERMINATION OF LATENT HEATS.

By A. A. Watson, B. Sc.

Certificated Assayer, Vernon, B. C.

SCIENCE has been called to the aid of almost every manufacturing process of the present day, to a wonderful extent, and especially that branch of science called physical chemistry which treats of the investigation of the physical properties of chemical substances such as their specific heat, electric conductivity, specific gravity, vapour tension, etc. Determinations of the quantity of heat rendered latent when a solid is transformed into a liquid, or a liquid into a gas, are important in starting any new chemical process requiring the aid of heat, because the greater the latent heat of a liquid the more fuel is required to evaporate it, and the more expensive is the evaporation. If a chemist had to investigate a process such as, for example, the extraction of grease by means of a solvent, he would examine all the solvents available such as carbon bisulphide, ether, and light petroleum oils, and the solvent having the least specific heat and latent heat would be the one chosen by him, if it were suitable in other respects such as cheapness and safety, because less heat would be required to destil it from the grease and recover it and consequently the fuel bill would be less. Knowing the specific and the latent heats of the solvent used, he could calculate to a nicety how much heat would be required to distil the solvent.

When solids change to liquids also, heat is rendered latent. This can be seen by the following experiment: Take a kilogram of water at the temperature 0° and another at the temperature 79° and mix the two; the resulting temperature of the mixture will be the mean of the two, namely, 39.5°. Now take a kilogram of ice at the temperature 0° and mix it with a kilogram of water at 79° and the temperature of the mixture will not be the mean of the two this time but will be the same as that of the ice, namely, 0°. The ice, mixed

with an equal amount of water, has absorbed just as much heat as would have sufficed to raise the temperature of the water 79°. The latent heat of water is therefore 79 thermal units. Similarly when water is evaporated, heat is rendered latent and so much heat may be absorbed from water that it may be made to freeze by its own evaporation. This may be shown by the following experiment :

Blow out a glass tube into the shape shown in the drawing leaving the bulbs unsealed ; half fill the bulb A with water and seal the bulb B. When B is cool let the water flow into it and carefully dry A. Next boil the water in B and when all the air has been driven out seal the bulb A. It is best not to have the water boiling too furiously in B while A is being sealed, otherwise the steam will keep making a hole through the red-hot glass. When the water in B is cold, the tube and the bulb A will contain nothing but the vapour of water. Now immerse the empty bulb A in a freezing mixture. The water vapour in A immediately condenses, a vaccuum is caused and the water in the bulb B commences to boil endeavouring to fill up the vaccuum. So much heat is absorbed in this process that the water freezes into a solid lump of ice.

The experiment is a simple example of the fact that energy is transformed but never lost and at the same time cannot be created. When water is evaporated heat is transformed into work and if no heat is imparted to it from an outside source it must necessarily lose its heat and consequently freeze.

To calculate the amount of heat rendered latent when water changes to steam, the best way is to determine how much heat is given out by a known weight in condensing. Weigh a calorimeter, half fill it with water and take the temperature. Now blow in superheated steam. The specific heat of steam is .48. The hot steam on passing into the calorimeter first cools to the condensing point. The temperature of the condensation depends upon the barometric pressure and upon how deep the steam supply pipe is immersed in the water.

If the barometric height is (H) centimetres and the depth under water (h), the pressure on the steam is $H + \frac{h}{13.6}$ cens. The condensation temperature for this pressure may be found in a book of tables or worked out by the following formula where T is the temperature.

$$76\left\{\frac{40 + T}{140}\right\}5 = H \& \frac{h}{13.6}$$

The steam then condenses at temperature T, giving out latent heat L per unit mass. It then cools as water from L to the final temperatures of the calorimeter. The experiment is performed in a very simple manner by weighing a calorimeter containing water and blowing steam into the water from a steam pipe, or by boiling a flask containing water, having a bored cork through which a bent glass tube passes, and passing the steam into the water in the calorimeter as shown below, on weighing the calorimeter again the increase gives the weight of steam.

The latent heat is now found by the following formula. Weight of steam : (Sp. ht. steam × Fall of temp. of steam to condensing point) + Latent heat + Fall of

temp. of steam from condensing point to final temp. of water = (Weight of water + Heat value of calorimeter) × (Rise in temperature of the water).

The rather long equation is used when superheated steam is used but when the experimented is carried out with an ordinary flask the data in regard to the fall of temperature of the steam from its higher temperature to its condensing point is not needed, but the result is not quite so exact. Suppose :

T_o = Initial temperature of superheated steam = 112°.
T = Condensation point = 99.4.
X = Specific heat of brass calorimeter = .09.
B = Weight of brass calorimeter in grammes = 143.4.
W = Weight of water in calorimeter = 445.7.
S = Weight of steam blown in = 37.0.
t_o = Initial temperature of the water = 12°.
t = Final temperature of water = 56°.
L = Latent heat. Sp. ht. of steam = 48.

$$\text{Then } S\left\{ .48\,(T_o - T) + L + (T - t)\right\} = (W + Bx)(t - t_o).$$

$$37.0\left\{ .48\,(112 - 99.4) + (99.4 - 56)\right\} = \left\{445.7 + (143.4 \times .09)\right\} \times (56 - 12).$$

$$37.0\,(L + 48.55) = 212\text{-}78.4.$$
$$37\,L = 194\text{-}82.05.$$
$$L = 526.$$

The latent heat of steam in the above experiment is thus shown to be 526 heat units. All the weighings and readings of temperature and pressure must be exceedingly accurate to obtain correct results. The actual latent heat of steam at normal temperature and pressure is 536 heat units.

The latent heat of any liquid soluble in water may be obtained in the same way. In the case of any liquid insoluble in water, such as ether or carbon bisulphide, the vapour is passed into a thick oil whose specific heat is known and the same equation is used as before, except that the factor W, the weight of liquid in the calorimeter, is replaced by the weight multiplied by the specific heat of the liquid.

The principle rests simply upon the fact that the heat given out by the vapour in condensing is equal to the increase in heat of the liquid in the calorimeter.

STAMP-MILL CONSTRUCTION.*

By the Hon. J. J. Deming,
Boise, Idaho.

THE first stamp mills of which we have any record, were used in the classic regions of Trans-Sylvania, Austria. From there the idea was brought across the sea to this country by the early pioneers of Georgia,

who in turn carried the same idea to the early mining camps of California and Colorado. The gradual changes caused by experience and local conditions, have so changed and modified the original mill, that to the casual observer it has but little resemblance to the mechanism of the modern stamp mill of to-day. The common operations or construction of a stamp mill do not necessarily involve a fine knowledge of chemical formulas or complicated mechanics. A good millwright or mill man has that common sense, which is the basis of all true science, and has won a knowledge of the true bed-rock principles of stamp-mill construction by close observation and experience, which no book knowledge can give him ; always remembering never to use a new device or make a change without a reason for it, and that where there have been so many great improvements in the past, that there is still room for more in the future, for no stamp mill has ever yet been built that was perfect in every detail.

One of the great axioms of successful stamp-mill construction, is to adapt the construction of the mill and reduction process to the character of the ore to be treated. This in a measure accounts for so many variations in stamp-mill construction.

The most truly scientific method in the reduction of any ore is certainly the most sensible, and it is one of the duties of every mill constructor or mill man to determine what are the exact conditions required, and then arrange his mill to them. If a stamp mill is to be the process employed in the treatment or reduction of a particular kind of ore, the first consideration in constructing that mill should be the arrangement and design of the process best suited to saving the values in the ore. It is the adaptability of the stamp mill to the ores of a great diversity of character which enables it to hold its own in the wake of the evercoming new devices continually offered by the inventive genius of this generation. It is this distinctive feature of combination that enables the stamp mill to compete successfully, for it is a crushing, amalgamation, reducing and extracting device combined, and despite these new inventions, with the encroachments of the smelter on one side, and the leaching process on the other, the stamp mill still continues to be the simplest and best way of extracting the hidden gold yet invented by the ingenuity of man. It is probably true that the ores of Gilpin county, Colorado, contain a higher percentage of sulphuret than any other gold-bearing mill ore treated by amalgamation at any of the chief milling centres of the world to-day. The fact that they make a higher percentage of extraction from these pyritic ores is evidence that their system of mill construction and milling is second to none. If this be true, it is due to the proper recognition of the necessity for changing the modes of treatment and mill construction to conform to the different characters of the ores. These changes did not take place in a day, but are the outgrowth of years of hard work and observation. The mill men of Colorado have been trained in the best of schools, that of experience.

The mine owner should not consider the work finished when the ore is hoisted to the collar of the shaft, but on the contrary, the mill demands the greater experience and attention, and no management can be too careful in placing competent men in charge of the plant. It is one of the faults of mill construction to-day that the building of mills has not been left to the direction of technically trained engineers. The design and mode of construction of stamp mills is usually left almost entirely to the judgment of the foundry man. The millwright, whose duty it is to look after these things, seldom ever concerns himself with the details of the design of the machine which is intended to do the work. The factories very naturally change their patterns as little as possible. There seems to be an unexpressed sentiment that the ores must suit themselves to the mills, rather than design the mill to comply with the character of the ore.

While it is not possible to go into all the details of stamp-mill construction in a few brief paragraphs, yet there are always certain principles that must be considered. In the construction of the mill building there are three important factors to be observed : light, heat and room. Nearly all of our large mills are dark in the middle ; none should be that way : builders depend too much upon side-wall windows for light. If the mill is not built in elevated sections so that each department can have its own system of lighting, it is better to place skylights in the roof, for one skylight will give more light than four windows in the wall of the building. Whitewashed walls and ceilings will aid in producing better light. The amalgamation and concentration departments should be warm in winter. It is best to build this part of the building double board with building paper between the battins on the outside. If the mill has steam power, a very good system of heating can be arranged from the exhaust steam from the engine. If the mill is not equipped with steam power, a good stove or two with large hot-air drums will prove economical of fuel and keep a 30-stamp mill sufficiently warm for operations. Avoid cold drafts of air, for icicles, plate amalgamation, and concentration will not work together.

In the matter of room or space, no millwright should try to economize in this particular. Have plenty of elevation between the different departments of the mill, plenty of room around the batteries and the concentrating machines. These three factors, light, heat, and space, are not luxuries ; they are necessities in every well-regulated mill.

Next, we come to the battery foundation. Nearly all stamp-mill constructors seem to think that the mortar blocks must be set on solid rock, or rather that mill sites must be chosen with reference to the foundation for the mortars. While it is probably true that natural rock foundation is better for any machinery, yet it cannot always be secured, and a better rule would be to locate the mill in the most convenient place with reference to the mine and other surrounding conditions, and if there is no rock foundation construct one. This may be a violation of all rules of battery foundation, but like many other rules there must sometimes be exceptions. If a natural foundation cannot be secured, make an excavation deep enough so that the bottom is of a homogeneous character. A foundation partly on rock and partly on sand can never last. A space of 72 square ft. or about 6 ft. x 12 ft., will be large enough for a ten-stamp battery. On the bottom of this excavation build a cement concrete 3 feet high, using about three parts sand, three parts of broken rubble, and three parts of Portland cement ; a coping of about 2 inches on this concrete, consisting of equal parts of sharp sand and cement will give a smooth level surface. After this concrete foundation has thoroughly set, it is ready for either an iron or wood mortar block. In a like manner concrete piers can be built for the mud sills and battery posts. Anchor bolts spould be built in the concrete work for holding the mud sills and mortar blocks.

The back knee frame, while it has some objections, is considered best for a battery frame ; it gives a solid support to the ore bins, and the pull of the belt to the cam shaft is downward. However, there seems to be a

* Read before the International Mining Congress at the Fourth Annual Session, Boise, Idaho.

considerable difference of opinion among mill men as to just where the driving shaft should be placed; many insist that the shafting be placed on the battery sills, while others maintain that it is better to place this shaft on an approximate level with the cam shaft. This last arrangement has two or three advantages over the first. There is less vibration at this point than on the battery sills, less dust and dirt; and the use of the belt tightener is not required. The life of the belt in this position is much longer as has been demonstrated in the mills of South Dakota where the two arrangements have been used.

The iron battery frame has gradually come into use in Australia; this has added much to the appearance of the stamp mill, but the question is often asked, Does not the iron frame increase the vibration produced by the fall of the stamp? It is generally supposed that the wood frame takes up this vibration better than iron and prevents a crystallization of the iron work of the battery. This question is often a matter of controversy between mill men, but the experience of the Australian mill man does not sustain the idea of crystallization, for many of the iron-frame batteries in that region have been running for years without any serious results. The design of the mortar, which is seldom ever left to the millwright or the amalgamator, becomes an interesting question, for the character of the ore may require that the mortar be made an amalgamating machine as well as a crushing; in that case the mortar should be built wide and deep, after the fashion of the Colorado or Black Hawk mortar, which gives room for both back and front inside plates. On the other hand, the ore may be of such a class that inside amalgamation cannot be effected. Notable among this class are the milling ores of Custer county, Idaho. Every attempt at inside amalgamation of these ores has reduced the percentage of extraction. From this experience, the mill men of this district have learned to design their mortar as a crushing machine; narrow, with a shallow discharge. Again, we may bridge between these two extremes and design a mortar with a chuck block and front plate only. This modification is to be recommended when both back and front plates cannot be used, for the sooner we catch our gold, the less chance there is to lose it. If it can be recovered in the mortar, it is better not to let it pass out in order to catch it on the outside. Finally, these different modifications become a business proposition to be carefully weighed by the mill manager, as to whether the increased extraction inside the mortar will make up for the loss in tonnage by inside amalgamation.

