

The Mining Record

VOL. X.

JULY, 1903.

No. 7

BRITISH COLUMBIA MINING RECORD

Devoted to the Mining Interests of the Pacific Northwest.

PUBLISHED BY

THE BRITISH COLUMBIA RECORD, LIMITED

H. MORTIMER LAMB, Managing Editor.

Victoria, B. C., Office, Province Building,
Vancouver, P. W. Charleson, Hastings St.
London Office: 24 Coleman Street, E. C. C.
Denver, Col.: National Advertising Co.
San Francisco: Duke's Agency.

SUBSCRIPTION TERMS:

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

Advertising Rates on Application.

Address all communications to

THE MANAGING EDITOR, B. C. RECORD, LTD.,

P. O. Drawer 645, Victoria, B. C.

COMPULSORY ARBITRATION OF INDUSTRIAL DISPUTES IN NEW ZEALAND.

PUBLIC opinion with regard to the merits of the legal method of adjusting industrial disputes differs vastly in Great Britain and America on the one hand, and Australia and New Zealand on the other. In America especially the principle of compulsory arbitration is scarcely looked upon with favour either by employers or workers. It is true that arbitration to a certain extent is recommended by both sides, yet neither the one nor the other seem willing to forego, in the interests of the general public, the power of forcing a strike or lock-out, as the case may be, by according support to measures embodying this principle. But in the Australasian Colonies the principle of compulsory arbitration is more fully recognized and agreed upon. Perhaps, of all the measures introduced in a Colonial Parliament the most interesting and important, both from the point of view of the student of economics and of the practical politician, is the Industrial Conciliation and Arbitration Act of New Zealand. In this age, when labour problems, owing to the strenuousness of modern commercial conditions, are rapidly assuming an importance and a significance which they have attained at no previous period in the world's history, it is deeply interesting to watch the result of an experiment made in a British Colony

with a view to the establishment of amicable relations between capital and labour, and the abolition of trade disputes in the shape of strikes and lockouts. It is neither possible, nor desirable, in an article of this description to explain the operation of the law in detail. It is only our intention at present to bring to the notice of our readers a few of the more salient features of the statute in question in the belief that any information upon a matter so important will prove of interest.

The disastrous strike of 1890, which left the industries of New Zealand in a disorganized condition, brought prominently before all classes of the community the urgent need of reform in matters affecting general labour. Naturally enough, bearing in mind the inconvenience and distress caused by former labour disturbances, the people decided that the arbitration of industrial disputes was a subject worthy of deep consideration. It was mainly due to the efforts of the Honourable W. P. Reeves, Minister of Labour, that action took the form of the introduction of the principle of compulsory arbitration. The first measure of this nature was introduced in the Legislature of the Colony by Mr. Reeves in 1892. It was carried in the lower chamber but suffered defeat in the Legislative Council. It was again introduced in 1893 and met a similar fate. The measure was brought down for the third time in 1894, when, the fact being recognized that the people as a rule sanctioned its passage, the opposition in the Council subsided and it duly became law. The Act was amended in 1895, 1896 and 1898, and was consolidated and revised in 1900. The law as revised in 1900 was amended in some particulars in the following year.

The chief features of the law are the provisions relating to industrial unions of workers and employers and to the formation of a Court of Arbitration and Boards of Conciliation, and the power given under the Act to the former to fix a minimum wage in the trades in which disputes arise.

In the first place it will be noticed that the Act does not recognize unorganized labour, and it provides that before workers can take advantage of the law they must be registered as industrial unions. This provision was adopted in order to prevent the working of the Act being jeopardized, as might happen should important privileges be granted to a minority. It was therefore considered advisable to place all on the same footing, and the workers were permitted to form new unions or register under the Act ones already in existence. In the case of employers any two persons, and in the case of workers, any seven can form a union, which, provided certain rules are complied with, may be registered, and then becomes for the purpose of the Act a body corporate. In order to prevent the need-

less multiplication of industrial unions connected with the same industry in the same locality, the Registrar may refuse to register a union when in his opinion there is no necessity for it. From his decision, however, there may be an appeal to the Court of Arbitration. Unions when duly registered are subject to the jurisdiction given by the Act, and for the purposes of the Act, every industrial union may be sued. Under section 21 of the Act, any council or other body, however designated, representing not less than two industrial unions of the one industry, of either employers or workers, may be registered as an industrial association of employers or workers as the case may be. It appears that while workers have more or less generally taken advantage of the provisions, employers are somewhat backward in doing so. At first many of them, probably most of them, ignored the Act and took little part in electing their representatives on the Boards, and in consequence the Government was obliged to exercise its right of appointing men to fill the vacant places.