The depth of discharge, or the distance from the level of the issue to the top of the die is a very important factor, the importance of which is usually underestimated. In the deep discharge mills of Colorado, the distance from the top of the dies to issue is from 14 to 16 inches, while in many other milling centres the discharge is less than 2 inches. These varying conditions usually come from arranging the mortar to suit the requirements of the ore. In any case the discharge should be kept as constant as possible. It is better to put more metal in the stem and less in the bosshead. With a light steel tappit there is less vibration in the stem and consequently longer life. With a steel tappit and the end of the cam chilled, there will be less friction and little wearing of cams.

Shoes and dies should not be of the same hardness; better have the shoes of steel, and the dies of cast iron. Use the individual iron guide; it is preferable to any wooden guide.

Tables for the apron plates should be made heavy and solid and of the best material; usually 3-in. x 5-in. pieces, spiked together and dressed to an even surface on the top side, 1-6 inch lower in the centre, with a side rail on either side 1½ in. x 20 in. This will make a solid bed for the plates. If the tables are long, 12 or 16 feet, it is better to divide them into two sections of 6 or 8 feet each, with a drop of 2 inches between the two. The pitch of the tables is another question that mill men do not always agree upon. The tendency in later years is to give the plates more pitch. The pulp in this case requires less water and gives it more of a rolling motion; a 2 or 2¼-inch grade seems to give the best results.

The weight of the stamp varies from 500 pounds to the heavy stamp of 1,250 pounds or more; only the prospecting mills have lighter weight. The most desirable weight for a given ore depends much more than is usually supposed upon the required conditions favourable to amalgamation. The light stamp of Colorado is an outgrowth of one of these conditions; while on the other extreme, the heavy quick drop of California is desirable on account of its great crushing capacity. A series of experiments carried out by the Alaska-Treadwell Co., among others, demonstrated that a stamp heavier than 1,000 pounds was a good pulveriser, but not a good amalgamator. Likewise the same conditions have been found to prevail with the heavier steam stamp on gold ores of the Black Hills. The arrangement in the order of drops of the stamps in a battery must be arranged according to the work required. For rapid crushing, the order 1, 5, 2, 4, and 3 will work well, while for the long, slow drop of the Colorado mill, the order 1, 5, 3, 2 and 4, will give an even distribution of ore in the battery. The order 1, 4, 2, 5 and 3 for heavy stamps and inside plate amalgamation will give good results. The order 5, 1, 3, 4 and 2, commonly used in Australia, is a very good system, but the order of drop is more a fancy of the mill man, rarely any two men using the same drop.

We find in general stamp-mill practice these three classes of plates in use: the plain copper, the silver-plated copper, and the Mutz metal, a composition plate 60 per cent. copper and 40 per cent. zinc. While the plain copper is used in many mills, it is not to be recommended in any instance, and although its first cost is less, it will not compare with the many advantages that the heavy silver-plated plate has over it. While it is true that in time the silver plating will wear off and expose the copper, and in that case lose some of its efficiency, it still can be plated again, for no large stamp is complete without a plating arrangement. Again, an old plate will always buy a new plated one. The Mutz metal plate used in Australia is in some instances superior to the silver-plated copper; its absorbing power for mercury is limited, and it is much more easily cleaned up than either of the other plates, which makes it better for test runs or custom mills. When the ores contain compounds of other elements, which will cut up the mercury, the composition plate is preferable.

Again, it is said that the zinc in Mutz plates sets up a kind of galvanic action which has a tendency to purify quicksilver. The "verdigris," so annoying to the mill man, never comes on the composition plate, but for all conditions, the silver-plated plates are superior to all others. The sluice plates should be made at least as wide as the plates above, instead of narrower, which is the common practice. The same amount of pulp and water must necessarily pass over them as the upper plates, and the gold expected to be caught by the sluice plate and more difficult to catch than that which has been caught on the plate above; but the reverse of this is generally the case. In most mills the sluice plates are much narrower, sometimes only 20 inches wide, and

set at a greater angle, and the little gold caught is more by accident than by reason of design.

It occurs to me that they are excellently devised for carrying off the mercury, the gold and everything else, rather than arresting what has already passed the tables above. The quantity of water used is usually about 750 gallons per ton of ore crushed; this amount is sometimes varied to suit the specific gravity of the pulps, the intention being to regulate this factor so as to produce a slow, wave-like motion as the pulp passes down over the tables, using sufficient water to prevent the heavy particles of ore from banking on the plates. Warming the water for amalgamation and concentration in winter is a point to which too little attention is given. This can be accomplished where steam power is used by passing the exhaust steam through a coil of pipe into the water tank. Never turn the exhaust steam into the water tank. The water should be kept at an even temperature, never exceeding 70 degrees; frequently a lower temperature will do better work. The water tanks should be so arranged as to give a constant pressure at the batteries, hydraulic sizers, and concentrators.

Every stamp mill, no matter how small, should be equipped with sizing bars, rock breakers, and automatic feeders; better to have two rock breakers, one for the coarse and a smaller one for the fine ore. Uneven ore sizing and irregular feeding add very much to the wear and tear of the stamp mill. Do not try to make a rock breaker out of your mortar. If it pulverizes and amalgamates your ore, that is all that is required. It has been thoroughly demonstrated that the rock breaker is a great saver of mortars, shoes, dies, bossheads, screens, etc. The time lost in a year by the frequent stoppage of the mill in order to replace and make these repairs, at once becomes a monetary question, which must be added to the cost of the excessive repairs.

A stamp mill can reach maximum capacity only through the aid of a perfect system of rock breaking, sizing, and automatic feeding; besides these factors are an efficient aid in the matter of amalgamation and concentration.

In the matter of machine feeding, it is safe to say that the automatic feeder is superior in every detail to the shovel, for man is human and the temptations known to stamp-mill feeders, as other men, cause them occasionally to neglect their duty. Every mill should have an automatic sampler for tailings. This is an apparatus too frequently left out of the mill entirely. The lack of proper tailing samples is one of the consequent losses of gold due to bad milling, which is the result of ignorance on the part of the mill man as to what he is doing. It is to the mill owner's interest to know what is being lost in the tailings. It is to the mill man's interest to have the tailings run low; the hand sampler will soon learn to sample to an idea of his own while an automatic sampling machine cannot be coached. The grinding pan or clean-up barrel is another machine frequently left out in the construction of mills. Many mill men object to these as an aid in cleaning the residue from the mortars after taking out old shoes and dies; they claim that the grinding process of the machine causes the mercury to flour and a loss is sustained. This loss can generally be prevented, very easily, by giving the barrel a slower motion and adding a small amount of perchloride of iron to the contents to be ground. Mercury traps should not be discarded where amalgamation is carried on by stamp mills.

The arrangement of the stamp depends somewhat upon the location of the mill; if the site is level and the mill large, it is better to arrange the battery in two rows back to back; when a graded mill site is used on a sloping hillside, the batteries are arranged in one single row. This is a better arrangement as the hillside gives the desired elevation for the different departments of the mill and makes a better condition for lighting the building.

The stamp mill of late has suffered much in reputation from the frequent failure of the designer or the constructor to adapt the arrangement and construction of his mill to the character of the ore to be treated. The mine owner orders his reduction plant about the same as a man orders his dinner; he goes to the agent of a well-known manufacturer of machinery and tells him about the mine and the probable character of the ore and then leaves the plan and management of the mill to him, the same as a man enters a restaurant and directs the head waiter to serve him with a good lunch. Mine owners do not like to spend a few hundred dollars in advice or experiment previous to the construction of a milling plant; but actually enjoy ordering a $150,000 mill, and too frequently, after it is completed and put in operation, they find that the plant or process is not adapted to the character of the ore, and from this frequent haste and ill judgment, we find so many failures in our mining camps, which are monuments to folly, and the hillsides are dotted with the silent mills. Only recently an instance of this kind came under my observation; a superintendent of a mine in one of the remote mining districts of Idaho, wanted a 50-ton reduction plant for his mine. The ore was of the hardest kind of silicious quartz. An agent of a mining machinery firm recommended that Bryan mills would be about the thing for this ore; accordingly a pair of mills were ordered with a complete plant of machinery; a large excavation was made in the hillside and without foundation or retaining walls, a building was erected, the machinery installed, and the mill started up. After running a few days, it was discovered that instead of a 50-ton plant, the mill would treat 15 tons; after a continned run of a few days ,onger, the excavated embankment gave way, carrying the whole building down the hill, throwing the shafting out of line, leaving the engine and other machinery without foundation; thus adding another silent mill to the already increasing number. Among these many failures, the questions often come up, "Will the stamp mill continue to survive, amid the many inventions daily made; will it continue to compete successfully with the unending number of pulverizers and amalgamators, together with the army of new processes which the active brain of man brings forth from time to time?" Looking over the field of competition and the continued failures of the army of ill-devised machines, which their originators fondly believed would revolutionize the reduction of ores, there is every reason to believe that the stamp mills will continue to survive amid all of these new inventions and enjoy a career of further usefulness.

In conclusion, to mine owners and millwrights who intend to build stamp mills: first, study the character and requirements of the ore to be treated and, if necessary, go to some expense in experimenting to find out the true process of your ore; or better still, employ a competent expert in that line, who is able to judge which is the real system by which to treat your ore. That done, design your mill according to these conclusions; employ the most competent millwright to superintend the construction of your plant, a man who can run the mill after he has built it and understands every detail of its operation; use your stamp mill intelligently and observe each and every one of its continued operations, take advantage of every occasion to use any new contrivance or change, which experiment and common sense may sanction; and in due time the inventive genius of this great age of progress, may pro-

duce something better than the stamp mill, by which, to extract from its hidden recesses, the yellow metal, the constant want of which is the continued pain of many, and its abundance the curse of others.

CAPITAL AND LABOUR CO-OPERATION IN THE COAL FIELDS OF ILLINOIS.

IN last month's issue we reviewed the annual report of the Illinois Bureau of Labour Statistics, dealing with the coal mining industry in that State, and called attention to the satisfactory state of affairs there existing, as evidenced by an enormously increased output of coal, in consequence of an understanding arrived at between operators and miners for the avoidance or speedy adjustment of disputes. We are now indebted to Mr. David Ross, secretary of the bureau, for further information on the subject of the co-operative movement. Our correspondent writes:

What is known as the joint or interstate organization resulted from the suspension which occurred in the summer of 1897. While the miners at that time were but partially organized, so miserable had their petition become, that the order to suspend was generally complied with. In the fall of that year representatives of the miners and operators met in national convention, and formed the present organization. It embraces the competitive coal fields of Pennsylvania, Indiana, Ohio and Illinois. I might say that the real basis of the movement is the mutual recognition of the right to treat with each other as an organized body, and all contracts affecting mining prices and wages of other classes of labour are consummated through duly selected delegates representing both interests. These agreements continue for one year, and have been scrupulously observed.

In consequence of this friendly method of adjusting business relations, the interest of the industry has been protected and promoted, and the consuming public, instead of being injured as some feared, has been spared the expense and embarrassment incident to strikes. Many reforms which the miners endeavored and failed to secure through legislation, have been obtained. In additional to a material advance in wages, the truck system has been practically abolished; wages paid semi-monthly, the working day reduced from ten to eight hours, and in Illinois the adoption of what is known as the gross-weight system, by which miners are paid on the basis of what the pit car contains.

This plan eliminates the disturbing question of screens, which in the past proved a most fruitful source of trouble. Laws have been passed from time to time designed to establish these changes, but our courts in almost every instance nullified them on the ground that they were in conflict with the expressed provision of the constitution concerning the right of private contract.

The States forming the national organization hold separate conventions for the purpose of adjusting matters local to them. Where any disagreement arises at any point between the miners and operators, representatives of each interest are selected to ascertain whether or not the general agreement between miners and operators has been infringed upon, the understanding in every case being that work will not be suspended or business in any way interrupted, pending such investigation.

The operators of this and the other States appoint commissioners at a regular salary, whose principal duties are to meet with representatives of the miners, and see to it that the provisions of the "scale," as it is called, is everywhere observed and complied with.

I have given you briefly a general outline of the method by which strikes and disagreements have so far been avoided, and the friends of the movement have faith that it will continue and permanently supplant the old system.

THE MARKETING OF B. C. LEAD AND SILVER IN THE ORIENT.

By Alfred W. Dyer.

THE Seattle Smelting and Refining Company is the name of a recently incorporated undertaking, established on Puget Sound. The company does not operate a smelter—the word in its title signifying merely the powers conferred upon it by its letters of incorporation which were only taken out last June—but a refinery, in connection with which the purchasing and marketing of silver is a chief consideration. As a possible factor in the development of the silver-lead mining industry of British Columbia. A reference to the new enterprise may be of interest.

The chief customer of the Seattle Smelting and Refining Co. is at present the Puget Sound Reduction Works, more popularly known as the Everett smelter, and, as is well known, the Everett smelter is a considerable purchaser of the silver-lead ores of the Slocan and other British Columbia districts. If the marketing from Seattle can be successfully achieved as anticipated, those whose capital is adventured in the refining undertaking, there will unquestionably be a brisk bidding for B. C. silver-lead ores from this point.

At present every ounce of silver refined has been sent to the Orient from this refinery by the Everett smelter to the order of the Hongkong & Shanghai Banking Corporation, the most powerful bank in the Orient and which is closely affiliated with the Bank of Montreal, which occupies so large a space in Canadian financial interests. A consignment was taken over by the last Empress and further shipments have been made by the Nippon Yusen Kaisha.

It is well understood that the market for silver is practically dominated by New York but there is no reason, allowing this to be the case, why silver ore mined in the west should be refined in the east and then shipped back to Vancouver or Seattle for its ultimate market in China or India. Hence the existence of the refinery in Seattle. The only wonder is that its advent should have been so long delayed and that its situation should be so far south on the sound.

The silver is shipped in bars which bear the stamp of the Seattle refinery, the impression, by-the-way, being the head of the Indian chief Seattle, from whom the present flourishing city is named. The metal is 999 fine. As will be noted it is shipped to South China and not to the north although its consignee has equally large interests in either. The reason of this is that in Northern China the ordinary Mexican dollar has currency as such despite the currency as accounted figuring as tæls, mace, candereen and li, which are merely weights whose standard varies in different parts of China; in the southern parts the dollar has no value as such but merely as a weight in silver, the fractional part of a tæl. The impress on the coin, if worth anything to the inhabitant of Canton, is merely a guarantee of the fineness of the silver. This being the case whether the silver is in coin, sycee or bars, except as a matter of convenience of handling, is a matter of indifference just so long as the fineness is unexceptionable. The Hongkong & Shanghai bank are the beginners in this matter but the Chinese are shrewd im-

itators, and themselves clever financiers, will not be long in following the example set, ordering directly and paying in merchandise. Hence the future that lies before this particular industry is very bright. The market in India is more curtailed as the government is unwilling to buy more than a certain amount of silver annually for the mint, but whether this policy can be persisted in despite the constant recurrence of famines and the persistent agitation against it in the imperial parliament by Anglo-Indian members, is doubtful.

But to return to subject of refinery. As already stated the chief customer is the Everett smelter, but the refinery also purchases gold dust from Nome and from Dawson through a city branch office where the depositor is paid on the same day as he tenders his gold at the same rates as the Seattle assay office. Besides this the refinery purchases "sweeps," or the dust from the floors of assay offices such as that at Seattle, and has entered a bid for that of the Dominion assay office at Vancouver. It is also in the field as a purchaser of concentrates.

The product of the Everett smelter handled by the Seattle refinery is the dore bar. Dore metal is a product of the desilverization plant of the lead produced by the smelter. The copper is not touched by the Seattle refinery, copper matte being sent eastward. The dore bar is practically a silver bar, 980 fine; the remainder being gold with a slight trace of copper and lead. Now the Dawson gold dust purchased averages 25 per cent. silver, and that of Nome 10 per cent. In addition the refinery is treating black sand from Nome, running $10,000 to $50,000 gold to the ton, the remainder being iron and silica. The contribution from Everett is heavy even at the present, being about 200,000 ounces of silver monthly containing some $60,000 worth of gold. The gold, when separated from the silver, is sold to the Seattle assay office, 997.5 fine, ready for minting with the exception of the addition of the copper alloy. The silver, as already stated, is sent to the Orient in bars, each bearing the stamp of the refinery and each weighing between 1100 and 1200 ounces.

The plant which at present is comparatively small, although it is hoped that it will be necessary to increase the capacity ere long, is equipped with a 50 horse-power electric motor, driving a blower, and with a gas machine by the American Gas Furnace Company, capable of producing 4,000 cubic feet of gas per hour. This is generated on the premises from naptha which is kept in a huge steel cylinder, 24 feet long with a diameter of 7 feet 6 inches, encased in brick, holding 8,000 gallons of naptha. This is for the use of the furnaces, four of which, each capable of treating 2,000 ounces at a melt, are in use. Next are a series of parting kettles which have a capacity of 15,000 ounces of silver and 3,000 of gold. The dore metal is placed in the furnaces with sufficient gold to bring up the proportion of gold in the silver from 20 to 200 per thousand. This is then melted down and recast in thin slabs of metal which are then placed in the parting kettles with sulphuric acid and boiled. The gold being insoluble is cast to the bottom and the silver is dissolved and takes the form of a sulphate. This sulphate being poured off into receiving tanks the gold is again placed in a parting kettle, this time of a smaller size and is again boiled with sulphuric acid attaching the portion of the silver still remaining. The sulphate of silver again being taken away the gold is washed, dried, remelted and cast into bars, which are of standard fineness—997.5. The sulphate of silver is treated in tanks filled two-thirds with water, into which copper plates are introduced. These have the effect of taking up the sulphuric acid and thus precipitating the silver which assumes the form of cement-silver. This is washed in hot water, dried and remelted, and is then cast into bars which are 999 fine. The copper taken up by the sulphuric acid from the plates is then in the form of a sulphate and is run through evaporation tanks and crystalizes as blue vitriol. This crystalization is imperfect, there being too much acid present and the crystals are in that state which is known as "sour" on the market. The process is therefore repeated, the extra acid being got rid of and the perfectly crystalized blue vitriol finding a ready market, being in demand among the agriculturists as a wash against certain forms of insect life injuring vegetation. This is therefore a by product although an important one of the refinery. No loss is incurred in either the copper or the sulphuric acid, both being present in a more valuable form as blue vitriol, which is composed of about 25 per cent. copper, the remainder acid and water—the latter about 4 per cent. The waste sulphuric acid from the mother liquor of the crystalization is recovered and used over again. This is about 10 per cent. over and above that which is called for by formula and has to be present in that quantity in order to successfully attach the silver. It will be seen that the process is simple and economical, and therefore likely to be practically successful.

There is one curious feature in the development of this new factor in the trade relations of this continent with the Orient, and that is whether trade conditions in the Orient will not demand the bars of silver being sent in a more easily handled form than the cumbrous bars of nearly a hundred weight apiece now despatched. Before coinage of silver was known in the far East the metal was current in Siam and China as sycee, or a piece of silver somewhat resembling the shape of a shoe, varylng in value from $2.00 to $10.00. Such "shoes" of still current despite the plentiful supply of Mexican dollars in China, Siam and the Straits Settlements.

THE STOCK EXCHANGE v. WHITAKER WRIGHT.

THE CHANGES ON THE LE ROI DIRECTORATE—WHITAKER WRIGHT LOSES CONTROL.

(From Our London Correspondent).

I WAS surprised to read in a recent issue of the Rossland *Miner* a very remarkable letter from a London correspondent in which he says :—

"Since last I wrote you considerable of interest (*sic*) has transpired in London affecting British Columbia properties. Of course you have all heard of the B. A. C. stockholders' meetings, and what was the outcome of those events. Aside from that particular theme, quite the most interesting event to London financial men has been the effort upon the part of British Columbia promoters to induce the investing public to take shares in the newest British Columbia flotation—The Giant Gold Mine, Limited, Rossland."

The prominence given to the issue in question by your contemporary's London correspondent will have caused much amusement to those who know the facts. I can assure you that the British public were not in the least bit excited over the Giant Gold Mines, Ltd., Rossland, and I have no doubt if a census could be taken of the Stock Exchange and investors, 99 per cent. of both

do not know anything about the concern in question. As for the "considerable of interest" (*sic*) which "has transpired in London affecting British Columbia properties," the only thing of any importance which has recently taken place in connection with the British Columbian market, has been the further developments in connection with the B. A. C. group, culminating in the resignation of Mr. Whitaker Wright from the board of the Le Roi company. As a matter of fact the British Columbia market has been quite dead for some time past, and although values are fairly well maintained, yet there is little or no public interest taken in the market pending a deliverance from the present unhappy condition of affairs brought about by the collapse of the London & Globe and British America Corporations. I can only assume that the correspondent in question is endeavouring to be facetious in his remarks about the Giant Gold Mine, Limited, because, I can assure you, that so far as London is concerned the investing public will not be in any way disturbed by the circulation of the prospectus of the new concern. English investors have been so badly bitten in connection with British Columbian properties that it would be very little good trying to dispose of shares in a local company at the present moment.

Mr. Whitaker Wright only just resigned his position in time, for in a few days he would have sustained a most pronounced defeat at the hands of the Stock Exchange people, who had set themselves the task of ousting him. When the day of the Le Roi meeting came Mr. Wright did not put in an appearance The proceedings were boisterous in the extreme, and the votes given for the change in the control of the property enormously in excess of those available for the old regime, as the following figures will show :

For Whitaker Wright,	. . .	15,263 votes.
Against "	. . .	132,338 "

Several of his fellow directors retired with Mr. Wright and at the meeting in question the shareholders cheered when these resignations were announced. The proprietors have elected as a director Mr. Frecheville, a gentleman of the highest repute as a mining engineer, who is probably by this time on his way to inspect the property. On the receipt of his report the shareholders will be called together again, and then the new policy of the company will be initiated, although of course it has really already commenced with the overthrow of the Whitaker Wright clique.

The revelations in connection with the Wright companies continues, the extraordinary developments in regard to the Standard Exploration Company, coming at the heels of the B. A. C. report, having caused a great sensation. One of the Stock Exchange creditors (with the sanction of the committee of that body) has presented a petition to the Court to wind up, *compulsorily*, the London & Globe Finance Corporation, which is now being liquidated *voluntarily*. The petition comes on for hearing in London on Oct. 30th, and if it is granted we shall then probably see some fresh sensational developments. The Le Roi's have fluctuated a good deal, o course, but keep at about £7, while on the statement that a large line of Le Roi No. 2's had been taken over "firm" from the liquidator of the London & Globe Corporation, their price hardened a little. The London & B. C. Gold Fields and New Gold Fields of B. C. groups have shown firmness, Velvets being strengthened by the latest news from the property. Changes in prices are, however, seldom important, and there is really nothing doing in B. C.

Several meetings have been held, amongst others, the B. C. Electric Railway, and The White Pass & Yukon Railway Co. At the annual general meeting of the Tyee Copper Co., held on August 20th, Mr. T. H. Wilson, who presided, gave an interesting account of his visit to the property. He said that he hoped next year the company would be producing, and that they would then be able to submit a profit and loss account. It was decided to increase the capital of the company to £180,000 by the creation of 60,000 new shares of £1 each, the further capital being required for the acquisition of additional property, while the erection of a smelter is also contemplated, the land at Howes Bay being regarded as a suitable site for this purpose. In conclusion, the chairman congratulated the shareholders on possessing a valuable property, and said he felt sure that if supplied with the capital required, they might look forward to a prosperous career, having arrived as they had at the stage when further funds should produce early dividends.

COMPANY MEETINGS AND REPORTS.

TYEE COPPER CO., LIMITED.

A MEETING was held on Tuesday, August 20th, at the Cannon Street Hotel, Mr. T. H. Wilson, (the Chairman of the company), presiding.

The Chairman : The report and balance sheet having been in your possession some days, I presume that you will, to save time, take it as read. It is, therefore, my pleasing duty to move that the same be received and adopted, but before doing so I should like to make some few remarks thereon, also respecting my visit to the mine. Referring first to the debit side of the accounts, I would say that the unpaid calls are now paid. The credit side also speaks for itself, but you might like to have some slight idea of the expenditure on the mine development. In another year I hope we shall be in a position to submit a profit and loss account, with all the details fully gone into. But to satisfy anyone who may wish to know what the expenses are I may say that the expenses at the mine are £6,119 ; the expenses in London £1,687 ; the company's formation charges—which you may remember we stated at the time would be about £1,500 — may be put at £1,540, and travelling and legal expenses £363. That makes £9,711, less revenue £218, leaving £9,493. I thought I had better let you know the details in case anyone wished to ask questions. At the unanimous request of the board I agreed to visit the mine.

Mr. Wilson then gave a description of his visit and added : At present our work has only been carried on upon the Tyee claim. On the latter the following buildings have been erected :—One office of five rooms—this at present accommodates the resident engineer ; three bunk houses, containing 22, 11 and 6 bunks respectively ; cook house, store house, bath house, four-stall stable, of which two are used at present (I may here mention that we have an excellent pair of medium fweight horses); timber shed in which the logs are shaped for use in timbering the main shaft ; blacksmith shop, powder magazine, well buried in the mountain side ; mine store house, divided into three compartments ; two engine houses, and one shaft house over main shaft. The engine houses contain two 50 h.-p. boilers and one 14 h.-p. boiler. The machinery includes two hoists, one for each shaft, a rotary fan for ventilating, complete outfit of rock drills, and air compressor. The buildings are, of course, wooden, but of good and substantial make, and all insured against fire. The mine employs on an average 40 men, over whom are Mr. Musgrave,

our resident engineer and Mr. McInnis, our foreman. Both the latter have had considerable experience, and their work and management leave nothing to be desired. The miners are a carefully selected body of men, and impressed me very favourably. They are housed in the bunk houses, and feed together in the cook house. The men pay $5.50 per week each for feed, which just covers expenses. The food is well cooked, excellent in quality and quantity, and is varied as much as circumstances permit. Since I left, in response to requests, a town site has been mapped out by Mr. Fry, provincial legislative surveyor; fifteen lots have been sold, fetching $35 each, surface rights only granted, and special conditions inserted by our solicitors giving the company entire control. One of the important points of any enterprise needing machinery is the water supply. At the Tyee mine it is obtained from a neighbouring stream named Whiskey creek, about six minutes' walk from the office at a level of 15 feet above the latter. The water rights have been acquired, and a dam constructed, to conserve the water, 40 feet by 15 feet, by 9 feet 6 inches deep at apron. As to the mine itself, No. 1 shaft, so-called, was only a small one put down by the original prospectors, and therefore needs no comment. No. 2 shaft is down 200 feet, and at that level most of the work has been done. Drives have been cut both east and west—to the east a distance of 350 feet, from which seven crosscuts have been made. To the west the drive is about 150 feet in length to the boundary of the Lenora mine. Just before I arrived, the No. 1 crosscut north passed through a parallel vein about 160 feet from the shaft. I took samples from this spot, the assays of which are mentioned in the engineer's report.