It will thus be seen that in order to take advantage of the law it is necessary that industrial unions of workers must be formed so that business before Boards of Conciliation and the Court of Arbitration may be facilitated. Unorganized labour only indirectly receives benefit from the Act.

New Zealand is divided into certain industrial districts which are determined by the Governor and given such names and boundaries as may be convenient. For every industrial district a Clerk of Awards is appointed whose duty it is to convene the Board for the purpose of dealing with any industrial dispute within his district, and to take charge of all applications which may be lodged for reference to the Board or Court, and generally to do all things and to take all proceedings as may be prescribed by the Act or the regulations under the same, or as the Court, the Board, or the Registrar may direct. In every industrial district there is established a Board of Conciliation and this Board has jurisdiction for the settlement of any dispute which may arise, and which may be referred to the Board. The Board of each district consists of an equal number of persons, of whom the members are elected by the respective industrial unions of employers and of workers, the unions voting separately and electing an equal number of members. After an election a meeting is held, and, by a majority of the votes of the members present, some impartial person who is willing to act, not being one of their number, is chosen as chairman of the Board.

The parties to all disputes must in every case be industrial unions or industrial associations, or employers, but the mention of the various kinds of parties shall not be deemed to interfere with any arrangement that may be necessary to insure the industrial dispute being brought in a complete state before the Board; and a party may be removed or joined at any time before the final report or recommendation of a Board is made. When an industrial dispute occurs an application by one or more of the unions is filed with the Clerk which is submitted to the Board at the meeting convened for that purpose. An employer may conduct his case in

person, or by his agent, but no counsel is allowed to appear without the express consent of all parties to the reference. The Board is bound to carefully and expeditiously enquire into all matters brought before it, and it has the power to summon witnesses, administer oaths, and to compel evidence to be received and heard. It is expressly laid down in the Act that in the course of an enquiry a Board should make suggestions and do all in its power to induce the parties to come to a fair and amicable settlement of the dispute, and if it is deemed advisable the proceedings may be adjourned for a reasonable period in order to allow the parties to agree upon some terms of settlement. The Board may also, if it thinks fit, refer the dispute to a committee of its members, consisting of an equal number of representatives of employers and workers, when such a committee may be expected to facilitate and promote an amicable arrangement. If a settlement of the dispute is arrived at it is set forth in what is termed an industrial agreement, which, before it has the force of law, must be duly executed by all the parties. If an industrial agreement is duly executed and filed, the Board then reports to the Clerk of Awards that the dispute has been settled. If, the agreement is not executed the Board is permitted to make such recommendations for the settlement of the matter in dispute according to merits and substantial justice of the case. A recommendation must deal with each item of the dispute and state in plain terms, avoiding as far as possible all technicalities what, in the Board's opinion, should or should not be done by the respective parties. A recommendation must also state the period during which the proposed settlement should continue in force, being in no case less than six months nor more than three years, and as well the date from which it commences, which must not be sooner than one month, nor later than three months, after the date of the recommendation.

If all or any of the parties to the reference are willing to accept the recommendation of a Board, either as a whole or with modifications, they may at any time before the dispute is referred to the Court, either execute or file an industrial agreement, or file in the office of the Clerk a memorandum of settlement. If the memorandum of settlement should be duly executed, the recommendation, with the modifications, operates and is enforceable in the same manner as an industrial agreement duly executed by all parties. At any time before the recommendation of the Board is filed, the parties to the reference may agree to accept the finding and then the Board's recommendation has the same force and effect as an industrial agreement which has been executed by all parties. In the event of an industrial dispute not being settled by the Board, any of the parties may at any time within one month after the filing of the recommendation refer the dispute to the Court of Arbitration for settlement. If at the expiration of one month no application has been filed the Board's recommendation becomes or has the same force and effect as a duly executed industrial agreement.

An industrial agreement may be entered into by unions and employers, without recourse to either a

Board of Conciliation or the Court of Arbitration, and all the provisions of such an agreement must be strictly adhered to by all parties. If either side refuses to observe its terms the matter may be referred to the Court of Arbitration, and this tribunal has the power to enforce the carrying out of all agreements properly executed in the same manner as it enforces its own awards or decrees.

The Court of Arbitration, upon which almost entirely depends the successful carrying out of the law, is appointed by the Governor and is composed of three members, one selected from persons recommended by the industrial unions of workers, and one chosen from those recommended by the employers. The President or the Court, however, must always be a Judge of the Supreme Court of the Colony, taking part in the ordinary work of that dignified and impartial tribunal. As no little depends upon the character and ability of the presiding officer, the success which has crowned the effects of the Court to adjudicate fairly upon the many difficult matters which have been brought before it reflects the greatest credit on the broad-minded and impartial manner in which these high officers have discharged their important duties. Indeed, the Colony has been exceedingly fortunate in the men whom it has placed in this difficult position.

The Court is for the whole of New Zealand and meets in different places, after due notice has been given, to consider such cases as may be right for hearing. In the event of neither parties to a reference to a Board of Conciliation agreeing to the recommendation made by such Board, the matter, after certain things have been done in the prescribed manner, may be referred to the Court for adjudication. The procedure is simple as the Act especially provides against technicalities of all descriptions, and neither side are allowed to employ counsel unless all parties to the dispute expressly agree thereto. The power of the Court is absolute in its jurisdiction, and it may alter an award, or add parties thereto, or impose penalties in accordance with the provisions of the Act, as may be deemed fit and proper. No other Court in the land has the power to interfere in any way whatsoever. One authority has remarked that no other Court in the whole Empire possesses such remarkable powers as the Court of Arbitration of New Zealand. It is, in fact, unique. And if its powers and authority are remarkable, its responsibilities are equally great. When it is remembered that this Court is continually called upon to pronounce judgment with regard to the most delicate points affecting capital and labour, some idea of its onerous duties and responsibilities may be formed. If in the opinion of the Court or a Board it is necessary that expert evidence should be given in any case that may be before either the one or the other, either has the power under the Act to appoint experts to give advice upon technical points. One of these experts must be acceptable to the industrial union or unions interested, and one is appointed upon the recommendation of the party or parties whose interests are with the employers. In this way the Court is placed in a position to acquire full and accurate knowledge of all the points in dispute.

It was confidently expected by the framer of the measure that fully ninety per cent. of the cases arising would be settled by the Board of Conciliation, but these anticipations have not been realized. It may be said that the majority of the recommendations are carried on appeal to the Court of Arbitration whose verdict is final and binding on all parties for a term not exceeding three years. If at the end of the period during which an award of the Court has been in force, no new arrangement has been entered into by the parties, the award holds good until the matter has again been considered and a new order made, and thus in the interim a strike or a lockout is prevented. If an award or order is not carried out in the manner prescribed, the party aggrieved has the right to appeal to the Court in order that the offender may be forced to comply, and the Court has the right not only to enforce its awards but to fine those persons who may endeavour to avoid their obligations.

During the period that the Act has been in force, from 1894 up to the present time, New Zealand has been more or less prosperous, and as a consequence the awards have been generally in favour of the workers, and this fact perhaps accounts to a great extent for the popularity of the law in the Colony. If the times had been hard, and trade and commerce had declined rather than expanded, if the Court had been obliged to lower wages instead of raising them, a considerable amount of friction and irritation might have been caused. Fortunately for the Colony, however, the Court as a rule has been enabled to order an increase of wages with the natural result that the law is not looked upon by the workers with distrust but rather held in high esteem. They are quite prepared to place full confidence in it and to abide by its decisions. Without personal knowledge of the practical working of the Act, it is somewhat hard to say just how smoothly the machinery runs. We know that while the workers seem to be more or less satisfied with it, the employers on the other hand cannot be said to be unanimously in its favour. If recent press reports may be relied upon it would appear that perfect harmony does not prevail, as some of the employers in the Colony, so it has been reported, have stated that it is impossible to carry on their business in the face of certain awards made by the Court, in consequence of which they claim it is cheaper to import goods than to manufacture them. If such is the case, there are evidently troubles ahead, for if the law in doing away with labour disturbances, should also prevent the influx of capital, and cause the various manufacturing concerns to languish, it is not difficult to imagine what the outcome must be. Perhaps it may be as well to await the arrival of authentic reports before too hastily assuming that the law in reality is not a success. So far as the prevention of strikes is concerned, the Act has no power over labour that is not duly organized, but as it takes only seven persons to form an industrial union that may be registered as such and read the benefits accruing from organization, it can be easily understood that the law must be a living force. In an indirect way, but none the less efficacious because indirect, unorganized labour is benefited by the Act.

If an industrial union of workers in any trade should obtain a favourable verdict from the Court, the employers are bound to treat all of their employees in the same manner; that is to say, that should a union obtain a verdict increasing wages, the employer would also be obliged to pay such of his workers as might not belong to any union a similar amount. If this were not the case an employer might easily avoid the order of the Court by employing only unorganized labour. In this connection it must also be remembered that the Court has the power to decide whether an employer should engage union or non-union workers. In some of the awards, when it has been ascertained that the number of union workers is sufficient to meet all demands in a certain district, employers in that district have been ordered to engage only members of a union; in other cases when it has been proved that the number of union men may be insufficient or that it has long been the custom in a particular locality to show no preference, one way or the other, it is optional with the employers as to the men they employ. But it is always distinctly understood that a man shall under no circumstances be debarred from employment merely on account of the fact that he is a member of a union. The Act is designed to encourage organization among workers, as it is considered in New Zealand that it is easier to deal with a properly constituted union than with individuals, and therefore it would certainly be an anomalous condition of affairs were the fact that a man was a member of the union allowed to work to his disadvantage.