The width of the reef at this point, widest part, was 5 ft. 6 ins., at narrowest just over 3 ft. These measurements were taken by myself. I went down the mine and saw that everything was perfectly correct. Since my return this reef has again been cut by a crosscut to the north at a distance of 350 ft. farther east, proving its continuity. I also took a sample from crosscut No. 4 in the No. 3 upraise. This was assayed by Mr. F. Claudet, and gave the following results: Copper, 23.60 per cent.; silver, 7 ozs. 18 dwts.; gold, 2½ dwts. per ton of 2,240 lbs. Large bodies of ore were exposed, but as to quantities, I leave it to more experienced individuals to compute. The new or main shaft consists of three compartments, timbered the whole distance in the most workmanlike manner, down, as per latest cable, 245 ft. North and south stations cut (since I left) at the 135-ft. level. This corresponds with the 100-ft. level in No. 2 shaft. This main shaft is to be our future working shaft. The following cable was received from the mine on August 19, 1901:—"Connection between main shaft, east drift No. 1 (main central), 200-ft. level, will be completed within 12 days. At the bottom of the sump 10-ft. below 200-ft. level ore body is dipping out of shaft north. Latest assays clean ore 18 per cent. copper, 3 dwts. per ton gold, 4 ozs. of silver, per ton of 2,000 lbs. By means of a winze tunnel No. 2 Lenora claim 8-ft. ore has been proved 100 ft. below 200-ft. level Tyee claim. (Signed) Livingston." The ore referred to in the cable, if copper were reduced to £60 per ton, which it is not likely to be, would be £12 per ton, taking all the values of the gold, silver and copper contents, while at the present prices it would be worth more. They have put down a winze on the neighbouring property, and the same ore they have there comes into our property, so that it assures us of another 100 ft., and I have very little doubt in my own mind of hundreds of feet yet to come. As to the schemes for increasing the area of our property, recommended by Mr. Thompson, I desire to support his suggestion for the following reasons:—1. That I am of the opinion that the valuable reefs that we possess pass through the claims named. 2. That we have now the opportunity of obtaining them at a low price. 3. That it will enable us to erect electric machinery, deriving the necessary power from the Chemainus river, which flows through the Muriel claim, by which much of the work on the mine can be carried out more economically, and enable us to concentrate all our low grade schists on the spot. In conclusion, I would mention that I visited the Tacoma smelter. I also inspected the land situated at Howe's Bay, over which we have an option to purchase upon very reasonable terms, and which I consider eminently suitable for the erection of a smelter, etc. I congratulate the shareholders in possessing such a valuable property, and feel sure that if supplied with the capital required that they may look forward to a prosperous career, having arrived at the stage when more capital will produce early dividends. It is now my pleasure to propose that the report and balance-sheet be accepted.

Mr. E. B. Livingston seconded the motion, which was carried.

Mr. Cooper proposed the re-election of the auditors, Messrs. Everett and Whibley, at a remuneration of 20 guineas.

Mr. Tait seconded the resolution, which was also agreed to.

The Chairman: Ladies and gentlemen, I must ask your indulgence for a short time to pass the resolutions mentioned on the last page of the balance sheet providing such resolutions meet with your approval. The majority of them must be passed in order to comply with the requirements of the new Act of Parliament of 1900. There are two out of the whole lot which more especially concern us:—1. The increase of capital—I have already explained so fully in my address to you the reasons why the directors ask for this that I will not detain you by recapitulating them. 2. On the resolution respecting the commission there may be some of you who think the board contemplate offering too great a consideration for obtaining the money; well, we are in this position—the money should be got at once, so as to enable us to carry out our programme, one important factor being the acquisition of the adjoining claims of which the option shortly expires. The offer will be made, in the first instance, to the present shareholders, and if they respond to a large extent then they will reap the benefit accordingly. If we have to go to the public for any important amount, the directors feel that in these non-speculative times they must offer a good inducement for outsiders to join them. They, however, have the satisfaction in knowing that, owing to their caution in capitalising the company at the small amount they did in the outset—namely, £120,000—that even under the circumstances of the bad times the capital now proposed, £180,000, is small compared to most of the companies at the present time, bearing in mind the large area of 240 acres, the whole, in their belief, being ore-bearing. Out of this £180,000, £80,000 will be actual working capital. I have, therefore, much pleasure in proposing the first resolution: "That the capital of the company be increased to £180,000 by the creation of 60,000 new shares of £1 each."

Mr. F. W. Hodges seconded the motion, which was carried. The meeting was closed in the usual way.

KLONDIKE AND COLUMBIAN GOLDFIELDS.

We reproduce the following report of the shareholders' committee of this ill-fated and fraudulent concern from *British Mining*, a London publication:

The history of the Klondike & Columbian Goldfields,

Limited, has almost passed into oblivion, and but a languid interest can be expected to be taken in the latest circular issued by the Shareholders' committee, important as are some of its statements. In the autumn of 1899 the directors of the company proposed a reconstruction and an amalgamation with three other concerns, its own miserable progeny, under the title of the Consolidated Goldfields of Klondike—a reconstruction involving an assessment of 4s. in the £. This scheme was opposed by the Shareholders' committee on the ground that it would only result in further loss to the proprietors. The committee further invited "co-operation in taking steps to procure a thorough investigation of the past transactions." It need only be added that the reconstruction plan fell through, and that in February, 1900, the court ordered the company to be wound up. The committee has now sent out a report, in which it is set forth what has been accomplished during the past sixteen months. It is stated:

"We have frustrated the scheme of the liquidator, conserved your right of action against the directors, and prevented you losing a further 4s. per share on your holdings. We have received bills of costs from our solicitors, amounting in the aggregate to the sum of £313 8s. 11d. These have been reduced by £82 16s. 5d. to to £320 12s. 6d. The sum of £19 1s. has been paid by our solicitors to the printers, and we have paid a fee of £1 19s. 3d. to the Board of Trade for the 1897 list of shareholders. The use of chambers, time and personal expenses have been given gratuitously by the several members of the committee. The net liabilities we have incurred amount to £251 12s. 9d. The subscriptions we have received are £148 13s. 6d., leaving a liability of £102 19s. 3d. to be met by our committee, holding 1,390 shares between us.

"We are officially informed by the Inspector-General in Companies Liquidation 'that a communication has been received from the Director of Public Prosecutions, in which he states that, after careful consideration, he does not think the case is one in which it would be expedient to institute proceedings.' We have expended a further sum of £25 in submitting a case to counsel, and have obtained an exhaustive opinion from Mr. Gore-Brown. We are advised that proceedings against the directors would have to be taken by the official receiver, who would require to be indemnified as to costs; and inasmuch as the debenture holders and creditors would have to be paid before any benefit accrued to the shareholders, this is a responsibility we do not consider it advisable to incur. We have done all that lay in our power. We can but deplore the existing state of the law, and urge each individual shareholder to agitate for an inquiry."

It is certainly reasonable for the committee to refuse to fight an action for the benefit of the debenture holders and creditors whilst incurring full responsibility for costs. So there the matter will probably rest, though that it affords a strong argument for a drastic change in the law no one will be disposed to deny. Considering the work done by the committee it hardly seems fair that the individual members should be left to make up amongst them the deficit shown by the accounts. The interest taken by prominent shareholders in protecting their own and their fellow shareholders' rights is not usually so keen that it should be discouraged in this way whenever legitimately manifested.

Simultaneously with the committee's report a notice is issued by the official receiver, Mr. G. S. Barnes, announcing that he intends to apply to the Board of Trade for his release. The usual statement of the position of the company shows that while £102 12s. 10d. has been expended in fees, etc., there are no receipts, and this amount remains due to the Board of Trade. The official receiver adds: "The whole of the assets of the company are charged with the repayment of debentures for £4,279 0s. 7d. The receiver for the debenture holders states that he has been able to realise about £6 only, and that there will not, in any event, be a sufficient sum realised to satisfy the claims of the debenture holders. There is, therefore, no probability of any funds becoming available for distribution amongst the creditors or shareholders of the company."

LE ROI MINING COMPANY, LIMITED.

Pursuant to a requisition signed by a number of shareholders, an extraordinary general meeting of this company was held on August 29th, at Winchester House, to consider resolutions with regard to the constitution of the board of directors. Mr. L. Aarons, who was stated to be the holder of 3,000 shares, was voted to the chair. There was a crowded attendance of shareholders.

The Chairman remarked that he took the chair with some reluctance, because Mr. Whitaker Wright in a circular had designated certain members of the Stock Exchange as a clique to deprive him of the control of the company's property and to obtain it for their own purposes. He must confess to being a member of that clique; but Mr. Whitaker Wright was entirely wrong in assuming that they had secured the control of the company merely to oust him and carry on some market manipulations of the kind with which that gentleman was so thoroughly accustomed, and which he had effected with disastrous consequences to so many people. (Hear, hear.) It was hardly reasonable to suppose that they bought about 40,000 shares, representing upwards of £250,000, with the spiteful intention of ousting Mr. Whitaker Wright from the board as the sole reason for their investment. It was only reasonable to conclude that they entertained the idea that there was value in the property which they were buying. Wr. Whitaker Wright, in his bitter anger at having been so badly beaten, in seeing by the number of proxies sent in by the requisitionists that if he did not retire from the board he would be literally kicked off, had vented his spleen on members of the Stock Exchange, many of whom had been absolutely ruined, and many others brought to the verge of ruin, by the failure of his companies. It should be remembered, moreover, that besides the large number of shares standing in their own name, the members of the Stock Exchange concerned were acting for clients, on whose behalf, as well as their own, they had taken this matter up. They believed that they had a good investment, and they wished to protect their clients' interests as well as their own. If the control had been left in the hands of Mr. Whitaker Wright they would have had to fear the same result as in the case of the Standard Exploration and the British America Corporation. The main object for which this meeting had been requisitioned had already been accomplished. They had got rid of Mr. Whitaker Wright from the control of the company, and two other directors had also seen fit to resign. To show how much the confidence of the shareholders in Mr. Whitaker Wright had been shaken, he said that the action of the requisitionists had been supported by 131,438 votes, while in favour of the other side proxies for only 15,263 votes had been sent in. These figures disposed of any argument which could now be brought to bear on behalf of Mr. Whitaker Wright's management. (Hear, hear.) That gentleman was the holder of forty shares. With regard to Mr. Andrew, all he could say was that the requisitionists were satisfied with the inquiries which they had made

into his business character, and were convinced that he was not one of Mr. Whitaker Wright's clique. They had therefore no desire to get rid of him. All that they required on the board were men of integrity and business capacity, and they believed that Mr. Andrew possessed those qualities. As to Mr. Hill, he was put on the board recently at their instigation, and they knew him to be a man of the strictest integrity and of business habits, and there was no wish to improve on him. What was required, however, was a man possessing thorough knowledge of mining matters to assist Mr. Andrew and Mr. Hill ; and it was for this reason that it was proposed to elect Mr. Frecheville to a seat on the board. The company's manager at the mine might be the best in the world, but he (the chairman) knew nothing about him. If he were a man of that character his services would no doubt be retained. The appointment of Mr. Frecheville would enable them to satisfy themselves as to the management on the other side. He wished to disabuse the shareholders' minds of any idea that those requisitionists who were connected with the Stock Exchange wished to have anything to do with the control of the company. All they now asked was that Mr. Frecheville, who was not a stockholder, should be elected, and they were quite willing to leave the election of additional directors to the shareholders themselves. All that he and those associated with him were striving for was to have on the board men of good business capacity and integrity, and who would intelligently manage a property which they believed to be one of the best in the world. (Cheers.)

Mr. Lionel Robinson then proposed the election as a director of Mr. R. J. Frecheville.

Mr. L. Harris seconded the resolutiou.

A shareholder asked how long it would be before Mr. Frecheville would issue his report.

The Chairman suggested that the forthcoming annual meeting should be postponed until Mr. Frecheville's report was ready. It could then be considered at that meeting. At the annual meeting, moreover, the shareholders could also fill up the other vacancies on the board.

The resolution was then carried unanimously.

AMERICAN INSTITUTE OF MINING ENGINEERS.

The eighty-first meeting of the Institute of Mining Engineers will be held early in November, beginning at the City of Mexico, on the arrival of the special excursion train from the United States. Sessions will be held in the cities of Mexico, Pachuca and Monterey ; and stops will be made en route at Chihuahua, Zacatecas, Guadalajara, Aguas Calientes, San Luis Potosi, Tampico, Monterey and Baroteran, besides excursions to Cuernavaca, Puebla, and other points of interest near the capital. For the convenience of members attending this meeting from the United States, two trains have been chartered by Mr. Theo. Dwight, one of which will start from Jersey City about 2 p.m. Nov. 1, by the Pennsylvania R. R., and the other will be run as a second section of the above, starting from Chicago at 10 p. m. Nov. 2, by the Atchison, Topeka & Santa Fe railway, The cost of the trip from Chicago and returning to Chicago, including Pullman berth and meals, and occupying about thirty days, will be $250 for each passenger.

The two volumes described below will be issued shortly, nearly all of the material of both being already in type :

1. "The Genesis of Ore-Deposits," comprising the famous treatise of the late Professor Franz Posepny, with the successive discussions thereof by Le Conte, Blake, Winchell, Church, Emmons, Becker, Cazin, Rickard and Raymond (all of which were published in volumes xxiii and xxiv of the Transactions of the Institute, and subsequently in the special "Posepny Volume," issued by the Institute),; also, later, papers by Van Hise, Emmons, Weed, Lindgren, Vogt, Kemp, Blake, Rickard and others, and the discussion of these papers by De Launay, Beck and many others (all of which will be published in volumes xxx and xxxi); also a complete bibliography of the Institute papers and discussions on this subject from 1871 to the present time. The volume now in press will be an octavo of about 825 pages, bound in "book-linen." This book will be sent postpaid, for $5 to members or others who subscribe for it before its issue.