In 1901 the Government of New South Wales commissioned Mr. Alfred Paxton Backhouse, a Judge of one of the district courts, to enquire into and report upon the operation of the Compulsory Conciliation and Arbitration laws in force in New Zealand and the various states of the Commonwealth of Australia. Judge Backhouse presented an exceedingly able and valuable report as the result of his enquiries, and his remarks have been widely quoted. Upon this report the Government of New South Wales founded their Industrial Arbitration Act of 1901. This Act follows closely the New Zealand law with the exception that the Boards of Conciliation have been eliminated from the scheme, and disputes are referred at once to the Court of Arbitration, whose award is final.

With reference to the industrial legislation of the various states of the Commonwealth of Australia and of the Colony of New Zealand, it is not an easy matter to come to a definite conclusion with regard thereto without personal observation of the machinery in operation, as opinions differ greatly concerning the working and effectiveness of this class of legislation. For instance, as far as we have been able to gather, public opinion is somewhat divided with respect to the Industrial Conciliation and Arbitration Act of New Zealand. The friends of the measure claim that it has prevented strikes and lockouts and performed good work in bringing about stability in industrial affairs. On the other hand its opponents have urged that while the Act undoubtedly prevents labour disturbances assuming the form of strikes, it also to a certain extent stifles enterprise. Fortunately for New Zealand since

1894, the year in which the Act came into force, the Colony has been generally prosperous, and in consequence conditions have been most favourable for the enforcement of the law. It is natural enough that the worker should take advantage of these favourable conditions and demand increased pay. The decisions of the Court of Arbitration have mostly been in favour of the unions, and this perhaps is not surprising when it is remembered that owing to the general prosperity of the country it is more than likely that wages would in any event have been augmented. With regard to this point, Judge Backhouse in his report remarks as follows: "My hope is that depression may be far distant, but when lean years come, as come they must, unless the world's history leads us to a wrong conclusion as to the future, when there will be curtailment instead of expansion, when wages will be cut down, instead of being raised, by the award; then, and not till then, can anyone speak with authority as to whether the principle involved is workable."

It perhaps may be deduced from these remarks that the Act is still in an experimental stage. It would not be well to overlook the fact, however, that the law has now been in operation for some eight years, and that the people as a whole appear to be satisfied with the results attained. There is another point worthy of consideration, and that is the fact that New Zealand is an island colony, possessing the power to enforce customs duties for the protection of its industries, and therefore less likely to be affected by outside competition than either the states of the Commonwealth of Australia or the Provinces of the Dominion of Canada should they enact similar laws. In view of these facts it is likely that the New South Wales Act will afford the student of economics and the statesman a better field for observation, as this State, being an integral portion of the Commonwealth, will be subject to competition from the States of Victoria, South Australia and Queensland, in the same manner as manufacturers of British Columbia are obliged to compete with the manufacturers of Ontario where the conditions that prevail are entirely different from those that obtain in this Western Province. From the foregoing it may be gathered that while a law of this nature may be successful in a country like New Zealand, it does not necessarily follow that it would meet with equal success in all lands. In an article on the Act of New South Wales, which appeared in the *National Review* of August, 1902, the Honourable B. R. Wise, Attorney-General for that State, remarks: "Framed thus in the light of New Zealand experience, and applied to a community of fuller industrial development and less isolated than New Zealand, the New South Wales Act may be regarded as a crucial experiment which should enable a decisive answer to be given as to the practicability and benefits of the legal method of settling industrial disputes. The measure, moreover, was conducted by its framer through both Houses of Parliament without material alteration, and expresses the ideas on which it rests with a rigid and logical completeness which is rare in an Act of Parliament. If such a measure fails in New South Wales, it is safe to say that no measure, having the same object, is likely

to succeed elsewhere; while if, on the other hand, it succeed in giving confidence to capital and higher wages and improved conditions to the wage earners, such a success, in a country with varied industries and in active competition with other Australian states, cannot be ignored by publicists in other lands."