2. "The Evolution of Mine-Surveying Instruments." This will be a volume of about 400 pages, issued in the same style as the foregoing, and containing the original paper of Mr. Dunbar D. Scott on that subject (Transactions xxviii), first published in 1898, together with later papers continuing the same subject, and discussions thereof, by Hoskold, Lyman, Davis, and many others. Subscriptions will be received for this volume in advance of its issue at $3, under the conditions already stated above.

WATER RIGHTS IN ATLIN.

THE following resolutions were passed at a mass meeting of Atlin miners and forwarded to the government. We are not sufficiently conversant with the particulars to comment adequately upon the situation there, but so stringent resolutions passed by a representative body of miners point to something gravely amiss :

This is to certify that at a called meeting of the miners and merchants of Atlin district, held at McDonald's hall, in the town of Discovery, B. C., at which meeting William Queen was elected chairman, and Samuel L. Lovell was elected secretary, among others, the following proceedings were had, the within preamble and resolutions were read, and upon motion unanimously passed by the meeting.

Attending said meeting there were 93 persons.

WILLIAM QUEEN, Chairman.

(Attest) SAMUEL L. LOVELL, Secretary.

September 14th, 1901.

Whereas, the season for mining operations, during 1901, has been very short owing to the lateness of spring and the long period of unusually high water, and the majority of claims upon Pine creek and adjacent benches are in such condition that a stoppage of work means serious loss if not absolute ruin to the owners and a serious blow and setback to this camp :

Whereas, most of the claims can be operated only by water from the ditches and pipe lines of the Sunrise company :

Whereas, said company has endeavoured, in all its operations, to respect and abide by the law, and has honestly bought all property acquired and paid a reasonable price therefor, has respected every man's rights, exercised a liberal and accommodating spirit towards the miners, and shown a disposition to aid them in operating their claims in every reasonable manner. The company has now in operation six and one-half miles of ditch and flume, and one and one-fourth miles of large pipe conducting water at such elevation that

such claims, both bench and hill, on both sides of Pine creek for a distance of three miles east and west of Discovery can use same, and said claims can be worked from no other source. These lines have been constructed at great cost for labour and material, all of which was promptly and honestly paid for:

Whereas, the said Sunrise company, continuing business as the Pine Creek Power Company, has incorporated for the purpose of supplying water, and the certificate of such incorporation has been received by the Gold Commissioner, upon the filing of which the law makes it mandatory upon the Gold Commissioner to amend the water records to correspond with the powers conferred by said certificate. Therefore we view with surprise and alarm the following order wired to the Gold Commissioner by the Provincial Secretary, plainly commanding the Commissioner to disobey the law, to wit: "Until further orders do not alter or amend Ruffner's water records Nos. 38 and 45, nor permit water to be used for any purpose outside original grant:"

Whereas, we have reason to believe said order is an unlawful one, issued upon a misstatement of facts, a misunderstanding of the circumstances and of the hardships involved, and upon a misconception of the conditions which prevail in this camp:

And whereas, the appropriation and distribution of water as exercised by the Sunrise company neither interfered nor conflicted with the rights or honest intentions of any person, but on the contrary has been the means of operating the majority of claims worked this season, and with the closing of the headgates of said company nearly all work upon Pine creek is stopped, hundreds of men thrown out of employment, miners prevented from further working their claims and from cleaning up ground already worked:

Therefore, be it resolved, by the free miners of Atlin district in public meeting assembled, that we view with alarm the recent order closing the ditch of the Sunrise company as an act of oppression and an unwarranted and undeserved outrage not only upon the company which has invested large sums for the improvement and development of this camp, but also upon every inhabitant of this district. We condemn the policy of the authorities in acting upon statements without granting a proper hearing to the parties interested, and we request that the order in question be withdrawn and the Sunrise company, or its successor, be allowed to supply water to miners upon Pine creek, and to continue the use of said water in operating the property acquired by said company.

The following is the telegram sent to the Provincial Secretary:

"John C. Brown, Provincial Secretary, Victoria, B. C.

"Order to shut down Sunrise water places 100 miners in financial distress. Cannot water be turned on at once to finish work, which is of critical importance to involved miners? Sent by request of miners' mass meeting.

(Signed) "James Staples,
"Member for Cassiar."

NEW ZEALAND MINERALS CO.

THE Secretary of the New Zealand Minerals Co., owning the Whitewater and Enterprise mines, has issued the following circular to shareholders relating to those properties:

"I am pleased to be able to inform you that shipments of the ore in stock from the Whitewater mine have already recommenced, and work upon the mine is also expected to be resumed within the next week or so. Owing to the action of the American Smelter Trust, in practically boycotting all British Columbia silver ores from the end of last year, ore shipments ceased from that time. Full operations continued at the mine until about the middle of February, when the mill was shut down and only development work carried out. These developments have opened up fresh reserves of ore of a better quality than has hitherto been met with, during the history of the company, and now that shipments are being resumed it is expected that the mine will soon be replaced upon the dividend-paying basis so unfortunately interrupted at the end of last year by the smelter difficulty referred to above.

Shareholders will be aware that the shipments from the Enterprise mine have hitherto been restricted as far as possible pending the erection of a concentrating mill which the engineers reported was necessary in order to produce the best results and save the loss which would otherwise be entailed by hand-sorting the ore. It was impracticable to instal this plant during the winter months, but its erection has been pushed forward during this summer season, and it is expected the mill will be in running order within the next few weeks. During the interval considerable development work has been carried out in order that the mill may be kept continuously working after having once started. The engineers report very favorably as to the payable character of the ore opened up.

CARIBOO PLACERS.

MR. WM. WATSON, a Californian placer mining authority, contributes an interesting article to the *Inland Sentinel*, on the subject of the Cariboo Placers. We quote as follows:

"The alluvial placers differ in several particulars from those of California; the origin of the gold however, is the same, being derived from the extensive disintegration and erosion of the quartz veins and country rock of the surrounding country during Tertiary times.

The Tertiary drainage of California was largely obliterated by effusive lavas; the present drainage has removed the greater part of these lavas, and cut deep canyons below the level of the Tertiary streams. The placer mines in California are therefore of two distinctive types, commonly known as hill diggings, and river or creek diggings. The hill diggings are practically all remnants of the Tertiary drainage, though some high benches along the present streams of California might be classed as such. The gold contained in the river and creek diggings throughout California was mostly derived from the older Tertiary streams.

In Cariboo, the geologic history since the Tertiary is different. The present system of drainage, especially towards the heads of the streams, follows lines approximately identical with the Tertiary drainage. Since that period there has been a great silting up of the rivers and creeks by glacial and fluviatile agencies, burying to considerable depths the older auriferous gravels. The winning of these gravels is therefore essentially different to gravels of similar age in California.

So far as the writer's observations went no stream in the vicinity of Barkerville has been worked 20 miles from its source. The depth of the gold-bearing gravels, the amount of water to be raised, and the expense of the necessary machinery for their exploitation, all being

factors which produce the present inactivity along the deeper parts of these Cariboo streams.

On Slough creek some well planned efforts are being made to mine these gravels; should success follow, there is no doubt that many similar enterprises will be undertaken.

The combined length of these unworked deep placers is greatly in excess of the ground so far mined, and form a large and important field for future development.

With the exception of the Consolidated Cariboo Company, there are no large operating hydraulic mines within the Cariboo district.

From reports read by the writer, it appears that the South Fork of the Quesnelle river has cut through the base of the older Tertiary drainage, leaving the base of these gravels at a sufficient height for hydraulicing above the present river system.

The overlying strata consists of boulder clay and glacial gravels, whereas in California we have beds of pipeclay and volcanic ash and tufas, showing widely different causes for the extinction of these older streams.

Owing to the wide extent of glacial drift, quartz lodes are not easily found; it covers the hill slope from valley to summit, and except on steep slopes but little bedrock is exposed. Dense forests and undergrowth cover the mountain sides, and outside the roads and trails travel is well nigh impossible.

In [illegible]ning the attempts in British Columbia have [illegible]d failures, repeating the history of this form[illegible] other parts of the world.

The [illegible]ers of New Zealand were the first to master this method of mining, and where their methods are pursued in other countries success has followed. In the vicinity of Kamloops on the North Thompson, a well constructed dredger was nearing completion at the date of my visit. From what I heard of the character of the gravel bars and banks of that stream, the enterprise has every promise of success.

Large deposits of very similar gravels exist along the principal rivers of British Columbia. The future exploitation should be undertaken cautiously, the character, depth, and value should be determined with fair accuracy before dredgers are constructed.

Dredge mining under such conditions with proper management, becomes as stable an industry as manufacturing, with the great advantage of uniform value of the product.

In the deep placers of the creeks and rivers, and in the river banks and bars of the larger streams, a large field for future placer mining exists."

RECENT PUBLICATIONS.

The Canadian Mining Manual and Mining Companies' Year Book, 1901, Vol. xi. By B. T. A. Bell, editor *Canadian Mining Review*; secretary Canadian Mining Institute, etc.: Ottawa. Price $5 00.

MR. BELL, as the editor and publisher of two unique publications has earned, and continues to hold, the esteem and approbation of mining communities throughout Canada. The *Mining Review* is the only technical periodical published in the Dominion covering the whole field of Canadian mining from Atlantic to Pacific; the *Canadian Mining Manual* is the Canadian "Skinner," and the only complete company directory and reference work of its class published in this country. The present volume contains the usual mass of serviceable data respecting the history, organization, equipment and operations of the active Canadian mining and smelting companies, including accounts, balance sheets and reports for 1900. In an introductory statistical note, the editor casts doubt on the accuracy of the preliminary computation by the statistical branch of the Geological survey of the value of the mineral output of the Dominion during 1901, which estimated that $63,775,000 would represent that production. From returns received direct from the producers and from official figures published by the Provincial Departments of Mines, Mr. Bell considers that a valuation of $67,000,000 would be nearer the mark of amount, computed on the basis of the selling price of the minerals at the pit's mouth, the various Provinces contributed as follows:—

Yukon, N. W. T. and Manitoba,	$28,000,000
British Columbia,	16,344,751
Ontario	9,248,624
Quebec,	3,000,000
New Brunswick,	500,000
Nova Scotia,	10,000,000
Total,	$67,143,375

British Columbia showed the very substantial growth of 32 per cent., the total being $16,344,751, compared with $12,393,131 in 1899. A notable portion of this was in the production of coal and coke, in which the increase was respectively $400,000 and $225,000. The increase in the bullion produced from placer, hydraulic and lode mining was $530,000, and the silver $646,000. The most notable increase of all, however, was in lead, which grew to $2,691,000, an increase of 206 per cent. In copper the production was nearly 10,000,000 pounds an increase of 19 per cent.

The figures for the Yukon, showing a production of $25,300,000 in gold, indicate how rapid has been the growth of that territory's output, which was $2,500,000 in 1897; $10,000,000 in 1898, and $17,500,000 in 1899. The output of coal in Alberta was 321,000 tons, while gold mining on a small scale had been undertaken in some parts of Manitoba.

The figures of Ontario's output have been recently published, and need not here be repeated in detail. The total value was $9,298,000, an increase of $880,000, or 10 per cent. over 1899. There were 10,034 employees engaged, and the wages paid amounted to $3,336,000. Common brick led in value $1,379,000; illuminating oil came next $1,076,000; pig iron third, at $936,000, and nickel fourth, at $756,000.

The feature of mining in Quebec was the revival of the asbestos industry, in which the production was about $1,000,000, or one-third of the whole mineral output of the Province. A strong market, and a considerable advance in prices caused old mills that had been shut down for years to be reopened and re-equipped, and notwithstanding an increase of 25 per cent. in wages the labour market is still unable to cope with the requirements of the industry. The production of iron ore, charcoal, pig iron and steel, also increased.

The production of manganese and gypsum formed the most important feature of the somewhat limited mining enterprise in New Brunswick.

The feature of the Nova Scotia mining situation was the great production of coal and the smelting of iron by the two great concerns, the Dominion Iron & Steel Co. and the Nova Scotia Steel & Coal Co. The total output of coal was 3,238,000 tons, compared with 2,642,000 tons in 1809. The production of iron ore for the local furnaces is of growing importance, the Ferrona furnaces consuming 19,000 tons of the home product. The output of gold was 30,399 ounces, compared with 27,772 ounces the previous year.

The growth of the mining industry has meant an increased need for mining machinery. Canadian manu-

facturers are not as yet, of course, able to meet the varied demands in this direction, but they have shown their capacity to turn out good work, and are reaping the benefits of their enterprise. The records show that the value of the mining and smelting machinery imported during the year, under the free list, was $724,000, compared with $299,000 in 1899, $207,000 in 1898 and $128,000 in 1897.

Canadian Trade Index: A Classified Membership Directory of the Canadian Manufacturers Association. Toronto, Canada.

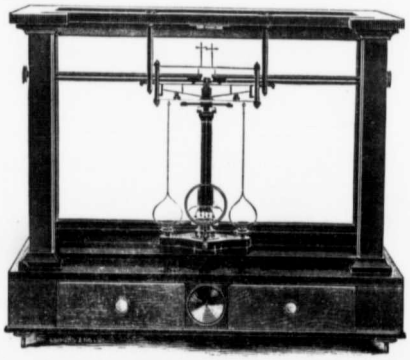
This work, of which fifteen thousand copies have been issued and many distributed gratuitously at the Glasgow and Pan-American exhibitions and elsewhere, is intended to convey some idea of the extent and importance of manufacturing in Canada. The association will be glad to forward copies to foreign buyers upon application being made to the secretary.

Annual Report of the Geological Survey of Canada: (New series), Vol. xi. King's Printer, Ottawa, 1901.

Included in this volume are reports A, D, F, G, L, M, R, S, of 1898, and comprise a summary report of the Geological Survey Department for the year 1898, by the Director; the geology and natural resources of the country traversed by the Yellow Head Pass route from Edmonton to Tete Jaune Cache, by James McEvoy; the geology of the west shore and islands of Lake Winnipeg, by D. B. Dowling, the east shore of Lake Winnipeg and adjacent parts of Manitoba and Keewatin, from notes of surveys by J. B. Tyrrell; the geology of the Three Rivers map sheet or northwestern sheet of the 'Eastern Townships' map, Quebec, by R. W. Ells; exploration of part of the south shore of Hudson strait and Ungava bay, by A. P. Low; exploration on the northern side of Hudson strait, by R. Bell; and reports by G. E. Hoffman and E. D. Ingall on the sections of chemistry and mineralogy, and of mineral statistics and mines, respectively.

A NEW SHORT-BEAM BALANCE.

OWING to the increasing demands for rapid and accurate work in assay offices, Wm. Ainsworth & Sons, of Denver, Colo., U. S. A., have just placed upon the market a button balance of superior design, with four-inch beam, which may operate faster and swings quicker than any balance now on the market.



FOUR-INCH BEAM BUTTON BALANCE.

The most important improvement is in the base which is extended on either side so as to include the pan-rest bearings, thus insuring their permanent alignment, together with that of the centre rod, and by removing the rider bar support screws and the two support screws the entire upper works may be removed for cleaning. The balance has a four-inch beam divided into fifty parts each side of the centre and unobstructed on the top, the rider may be placed at any point from zero at the centre to the last division at either end, which is directly over the end edge and represents the full weight of the rider used. An improved rider apparatus is provided, the slides being cushioned and German silver springs provided, which take up all wear. Special reading glasses are provided for the beam and index, all bearings and edges are of agate; has fall-away pan-rests and plate glass sub-base. The case is of thoroughly seasoned mahogany with counterpoised sliding door, which has been removed (in cut) to better illustrate the balance. All parts are made to gauge and ample provision made to take up any wear. This and other balances are illustrated in the firm's latest catalogue.

A very handsome special California edition of the *Pacific Coast Miner* has been published by the Calkins Bros. Publishing Co. of San Francisco. The issue is most profusely and handsomely illustrated and the letter press description of the mineral and other rich resources of the "Golden State" is most readable.

THE MONTH'S MINING.

BOUNDARY DISTRICT.

(From Our Own Correspondent.)

THE output of ore from the mines of Boundary district for nine months ended Sept. 30, was about 270,000 tons. As the average daily tonnage is about 1,000 tons it will be seen that, should no unforeseen contingency arise to interfere with the output, the aggregate for the year will be at least 360,000 tons. The probabilities are that higher figures will be reached, for with the completion of the additions now being made to the Granby Company's smelter, at Grand Forks, that company's mines will increase their daily output by 600 to 650 tons. It is likely that this output will date from some time in November, so that there is a prospect of 20,000 to 30,000 tons being added from this source alone to the total given above, in which case the year's tonnage will not be far short of 400,000 tons. There is still another prospective increase to take note of, viz., that to be provided for by the time the second furnace, ordered from the Allis-Chambers Company eight or ten weeks ago, shall have been installed at the British Columbia Copper Company's smelter at Greenwood. This additional furnace should also be ready for operation in November, but labor difficulties have so interfered with the carrying out of contracts by eastern manufacturers that it will be well to regard the doubling of the tonnage treated by this smelter as only possible rather than probable in time to add materially to the year's tonnage. If, though, this second furnace be ran even for one month of the current year, it will increase the total by fully 10,000 tons, for there is now plenty of ore available from the Mother Lode mine to keep it going. In placing the output of the district at 360,000 to 400,000 tons no account has been taken of the probability that other mines, notably the Snowshoe and Sunset and, to a smaller extent, the Winnipeg, will together add a few thousand tons to the year's total, so that the foregoing estimate may be well regarded as a conservative one.

THE OUTPUT.

The increase in the output, as stated above, over that of last year is very marked. During the first half of 1900 about 4,000 tons of ore were sent to the smelter at Trail. In August the first of the Granby smelter was blown in, and the second in October, by which latter month shipments had considerably increased, reaching for that month to between 17,000 and 18,000 tons. The output for the year was 97,781 tons—probably less than one-fourth of what this year's shipments will aggregate. Still last year's output made a gratifying showing, the gross value being—at New York prices for copper—not less than between $600,000 to $700,000. The value of this year's product will be between $2,000,000 and $3,000,000, gross, so that it may now be fairly claimed that the district has attained to an important position as a producer.

In contrast to the reckless assertions, relative to the number of shipping mines there are in the Boundary district repeatedly made by certain local correspondents, the writer has persistenfly adhered to the statement that there are as yet only three properties (regarding the Old Ironsides and Knob Hill group as one property) that may fairly be described as producers. In support of this contention it may here be pointed out that of the nearly 98,000 tons shipped in 1900 the Old Ironsides and Knob Hill group produced 64,500 tons, the B. C. 19,500 tons and the Mother Lode 5,500 tons, leaving a balance of only 8,000 tons—the exact figures were 8,188 tons—as the production for the year of all the remaining "shipping mines" the boomers made so much of. This year's figures show an even greater disproportion, for of the 270,000 tons given as the total output for five months to September 30, the proportion of the Old Ironsides and Knob Hill group is 168,000 tons, of the Mother Lode 64,000 tons, and of the B. C. 34,000 tons, leaving only 4,000 tons for the remaining properties. In justice to the district, though, it must be pointed out that the Snowshoe, Brooklyn and Stemwinder group, Sunset group, Morrison, Jewel, Winnipeg and several others, are likely to add considerably to next year's total output, their present tonnage, in two or three instances at any rate, being infinitesimal as compared with the quantity of ore blocked out or otherwise made available for shipment whenever suitable freight and treatment arrangements shall have been made. To induce mine owners to ship to smelters in which they have no profit-sharing interest, freight and treatment rates on low grade ores will have to be lower than they have heretofore been, otherwise, and until some more advantageous arrangement can be made for treatment, the ore will in large measure be kept in the mines.

THE PRODUCING MINES.

Deference is made above to the additions now being made to the two district smelters that have been in regular operation for some time past. The preparations for increasing the number of furnaces at the Granby Company's smelter, at Grand Forks, to four, and for putting in two copper converters, are well forward, but a delay has been caused by the non-arrival of the machinery. The recent settlement of the steel strike should, however, admit of the manufacturers completing the plant, which should shortly be received at the smelter. With four furnaces running the management anticipates being able to treat between twelve hundred and thirteen hundred tons of ore a day, and it is believed that the company's Old Ironsides, Knob Hill and Victoria mines will be able to supply that quantity daily if necessary, but with the completion of the Grand Forks and Republic railway there will be a lot of custom ore coming from Republic and neighbouring mines, and this together with a share of the Boundary custom ores, will easily keep the enlarged smelter supplied to its full capacity. The B. C Copper Company now has its Mother Lode mine in such shape that there is no concern felt as to a supply of ore for the Greenwood smelter, the capacity of which is now being increased to between 750 and 800 tons a day. More ore bins are being added for storage purposes and for convenience in handling the custom ores which are being received in increasing quantities. There is no progress to report in connection with the Standard Pyritic Company's smelter, which is now in the possession of the mortgagees. In the light of the relative positions of the B.C. Copper Company's smelter and the Pyritic smelter respectively to-day, the rash statements made last winter by boomers to the effect there was a race in progress between these two works and that the latter would likely be in operation as soon as the former, appear even more ridiculous than their romances about the "shipping mines." The quantity of ore treated to September 30 by the former company's smelter at Greenwood is about 80,000 tons, with additions being made to its treatment capacity. The Pyritic smelter has done nothing but expose the district to reproach, for the outside public, ignorant of the facts attendant upon the attempted establishment in the district of these experimental works, naturally assume that they have failed of their purpose, whilst the truth is they have not been even completed, nor has there been any attempt to start the furnace. It has lately been announced that Chicago capitalists are likely to buy the concern and put it in working order. There does not appear to be any good reason to doubt that this smelter can be run successfully, treating ores in the ordinary manner should the pyritic method not be found to suit local ores, but the enterprise will have to be placed in the charge of a thoroughly practical man who has had successful experience, and not be left to the almost certain failure that necessarily attends the efforts, however well meaning, of novices. Other smelter talk is that the Montreal and Boston Copper Company, owning the Sunset group, near Greenwood, intends to put up its own smelter, but at present this project is in embryo. The Snowflake Company may find it necessary to have its own smelter, but in view of the experience that operations on a large scale are necessary to make a mining and smelting enterprise distinctly successful in the Boundary district it is probable that this British company will take time ere it launches into an undertaking that will involve the expenditure of a large amount of money.

WORK AT THE SMELTERS.

The Snowshoe Company has thus far gone about its mining business in a thoroughly practical manner, doing good work, and extensively opening up the big body of ore that occurs on its Snowshoe property, so it may be expected to follow a similar business-like policy in dealing with the important question of making provision for the treatment of its ores so that a fair proportion of the profit coming from them may be retained by the company. People in the district seem to have given up prophesying, and guessing, too, for that matter, as to when the Dominion Copper Company, of Toronto, will erect a smelter, whilst its location is now regarded as much more problematical. Mr. James Breen's name has for the time lost its power as one to conjure by, so the newspapers no longer contain "the latest" information, as to that gentleman's intentions. And yet the district makes steady progress, notwithstanding.

The progress being made at the three chief producing mines of the district is in large measure indicated by the figures given above respecting their output of ore. The development of the Granby Company's group is in keeping with the increasing requirements of its smelter, work being extensive both above and below ground. The surface openings or quarries are contributing very materially to the output of this group of mines and will do so on a larger scale as calls shall be made upon the property to send out more ore. The B. C. Copper Company, too, is similarly preparing for an enlarged output, but for the time operations here will not equal in magnitude those at the Granby mines. This company's Mother Lode mine continues to fully justify the expectations of those who have found the money to develop it, the surface workings as well as the stopes at the 200 and 300-foot levels yielding large quantities of ore that can be treated at a profit. The B. C. Chartered Company's B. C. mine is being thoroughly prospected at its lowest level, the diamond drill still being used freely in exploring the ground.

Of the other mines not yet producing on so large a scale as those just mentioned the Snowshoe takes first place. The ore bodies are being so opened up, both below ground and by surface openings, as to make them accessible for maintaining regularly a considerable output so soon as the management shall have made suitable arrangements for the treatment of the ore. Facilities for shipping, such as chutes, ore bins, railway connections, etc., are being provided and mine buildings to accommodate 70 to 80 men are being erected. It is probable that before the year closes the Snowshoe will be among the larger shipping mines of the district. There is not much information obtainable respecting the Dominion Copper Company's Brooklyn and Stemwinder group, but it is known that the power plant is being added to and that development is being continued. The Winnipeg has attracted much notice of late, and apparently deservedly so. Development has been pushed with much energetic perseverance and the persistent efforts of the management have been rewarded by the discovery of two bodies of ore, the existence of which at the 300-foot level was not previously known, and now ore of excellent grade is being mined from what is known as the railway ledge. It is expected more information will be available shortly, and if so it will be given in next month's letter. The Golden Crown nas not yet resumed work. The R. Bell has suspended, and nothing has lately been made public as to what is to be done at the Blue Bell, lying near the B. C. The Jewel, in Long Lake camp, is still steadily at work, but no information of unusual importance has lately come from that very promising mine. The sinking of the shaft on the northeast ledge is being proceeded with, and crosscutting to endeavour to meet the ledge at 500 feet depth is being continued.

In Deadwood camp the Montreal and Boston Copper Company's Sunset and Crown Silver properties are being got into shape for regular shipping. Additions are being made to the power plant and ore bins, railway tracks and mine buildings are being put in. Following the lead of other mines, surface openings in ore are also being made. The Sunset group should ere long be in a position to maintain regular shipments. Not much is heard of the Morrison, but development work is in progress and the mine is receiving much more practical than newspaper attention. The King Solomon, in Copper camp, has commenced to send out some high-grade carbonate copper ore. The Ruby, in Smith's camp; the Lake, in Skylark camp, and the No. 7, in Central camp, are the only others that call for mention this month, all three being at work and promising to come into more prominent notice by and bye.

YMIR.

(From Our Own Correspondent.)

The extensive operations now proceeding in connection with the big cyanide plant in course of erection at the Ymir mine, is quite changing the aspect of the Wild Horse valley. A large acreage in this valley has been purchased by the Ymir Co. and the timber which was very plentiful has all been cut, making many thousand cords of wood. At the junction of the North Fork with the main Wild Horse creek a large track has been graded out on which the cyanide plant will be erected. The building covering the tanks will be 500 feet long. Besides this large building a number of other buildings and dwellings are in course of erection between the stamp mill and the cyaride works, so that the place has the appearance of a new town. The stamp mill is keeping up to its average of 200 tons per day, the last monthly returns indicating a net profit over and above expenses, of $26,600. This brings the total net profits for the present year to over $150,000. The long crosscut tunnel which is being run to tap the vein at the 1000-foot level is now in about 1500 feet, with 600 feet further to go.

CYANIDE PLANT AT THE YMIR.

The Chicago National Development Co., which recently acquired the Carthage group adjoining the Ymir mine, is doing considerable development work. Two tunnels are being run on the vein, and are now in 220 and 160 feet respectively. In the upper tunnel four feet of wet carbonate ore similar to the shipping ore from the Ymir has been exposed.