Apart from all other considerations the compulsory arbitration law of New Zealand is of peculiar interest to the people of British Columbia in that in certain particulars the conditions existing in the former country are not altogether dissimilar to those that exist in this Province. In New Zealand, as in British Columbia, gold and coal mining are extensively carried on and many of the disputes which are referred to the Court of Arbitration arise in connection with the working of the mines of the Colony. As we know, the mining operations of this Province in the past have not been entirely free from labour troubles, though fortunately they are much less frequent here than in other countries. Both the gold miners and the coal miners of New Zealand have had, on several occasions, differences of opinion with their employers and as a result several important cases have been carried to the Court and awards have been made which are strictly enforced. Not so many months ago a dispute arose between the Waikato coal miners and the Taupiri Coal Mines, Limited, and the Union Collieries. As the various parties were unable to agree to a settlement, or execute an industrial agreement, satisfactory to all concerned, the matter was referred to the Court. After both sides had presented their case, and witnesses had been examined, on the 28th day of February, 1903, Mr. Justice Cooper, President of the Court, handed down his decision. All the points in the dispute were treated separately and altogether there were forty-two sections in the schedule which was drawn up in connection with the settlement, the provisions of which are binding on both the employers and workers concerned. A brief examination of this award, which is not exceptionally long, shows that great care is exercised in preparing the details. Hours of labour, cavilling, trucking, yardage rates, tonnage rates, laying roads and sharpening tools, wet work, and numerous other matters are referred to and disposed of in clear and concise paragraphs. Section 9 settles the minimum wage to be paid certain underground workers and reads as follows:—

MINIMUM WAGE FOR OTHER UNDERGROUND WORKERS.

9. Miners, 9s. per shift; road-men, 8s. 6d. per shift; bankers-off, 8s. per shift; onsetters, 8s. per shift; horse drivers, 7s. per day. Youths up to the age of seventeen years employed as horse drivers, or for any other class of work not coming within Clause 8 hereof, shall be paid from 4s. to 6s. per day, according to experience and ability.

In this connection it should be stated, however, that Section 25 provides that if a worker is from any cause unable to earn the minimum wage for any class of work for which he may desire employment, such worker may be employed at a lesser rate to be agreed upon by the representatives of the union and the mine manager. In this way incompetent men are prevented from re-

ceiving as high a wage as first class workers. Section 31 is of great interest and importance as it settles the question as to the right of the companies in question to employ union or non-union men. With regard to this point the President of the Court, in giving his reasons for the award, remarks that as preference has been given to the Coal Miners' Union throughout the Colony, there is no special reason for exempting this particular district and accordingly preference of employment is given to the union. This section is of such general interest that, although it is somewhat long, we cannot refrain from quoting it in full:—

PREFERENCE.

31.* So long as the rules of the union shall permit any person of good character and sober habits now employed in a coal mine in this industrial district, and any other person now residing or who may hereafter reside in this industrial district who is of good character and sober habits, and who is a competent worker, to become a member of the union upon payment of an entrance fee not exceeding 5s., and of subsequent contributions, whether payable weekly or not, not exceeding 6d. per week, upon the written application of the person so desiring to join the union, without ballot or other election, then and in such case employers shall employ members of the union in preference to non-members, provided that there are members of the union equally qualified with non-members to perform the particular work required to be done, and ready and willing to undertake it. This clause shall not apply to the employment of casual labour above ground.

It will be seen, then, that the right of the union to demand employment for their members over the heads of non-union workers is qualified by certain provisions which are made so as to prevent these organizations from becoming close corporations. Under certain conditions the members of a union have the prior right of employment, but on the other hand the unions are enjoined from limiting their membership to a favoured few. Section 32 sets forth that the union shall keep at a convenient place, an employment book in which is to be entered the names and exact addresses of all members who, for the time being, are out of employment, together with a description of the class of work in which each is proficient and certain other information. The employment book must be open to the inspection of the company, and if the union fail to keep it the company may employ any persons they please whether members of the union or not.

In the foregoing remarks, we have endeavoured to give in an impartial manner some idea of the working of the Act, and without making restrictions one way or the other. In other words, it has only been attempted to give a few details which may assist those who may be interested in the matter of compulsory arbitration in industrial disputes. In a short article it is not possible to make everything plain, but we trust that these words may make for a clearer conception of the merits and demerits of the legal method of adjusting labour troubles. The question has in no sense been approached in a partizan spirit, but solely

with the idea to give our readers a little information regarding a law which is as remarkable as it is important.

THE VANCOUVER POWER COMPANY'S INSTALLATION.

WE publish this month an interesting description of the installation by the Vancouver Power Company of the new transmission plant at Coquitlam. That, in the opinion of the first engineering authorities of America the conditions are sufficiently favourable to admit of the undertaking proving profit-earning from the start, unmistakably attests to the rapid industrial growth of Vancouver in recent years, and it is not too much to predict that with the present rate of progress in this regard, at no very distant date, the Power Company will find no difficulty in disposing of full thirty thousand horse-power, which is the limit of development at present contemplated. From an engineering point of view the undertaking *per se* is not of an unusual character for there are several transmission plants on the Pacific Coast more notable in respect to size and distance of transmission. But the installation is nevertheless remarkable in that the adopted standards of engineering practice have been departed from in more than one important regard, with a view to affording both economy and increased efficiency of operation. The first of these innovations is the junction of Trout and Coquitlam Lakes by means of a tunnel two and a half miles long through a mountain four thousand feet high in order to use the lakes conjointly and to discharge the larger one through the smaller. In criticizing this plan our contemporary, the *Electrical World and Engineer*, suggests that ordinary sound practice would dictate merely the electrical union of the powers. That, naturally, would appear to be the obvious mode of procedure under ordinary circumstances. But the circumstances are not ordinary. In the establishment of a power plant the first requisite is that the service should be uninterruptedly continuous. This could not have been assured had ordinary methods as suggested been followed, for the reason that the hillside round which it would have been necessary to flume is composed of loose, constantly sliding rock, nor are the topographical features of the country favourable to the latter plan. The tunnel, on the other hand, although an expensive item in the first instance, insures absolute continuity of service, while the subsequent cost of maintenance will be practically *nil*. As an additional prevention to guard against interruption of service, it may here be added, that two independent transmission lines, each consisting of two 3-wire circuits are being provided.

Meanwhile it has also been suggested that save under severe compulsion the crossing of navigable waters by a cable span is not advisable. But we fail to quite follow this contention. At many mines in the Province we have aerial rope-ways having spans as great as that contemplated in this case and also equal to the duty of carrying loaded buckets of ore, but the Van-

couver Power Company's cable is required to support only its own weight, and is elevated at such a height above the water as not to interfere in any way with navigation. A further interesting feature of this plant is the combination of needle valve and deflecting nozzle in the regulation of the water wheels, for the introduction of which credit is due to the engineer of the B. C. Electric Railway Company. This clever idea was first practically applied in connection with the Goldstream power plant, and has given the most satisfactory results in the conservation of economy in respect to increased hydraulic efficiency needed. From tests made by Goldstream by means of a weir in the tailrace, with a view to determining the actual all-day hydraulic efficiency of the plant, it was found that the saving of water amounted to twenty per cent. In the descriptive article published elsewhere in this issue reference is made to several other matters of interest, which renders their further discussion here therefore unnecessary, but it may be pointed out that the installation of the transformers, high-voltage switches and lightning arresters in a separate building from the generators, and the substitution of the rather dangerous oil for air-blast transformers, serves to minimize the risk of loss by fire. The plant, it is expected, will be in operation by December of this year, sufficient power being then available for present needs; but the completion of the tunnel and the consequent full development of the Coquitlam water power can hardly take place under two years' time.

In conclusion we desire to congratulate the Vancouver Power Company on the promising nature of its enterprise, and furthermore on the fact that the practical working out of the scheme is in such capable hands.

THE CAMERA AS AN AID TO THE GEOLOGIST AND ENGINEER.

IN a recent issue of the *Amateur Photographer* (London) Mr. G. C. Lewis writes interestingly on the aid photography affords to the geologist. Within the last few years, he informs us, a committee of the British Association has been collecting geological photographs of typical rock exposures, and a fine collection of these now lies at the Geological Museum in Jermyn Street, London, where they may be consulted at any time. In our own country the Canadian Geological Survey has also recognized the advantage of obtaining photographic records in the field, and the reports thus illustrated have in consequence gained much in value and interest. Mining and civil engineers too are beginning to appreciate what valuable assistance the camera is capable of giving them in their work. If, for example, a report is to be made of a mine for a prospective purchaser, what a deal of explanation and description may be avoided, and the facts so much more clearly brought home, by a set of photographs showing, we shall say, the topography of the country, the exact situation of the mine, possible mill or smelter sites, ore exposures, the trend of the vein, flashlights of underground workings and of the

many other details which in such a report would be discussed. Again for the engineer in charge of operations photography offers the same aid—only perhaps more so. Only the other day the writer was shown by a well-known consulting engineer in Vancouver a very remarkable report photographically illustrated, which is issued regularly to the directors in serial form. The first issue made its appearance about a year ago, and contained three or four photographs showing Nature in her virgin garb, that is, as we are accustomed to view her in the pine-clad mountain solitudes of the Pacific slope. Then in subsequent numbers a change began to be apparent. Through that seemingly impassable swamp a corduroy road is built, the photograph showing the mode of construction: then what in an earlier picture had been represented as an impenetrable forest of cedar and pine, in a later view of the same locality these trees have disappeared, and in their place is a great clearing through which a tramway conveying supplies has been built. And so on, as the work progresses, so are photographs taken: the arrival of machinery, its installation; the laying of foundations for a building, the completion of the structure; early beginnings of dam-building, and behold, a few weeks later is an actual record of the finished dam doing the duty for which it was built. The report already makes a bulky volume, and the author will not for two years yet be able to write "finis" thereto. It is meanwhile one of the most interesting of "serials," and none the less because three-fourths of its bulk consists of photographs—technically excellent bromides, most tastefully mounted and notwithstanding the strictly utilitarian purpose for which the views were taken, not a few of them possess distinctly pictorial characteristics. In displaying this work, of which our friend the engineer is not a little proud, he remarked, that as a very busy man he found photography a great time saver. He no longer requires to write very long-winded reports in order that the directors of his company in England may fully understand the situation, the reason for erecting a building here, or running a pipe-line there—with a few explanatory notes the photographs answer that purpose, or rather they go one better, for without an actual knowledge of the ground, it is not always easy to follow the whys and wherefores, whereas the views make all clear.