Much excitement has been caused by the discovery of a vein of free-milling ore of exceptional richness near the Port Rico Siding, four miles north of Ymir. The owners Messrs. Cole and Ditter, have made a shipment of a few tons of this rich rock to the Nelson smelter, and the returns showed a gross value for the ore of nearly $300 per ton. The property will be further developed by the owners who intend making periodical shipments of this rich ore to pay for the opening up of the property.

The mill at the Arlington mine has been concentrating some 30 tons of rock per day for the last month. The concentrates produced are of very high grade. At the present moment work is temporarily suspended, that the men may attend the funeral of the late foreman, who was last week the victim of a sad accident in one of the stopes of the mine. How the accident occurred is not exactly known, but it is supposed that the stope caved and Mr. R. Hamill, the foreman of the mine, and also another man were buried beneath the immense masses of rock. Mr. Hamill died shortly after he was extricated, but the other man, who is now in the Ymir hospital, is on a fair way to recovery.

The Ymir district is now a scene of considerable activity and there are hardly any men idle in the vicinity. Three important deals are now in course of recognition, with every prospect of being brought to a successful conclusion, whilst a number of foreign and local companies are energetically pushing development on their properties here, amongst the most important of which are the following:

The Golden Monarch Mining and Milling Co. of Spokane, which is developing the Fog Horn claim. Two tunnels are being run, the first, a crosscut now in nearly 450 feet, and the second, on the vein a distance of 150 feet.

The Silver Crown Consolidated Co. of Spokane, is running a crosscut on the Shiloh property, half a mile from the town. This tunnel which is now in 200 feet is calculated to be within a few feet of the vein.

The British Lion Syndicate of Owen Sound, Ontario, has let a contract for a 50-foot shaft on the Big Four group owned by it.

The Sunrise Mining and Dev. Co. of this town, is developing the Big Horn group. The crosscut tunnel has reached the vein at 320 feet, the vein proving very wide so that the farther wall has not yet been reached.

SLOCAN CITY MINING DIVISION.

(From Our Own Correspondent.)

This month has been a busy one in this division, and most of the reports that come to hand are quite rosy. The shipments for the year have reached 3,750 tons, carrying about $300,000 in values. Work is being actively prosecuted in all directions in order to be prepared for the coming winter, which is already showing signs of its early advent. The Arlington mines are working a large force in the building of bunk houses, superintendent's quarters and cottages for miners who have families. Underground about 70 men are kept constantly employed. The Black Prince will be worked all winter and the present intention of the owners is to drive a crosscut still lower down the hill into the big vein. The Enterprise mill is now ready for operation and we all hope to see the mine as profitable an undertaking as it was in its earlier stages. The Tamarac, Two Friends, Viking, Hampton, Kilo, Iron Horse and others will work crews all winter, and as they are all working on pay ore, should materially increase our shipping tonnage. The Slocan-Republic Co. have had a grade run for a sleigh road after a visit here from their president, two directors and their engineer. The general impression is that they will proceed with the development of the Republic group on a large scale. The month has witnessed considerable activity in leasing and bonding of mineral claims of which the most important are the Gatineau group, north of the Enterprise; the Erin group south of the Republic; the Peerless, on Republic mountain, all bonded at good figures. The Bondholder and the Old Exchange are being actively worked under leases. Taking the outlook as a whole prospects in this division are brighter than ever before.

SATISFACTORY CONDITIONS.

CATALOGUES, CIRCULARS AND TRADE NOTICES.

BRITISH MINING MACHINERY IN CANADA.

THE Hadfield's Steel Foundry Co., Ltd., of Sheffield, England, announce the appointment of Mr. Francis T. Peacock, of Montreal to their Canadian agency. The Company also issue a circular in which it is stated that they have exceptionally good experience in the production of the various classes of steel regularly required in collieries, mines, quarries, etc., etc., comprising wheels and axles. Haulage rollers and pulleys, etc. Stamper crusher castings, such as shoes and dies, etc. Wearing parts of crushers, such as jaw faces, side cheeks, etc., all of which are made of Hadfield's patent manganese steel. They also manufacture the most improved types of crushers, such as roll, gyrating and reciprocating crushers.

HYDRAULIC MINING MACHINERY.

A most interesting catalogue of hydraulic mining machinery is issued by Messrs. the Parke & Lacy Co. of San Francisco, in which attention is specially directed to the Campbell improved gravel elevator and the Simmons patented ball-bearing hydraulic giant. The Campbell elevator is already in use in British Columbia, and was described fully in a former issue of this periodical. The distribution of the water for an elevator plant is generally in the proportion of 60 per cent. of the available quantity for use in the elevator and 40 per cent. for use in the pit through the "giants." The character of the gravel and nature of the bank governs as to the quantity to be used in the pit and the grade of the bed-rock sluices. Where the ground is wet and has no natural drain, some form of pump must be used when making the excavation for the elevator pit to keep it freed from water until the elevator can be placed in position and the connections made; and when an elevator with a single upcast is used, a water lifter should be permanently installed for this purpose and to keep the pit free of water whenever it becomes necessary to stop the elevator to make repairs or to relieve it of obstructions.

In the double-jointed giants the ball-bearing is arranged in a groove under a flange surrounding the upturned end of the stationary, or supply pipe, and a grooved ring is bolted to the flange of the upper or movable section of the giant. The groove formed by the flange and movable ring is filled with hard iron, or steel balls, forming a rolling contact between the movable section, arranged around the upturned end of the supply pipe which takes the vertical or upward thrust due to the pressure, as well as the end thrust due to the spouting force of the water. The pressure of the water is distributed upon thirty-seven balls in the No. 1, or 7-inch giant, and a proportionately larger number in other sizes. A free space is left between the stationary pipe and the movable elbow to prevent contact of any surfaces but the ball-bearing. The packing is in the same form as in the old style double-jointed giants. By arranging the ball-bearing in this manner, the inventor aimed, successfully, to dispense with the obstructing king bolt, which, being in the centre of the pipe, is an impediment to the flow of water, and catches all stringy material passing through the pipe. The ball-bearing being on the inside of the ring, is completely protected from sand and grit. Another improvement is the strengthening of the swivel bearing of the nozzle pipe. In place of the screw and lock nut, heretofore used, a steel pin is provided which passes through the rim of the swivel plate and into the side of the ball. The other end of the pin is riveted to a steel plate which is bolted to the side of the giant, thus giving a support to both ends of the swivel pin, increasing its strength more than six times without increasing its size and avoiding the danger of the lock nut coming loose. Owing to the shape and position of these ball-bearings in the giants, they can be made of sheet steel riveted in sections, making a saving in weight of from 50 to 75 per cent. over cast iron or cast steel giants, as usually constructed.

We would refer our readers desiring a fuller description of these appliances to Messrs. Parke & Lacy, who will be glad to forward the catalogue referred to upon application. The catalogue in addition to containing an account of hydraulic mining machinery manufactured by this establishment, includes some very excellent tables, such as "volumes of water required for effective use in operating hydraulic giants," a table for calculating the horse-power of water; for calculating the flow of water through clean iron pipes per second; a table showing friction of water in pipes; a table for calculating the additional head required to overcome the resistance of one circular bend, and others equally useful.

HORIZONTAL TUBULAR BOILERS FOR BRICK SETTING.

The Jenckes Machine Co. of Sherbrooke, Quebec, have just issued a Bulletin No. 112, (1st Edition, 1901), entitled "Horizontal Tubular Boilers." This is a very comprehensive catalogue containing much information on the subject of boilers, tables and plans, directions for erecting and operating pumps, a chapter on the cost of boilers, on feeding boilers and other information of a practical character.

ELECTRIC LOCOMOTIVES.

Catalogue No. 18, issued by the Jeffrey Manufacturing Co. of Columbus, Ohio, contains upwards of thirty large plates illustrating various types of Jeffrey locomotives, ranging in weight from two to twenty tons, equipped with one, two or three motors. The "Standard" locomotive is arranged so that the motorneer is seated in the centre, protected from injury by the frame of the engine, but the Company also manufacture another style in which the motorneer is seated at the end. The former is, however, recommended. In this catalogue no attempt has been made to give detailed specifications nor to enlarge upon the advantage of using electric locomotives, but complete specifications and guarantees will be furnished on application.

JACKSON ROCK DRILLS.

Mr. H. D. Crippen, manufacturer of the Jackson Hand Power Rock Drill, has just issued a new descriptive Catalogue (No. 14). There is, however, little alteration from the catalogue of these drills to which reference wss made in these columns a month or so since.

THE VAN DER NAILLEN SCHOOL OF ENGINEERING.

We have received from this well-known San Francisco School, established in 1864, a pamphlet describing the different courses open to students. These include, surveying, civil engineering, mining engineering, assaying and metallurgical practice, electrical engineering, hydraulics and architecture.

PATENT OFFICE REPORT.

MR. ROWLAND BRITTAIN, patent attorney, Vancouver, sends the following report from the Canadian Patent Office Record for June, which has just been issued. During the month 440 patents were issued, of which number four were to British Columbians :

F. W. Nolte, Victoria, sound producer.

W. E. Vanstone, Westminster, water-tube steam boiler.

R. Sanderson, Nelson, rotary engine, and by assignment from the inventor, F. L. Webster, Messrs. J. and R. McNair have obtained a patent on a method of suspending a sliding gate or door, which facilitates very much the opening and closing of the same, as it can be operated from the roadway by the driver of an approaching team. The hanging sheaves of the gate run on over-head tracks, which are so inclined that on the gate being pulled half open by an external lever or rope, it travels the remaining distance to open or shut, down the opposite incline of the track. The gate has been in use for some little time, both here and in New Westminster, and has, I am informed, given every satisfaction, and the name of the present holders of the patent is a guarantee that what is done with it will be done well.

MINING RETURNS AND STATISTICS.

THE KLONDIKE YIELD.

GOLD export certificates obtained at the Gold Commissioner's office at Dawson to August 31st, show that during the month of August gold to the value of, approximately, $3,000,000 was shipped. The total gold shipments from Dawson to the outside world since the first of June have amounted to $18,643,000. The shipments in May before the law went into effect requiring the issuance of export certificates, would probably raise the total to near $19,000,000.

The shipments from Dawson each of the summer months were as follows :

June	$ 5,918,000
July	9,725,000
August	3,000,000
Total	$18,643,000

The final shipments of the seasou will likely not exceed those of last season, and it is thought because of this being the last opportunity of the summer to get out, and about the last month to start by steamer, that many who have held off to spend the summer in the Klondike may now come out with gold enough to swell the total to far more than what it is. Mr. Dufferin Patullo, chief clerk in the gold office, estimates the season's total at $20,000,000, but there are some who feel that it will probably be larger. The shipments ftom Dawson do not represent all going from the territory. The Forty-Mile, Big Salmon and other Mining Recorders' offices in Yukon are also recording shipments passing through.

ROSSLAND.

The mine managers' report on the Rossland Great Western Mines for the months ending May 31 and June 30th gives the total tonnage of ore shipped from the mine for May amounted to 2,824.456 dry tons of 2,000 lbs. each, having an average assay value of $10.52 per ton ; the tonnage for June amounted to 303.329 dry tons, having an average assay value of $13.20 per ton. The ore produced during the last two months, as above stated, came from various openings and stopes made on the vein on the 200-ft., 300-ft., 460-ft. and 600-ft. levels. So far, the ore bodies occurring in the vein have not been sufficiently developed to afford rellable data for estimating the extent and value of the ore bodies. The developments made on the vein on the 600-ft. level show the most extensive body of ore in any of the mine workings. This body has an average width of 30 feet, and carries ore of shipping grade from wall to wall. A winze is being sunk on the vein from the 400-ft. level from which to develop the ore shoot at intermediate points between the 400-ft. and 600-ft. levels. This has reached a depth of 132 feet on the dip of the vein. When connected with the 600-ft. level the ore shoot can be rapidly be developed, drained, and the workings ventilated.

Gross value in the 2,825.456 dry tons shipped to the Northport smelter for the month ended May 31 :

817.140 oz. gold	at $20.00	=	$16,202.80, or	$5.74 per ton.
1,865.110 oz. silver	at 0.60	=	1,119.66, or	0.39 "
75,238 lb. copper	at 0.16½	=	12,414.27, or	4.39 "
Making total gross value			$29,736.73	
or the average value per ton				$10,52

Gross value in the 393.329 dry tons shipped to the Northport smelter for the month ended June 30.

12.339 oz. gold	at $20.00	=	$2,406.78, or	$6.12 per ton.
358.490 oz. silver	at 0.60	=	203.09 or	0.22 "
15,369 lb. copper	at 0.16½	=	2,480.43, or	6.56 "
Making total gross value			$5,090.30	
or the average value per ton				$13.20

The following table gives the monthly production from this district during 1901 to date, as compared with the shipments last year :

	1901. Tons.	1900. Tons.	Increase Tons.
Shipments for January (revised)	30,894	24,933	5,061
" February "	26,778	6,060	19.818
" March "	34,172	279	33.893
" April "	40,160	6,834	31,296
" May (estimated)	47,000	25,704	31,296
" June "	32,000	17,161	14,839
" July "	6,000	17,396	*11,399
" August "	1,000	19,417	*17,456
" Sept'r "	6,500	24,830	*18,330

The total production from Rossland for the nine months ending September 30th is approximately 225,000 tons.

BOUNDARY DISTRICT.