In Mr. Lewis' article to which we have referred, much stress is laid on the necessity of securing strong, crisp negatives in geological record work. Isochromatic plates, a small stop, exact focussing and the exactly correct exposure are suggested as essentials, and in respect to the last mentioned requisite we would strongly recommend the use of an actinometer as minimizing the danger of failures from incorrect timing. Mr. Lewis also makes a sensible suggestion in that it is always advisable in photographing geological sections to include some figure or give a scale which will serve as an indicator of the actual size.

The "Coal Mines Act," C. A. 1888, c. 83, s. 1. or "An Act to Encourage Coal Mining," contains the following important section:—

12. Notwithstanding anything in any Act contained, it shall be lawful to grant licenses to prospect for coal over reserved lands, but such licenses shall be subject to such restrictions, conditions and regulations as may be imposed by the Lieutenant-Governor in Council. 1891, c. 15, s. 16.

If this section means anything it means that there is nothing to prevent the location of and the granting of title to coal lands on Government reserves, except under a condition which applies only to surface rights. The phrase "it shall be lawful" is interpreted by the courts as signifying "must," that being the judgment of Lord Cairns in a celebrated case of *Julius v. the Bishop of Oxford*. Thus the only possible ambiguity of wording in the clause is removed. The late Government, however, thought fit to adopt the extraordinary and quite inexcusable course of refusing absolutely to accept applications in respect to coal prospecting licenses for lands located in certain reserved areas in East Kootenay, which it was proposed should be granted to the C. P. R. as part of the C. & W. subsidy in lieu of relatively worthless lands through which their railway is built. It has been contended by some that the Government are not only justified but well advised in reserving a portion of the valuable East Kootenay areas in which coal is known to largely occur, in order that the means would not be lacking to hold in check or successfully combat any attempt of the Crow's Nest Pass Company to take undue advantage of its monopolistic opportunities to discriminate unfairly against British Columbian consumers. But while there is much to be said in favour of this contention, there is also always a right and a wrong way of carrying out a policy on these lines if contemplated, and surely it does not look well, to say the least, to find the Legislature of the country practically acquiescing in a violation of the statutes, which in this case they certainly appear to have done. The Act from which we have quoted may not be a good Act; as a matter of fact it is not. It might be advantageously amended in many important particulars. The area, for example, that may be acquired under it is a great deal too large, more especially as regards the location of petroleum lands. But all that is beside the point. The Act is on the statute books, and until it is changed it is the law of the land, and should be observed as such. We submit that those who have complied with the requirements and applied in perfect good faith for licenses to prospect for coal and petroleum in the East Kootenay reserves have every right to expect and demand that satisfactory title be granted them, subject only to such restrictions as the Lieutenant-Governor in council has the authority to impose.

It appears, meanwhile, that a large proportion of those applying for coal lands in these areas are not bona fide prospectors, but Spokane speculators and brokers, who see here a magnificent opportunity to enrich themselves at a modicum of difficulty or risk. It is urged that this is in itself a sufficient reason for the reservation of the lands in question. Had the Legislature, looking at the matter from this point of view, passed a special Act to prevent the acquisition of these

lands by alien speculators, such action would have received no criticism but very likely have been applauded. But no such Act was passed, and the question remains whether the country is justified in now ignoring obligations which by a recognized ethical standard could not positively be disregarded by honourable men in private life in their dealings with one another. If between individuals a contract is entered into, and one of the parties subsequently discovers that he has made a foolish bargain, would he be less bound to the performance of his part of the agreement? We deplore as much as anyone the possibility of these valuable coal areas passing into the hands of alien speculators, but why particularize in this special instance. Is this not the system we have long adopted? Is nationality or calling a bar to acquisition of and speculation in agricultural or mineral lands, or for that matter, coal lands in other sections of the Province? True there are special circumstances to be considered in the present case. It is vitally important that the undeveloped coal areas in East Kootenay should be worked in order to create healthy conditions of competition in respect to Kootenay fuel supply and to avoid the evils which are already apparent from the enjoyment by one corporation of a monopoly in those fields. This, we admit, would be a strong argument, if there were room for argument in the matter; but even as things stand, it may afford those who advocate the non-removal of the reservation, some consolation to remember, that the Lieutenant-Governor in council has power to enforce "restrictions, conditions and regulations" on those to whom licenses are granted, and further, past experience goes to prove that "Spokane speculators" played no inconsiderable part in promoting the development of and inducing investment in the metalliferous mines of Kootenay. As long as we have some reasonable assurance that the coal areas will be opened up—and if they are really valuable, they certainly won't be allowed to remain idle—does it really matter to the Province as a whole, into whose hands they pass in the first instance?