The following table, extracted from the Phoenix *Pioneer*, gives the ore shipments from Boundary district during 1900, and the 1901 production to September 21st, inclusive :

	1900	Week.	1901	Totals.
Old Ironsides, Knob Hill and Victoria	64,533	4,440	160,890	125,429
B. C. Mine	19,494	420	33,380	52,880
Golden Crown	2,500	....	....	2,500
Winnipeg	1,075	180	435	1,750
Athelstan	1,200	....	550	1,750
Snowshoe	300	180	655	1,055
Brooklyn	150	....	....	150
R. Bell	....	....	....	560
Total tons	89,252	5,220	196,476	285,879
Mother Lode, Deadwood	5,340	1,536	59,435	74,715
Sunset, Deadwood	....	....	300	300
No. 7, Central	....	35	715	715
King Solomon, Copper	....	90	140	140
Other Boundary mines	3,180	....	500	3,680
Grand totals, tons	97,772	6,881	257,566	355,349

SLOCAN.

The shipments from the Slocan district for the nine months ending September 30th, aggregate. aproximately, 18,000 tons, of which over 4,000 tons have been contributed from Slocan Lake division. The value of this year's output to date from Slocan lake is placed at about $300,000.

THE COAST.

Shipments continue to be regularly made from the Lenora mine, Mt. Sicker district, at the rate of 70 to 80 tons daily. The Tyee Co. also made a first shipment in September of 200 tons to the Tacoma smelter. The Marble Bay mine, Texada Island, is also producing steadily, sending out about 1,000 tons monthly.

KAMLOOPS.

Dredging operations were commenced on the North Thompson river towards the end of September, and from a first clean-up after a four days run 32 ounces of gold at $544 were received. The operating expenses of the dredger are estimated at $40 per diem.

CARIBOO.

The second clean-up at the Cariboo Hydraulic mine is placed at approximately $35,000.

EAST KOOTENAY.

Production is at present restricted to the North Star mine, which is shipping about 50 tons daily.

LONDON CABLEGRAMS.

YMIR.—The following cablegram has been received from the company's representative at Nelson, British Columbia :—" During last

month 80 stamps ran 706 hours (29 days 10 hours). Estimated profit on operating is $26,900 (£5,480).

LE ROI.—The manager cables:—"Smelter treated 10,500 tons of ore during month of August. Estimated value $150,000, matte shipped $130,000. We are now shipping 80 tons per day dump ore to the smelting works at Trail. Expect to have plenty of men within two weeks from this date to commence shipments from the mine."

HALL MINING AND SMELTING CO.—Output of smelting ore from the Silver King for four-weekly period ending 26th August, 2,586 tons, averaging 21.62 ounces silver and 4.75 per cent. copper.

KOOTENAY MINING COMPANY MANAGER'S REPORT.

The following is the Mine Manager's report on development work to June 30th:

"On assuming charge of this property as General Manager in December, 1899, I found the vein had been developed by five adit tunnels, known as Nos. 2, 3, 4, 5 and 6. These were driven on the vein for various lengths, ranging from 260 feet up to 1,200 feet. The vein being wide, these tunnels were driven within it, without any attempt being made to locate the ore bodies. However, in Nos. 2, 3 and 4 tunnels good ore is exposed. In No. 3 tunnel considerable stoping has been done by the original owners, and the openings made exposed a very extensive body of ore. A general sampling of this ore body, however, showed that, taken as a whole, it was low grade, my average samples indicating that an average value of $9 per ton would be about the average grade of the ore if stoped out in its entirety. At this time the Le Roi smelter at Northport had not sufficient capacity to handle any ore in addition to that produced by the Le Roi mine. The custom rates charged at Trail and elsewhere would have left no margin of profit over the cost of mining and smelting. Owing to these conditions, it was decided that the vein should be developed to considerable depth in the hope of finding higher grade ore bodies, on the downward extension of the ore body already developed. Accordingly, in No. 6 tunnel, which is driven on the vein at a depth of 600 feet below its outcrop, at a point about 1,000 feet from its portal, a station was cut, and a three-compartment shaft sunk on the vein. It was hoped that the vein, which had been practically vertical from its outcrop down to the No. 6 tunnel, would at some point immediately below this tunnel, assume the regular dip of the other veins in the camp, in which event it was expected that as soon as it would do this a higher grade of ore would make in it. The shaft, however, had been sunk to the vertical depth of 600 feet, for which depth it continued in vein matter, which showed no signs of assuming the normal dip of pay-ore shoots elsewhere in the camp. However, at the bottom this shaft had attained a depth of 1,200 feet below the outcrop of the vein, it was decided to prospect the vein thoroughly to this depth without going any deeper. Therefore stations were cut in the shaft at depths of 400 feet and 600 feet below No. 6 tunnel, and drives have been started along the vein at these levels. In order to prospect the vein thoroughly, it is the intention to continue these tunnels westward in the vein, crosscutting to both walls at intervals of 200 feet, to locate whatever pay-ore bodies exist in the vein. The Spokane Falls and Northern Railway Company is prepared to extend a branch line to the mouth of the No. 6 tunnel as soon as we have sufficient ore in sight, and of such grade as will warrant the commencement of regular shipments. Having no smelting facilities for the treatment of this ore to date, the work of blocking out the ore bodies occurring in Nos. 3 and 4 tunnels, and preparing them for stoping has been postponed to allow the concentration of the mining force on deeper development, which has been carried on in the vertical shaft and the workings therefrom.

"Character and extent of workings:—Tunnelling and driving, 7,280 feet; crosscutting, 2,155 feet; raising, 1,199 feet; shafting, 600 feet; total, 11,234 feet.

"In detail these workings are classed as follows: No. 2 adit tunnel drive — Tunnelling 270 feet. No. 3 adit tunnel drive — Tunnelling, 1,590 feet; crosscutting, 470 feet; raising, 241 feet. No. 4 adit tunnel drive—Tunnelling, 1,920 feet; crosscutting, 540 feet; raising, 340 feet. No. 5 adit tunnel drive — Tunnelling, 1,280 feet; crosscutting 270 feet; raising 288 feet. No. 6 adit tunnel drive — Tunnelling, 1,680 feet; crosscutting, 875 feet; raising, 340 feet. Below No. 6 adit tunnel—three-compartment shaft—600 feet. 400-ft. level below No. 6 adit tunnel—Driving, 370 feet. 600-ft. level, below No. 6 adit tunnel—Driving, 170 feet; total, 11,234 feet.

"I regret to report that the result, so far, of the development work above described, has not been as encouraging as expected. It is hoped that the downward continuation of the ore bodies developed in the upper levels will be found in the deeper workings, and since the westward extension of the 600-ft level in the vertical shaft should cut the downward continuation or the ore shoots at the depth of 1200 feet below the outcrop of the vein on the surface, the ore body found at this depth would show sufficient dimensions to warrant an output at the rate of 1,200 to 1,500 tons daily, on which basis a small per tonnage profit would mean a large profiit in the aggregate. If in position to guarantee an output of this kind, the Company could secure favourable rates for transportation and for smelting, and the profit on the ore correspondingly increased. At the present time, the development, although extensive, has not reached a stage sufficient to warrant me in speaking with the degree of confidence I would like on the probability of finding the ore hoped for. Nevertheless, it is quite probable that the downward continuation of the large body of pay ore already developed in the upper workings will be found in the deeper levels when extended farther to the westward. If the ore shoot is developed in the deeper workings the mine will be in shape to begin a large and regular output; but until such time as the ore shoots are thus developed, it would not be possible to make rates for the mining and transportation of the ore from the property that would leave any considerable profit to the Company."

THE KITCHENER HEMATITE ORES.

WE are indebted to Mr. William Blakemore for the following analyses made at the Canadian Smelting Works laboratory, Trail, of samples of hematite iron ores from the occurrences at Kitchener, the acquisition of which by a Montreal syndicate has occassioned much interest.

Assays of Hematite iron ore, samples from Kitchener, B.C., made at the Canadian Smelter, Trail.

Claim.	Iron.	Silica.	Sulp.	Phos.
Rhodesia	60.52	..	..	.03
Rhodesia	24.2	63.2	..	.
Cynic	56.2	17.2	0.15	.01
Dakota	52.4	23.5	trace.	..
Rhodesia	36.1	46.8	.05	..
Dakota	56.3	16.7	trace.	.
Rhodesia	34.0	50.0	.05	..
Atlantic	47.2	30.1	.04	..
Idaho	64.0	6.2	.08	..
Cymric	45.4	33.0	trace.	..
Maple Leaf	64.0	6.2	.05	..
Rhodesia	58.5	11.8	.05	..
Dakota	52.3	23.5	.15	.02
Agnes	52.6	12.0	.03	nil
Niagara	59.4	12.6	.08	nil
Union Jack	44.5	35.0	.02	.02
Maple Leaf	64.0	5.7	.01	.06
Golden Cap	64.0	6.0	.03	.02
Union Jack	48.4	30.6	.03	.03
Rhodesia	32.4	52.4	.15	nil
Orey	62.3	5.6	.03	trace
Golden Flag	52.0	26.0	.03	nil
Maple Leaf	66.4	2.2	.07	trace
Maple Leaf	62.7	6.0	.05	.03
	1258.18	521.3	1.15	
Average	52.4	22.6	.05	.018
WHITE IRON.				
South	45.0	32.0	..	..
Idaho	43.8	33.8	1.21	.02
Idaho	43.5	33.0	1.17	.02
NOTE—The twelve best samples give:				
	61.4	8.6	.05	.010
Other samples gave	66.2	1.6	.03	nil
	66.7	1.0	.03	nil
	92.8	6.6	.04	nil

THE METAL MARKET.

THE market during the month has been nearly featureless, prices fluctuating within very narrow limits. Silver remains fairly stationary at from 58 1-8 to 58⅜c. in New York. The average price of silver last month was 58.37.

COPPER

The consumption of copper in the United States continues good while the demand from abroad has also lately improved. American manufacturing are sold well ahead with finished material, and there is a disposition to cover copper requirements for some time to come. Lake copper is quoted in New York at from 16½ @ 16⅝, electrolytic in cakes, bars or ingots, 16¼; calliodes, 16, and casting copper. 15¾. The New York *Engineering and Mining Journal*, commenting on the discussion occasioned by the publication of a statement that the United Metals Selling Company was carrying extraordinarily large stocks of copper, which must sooner or later come on the market and break prices, remarks that it does not appear that this statement is made on any competent authority, or that any special importance should be attached to it. The United Company necessarily carries at all times large stocks, both in course of refining and ready for shipment. The quantity varies from time to time, but does not appear to be at present unusually large, nor has there been any accumulation of copper which need excite

apprehension. As a matter of fact, the report has had no effect on prices, as will be seen from our statement above. At the present time it is pretty well understood that there are no differences between the large sellers here and abroad The price of refined copper in London remains very steady as shown by our reports.

LEAD.

Lead has been quiet during the month prices remaining practically unchanged at 4.27½ @ 4.32½ St. Louis and 4.32½ @ 4.37½ New York. London quotations have ranged from £12.58.

SPELTER.

The demand for spelter has lately improved somewhat and prices are slightly higher. The latest quotations are 3.90 St. Louis, 4.05, New York.

COAL EXPORTATIONS.

THE foreign coal shipments from the Vancouver Island collieries for the seven months ending Sept'r 1st aggregate 636,413 tons. The shipments in September were divided as follows:

New Vancouver Coal Co	37,051
Union	2,659
Ladysmith	18,429
Total	58,139

1500 tons of coke were also shipped from the Union colliery during the month to San Francisco. For the three weeks ending the 20th September, the New Vancouver Coal Co., exported 19,197 tons to Mexico, Alaska and Californian ports.

The total amount of coke imported by San Francisco, in 1900, was 41,771 tons against 31,091 tons in 1890. Fully 50 per cent. of this came direct from the United Kingdom by sailing vessels, and over 6,000 tons were received from Comox, in British Columbia. It is difficult to estimate the quantity received by rail, as it does not pass through this city, but delivered direct to the consumers at interior points.

THE LOCAL STOCK MARKET—SEPTEMBER.

CONDITIONS during the month have been fairly satisfactory, although there is little change in the general situation. Rossland has now become the most important market for local British Columbia mining shares, dealings in Toronto and Montreal having practically ceased. It will necessarily be some time before confidence among eastern investors is restored. In the west business has been quiet, but the market on the whole has shown greater strength. The decline of Cariboo McKinney and Cariboo Hydraulic, two of the best speculative securities locally listed, was most unexpected, and so far as the former is concerned somewhat inexplicable, as reports from the mine continue to be favourable, consequently a recovery in the near future may be expected. Touching Cariboo Hydraulic, however, the fall in the shares is explained by the disappointing results of the season's operations, the reason of which is referred to elsewhere in this issue. But although the quotations are affected, very few, if any shares are obtainable at present prices. The majority of the stock is in comparative few hands and none of the large holders are disposed to throw stock on the market. There can be no doubt that this confidence in the great potential value of the property is fully justified. Centre Star, which early in the month was firm at from 32 to 33, has since suddenly advanced to 48, probably in anticipation of the speedy settlement of the Rossland strike. Crow's Nest quotations remain unchanged at $80 asked, $62 bid. No transactions are reported. Noble Five continues fairly steady at from 9 to 10, the reported strike on the Maud E. claim having as yet failed to affect the market. Should the Last Chance vein be encountered as is expected in the next few days, a material advance in this stock may be looked for. Payne is firm at 15, large holders in the east having recently been heavy buyers. According to the report of the manager, prospects at the mine are brightening Rambler-Cariboo has slightly weakened in the last few weeks, but there are few offerings. The only other features during September, was the advance in Winnipeg which gained 5 points. The property is reported to be in better condition than at any previous period.