The reported rich discovery of gold quartz on Poplar Creek in the Lardo-Duncan, some forty miles distant from Kaslo, has occasioned the greatest possible excitement and interest, and has resulted in a rush to locate claims in that section. While, of course, it is impossible to form any conclusions from the mere fact that a small seam of phenomenally rich ore has been opened up on a single claim, there is every reason to hope that this section, which has long been known to be highly auriferous, will not prove disappointing. The opening up of new and rich gold areas in the Province at the present juncture would undoubtedly have a most stimulating effect on the industry as a whole, and we shall eagerly await further information and developments.

It is interesting to learn on the authority of Mr. John Stanton, the eminent copper statistician, who with other directors of the Granby Company, visited

the mines this month, that even should the price of the metal fall as low as seven cents per pound, operation of the Phoenix properties might still be profitably continued. Such a statement is most reassuring, and at the same time is a high encomium on the economic and efficient methods of mining and smelting there employed. Referring especially to this point Mr. Stanton remarked: "I have visited a great many mining camps during the past half century, and nowhere have I seen superior methods in vogue. I was not prepared to see such a state of affairs in existence outside of the United States. * * * W. Yolen Williams, the mine manager, and A. B. W. Hodges, the smelter superintendent, have respectively solved the mining and metallurgical problems in an eminently satisfactory manner."

Mr. Stanton further added that higher results as regards tonnage per man per shift was obtained by the Granby company than by the Michigan mines.

In a report to the acting Minister of the Interior, dealing with the subject of the recent rock slide at Turtle Mountain, Messrs. McConnell and Brock, of the staff of the Geological Survey, after showing that to the solidity alone of a shoulder of the mountain running east from the north peak, the town of Frank was saved from entire annihilation, state that further danger is apprehended from the fissures which extend behind and further to the west of the north peak, as the breaking away of the central portion of the mountain is continuing; and it is suggested that these northern fissures should be closely watched, and the town evacuated on the first indication of slipping in of the fissures back of the face of the north peak. The report thus concludes: "The fracture zone, surrounding the old break is bound to fall away, but whether it falls away gradually and in comparatively harmless blocks, or in large destructive masses, depends upon future conditions which cannot be foretold. The town of Frank might possibly exist on its present site uninjured for ages, but there will always be the possibility of a second havoc-bringing slide. The fact that the threatening shoulder withstood the first slide is no proof that it is too solid to fall. The same conditions exist on the north peak and shoulder to-day as obtained on the central before it fell away. A succession of seasons with unusually heavy temperature, a slight earthquake shock, which is by no means an impossibility, or the closing of the chambers in the mine, after the coal has been drawn, perhaps after the inhabitants have lost all dread of the mountain, may give the impulse which would dislodge this mass and start it on a career of destruction." Since this possibility must always overhang the town, it would seem advisable to move it a short distance up the valley, beyond reach of danger.

In addition to the letters we print this month dealing with local smelting charges on lead ores, we have received several other communications from mine operators, which are either marked "confidential" or if not so marked contain information which is evi-

dently not intended for publication. We have, however, sought permission of these correspondents to publish these communications in part, particularly as several take the view that the local smelters could well afford to reduce existing rates. The grounds for objection appear to be (1) That the smelters discriminate unfairly in the case of certain mines; (2) that a charge of \$20 per ton freight to London is dishonestly exorbitant, as the product, it is alleged, is not sold in London but in the States; (3) the basis of a ninety-day settlement is objectionable, and is not exacted by American smelters. A correspondent further states that he understands that the mines in the Lardeau Camp, shipping over the C. P. R., are taxed more heavily than those of the Slocan, the smelter only returning to them 90 per cent. of the silver values, and adds: "I do not think that the local smelters can handle our lead ores successfully until they have refineries and protection on the products." This last contention contains, to our mind, the kernel of the whole matter. After studying the evidence we conclude that under existing conditions the local smelting rates are not unreasonably high for they admit of ores being treated in the Province as cheaply as in the States; but if the industry were in a flourishing condition, and production was such as to justify the enlargement of the local smelters, and the building of refineries in conjunction therewith, then a general reduction of rates might be fairly insisted upon. The conditions at the moment are not conducive to the successful operation of lead mines in the Province, or to an increased output. The outlook, indeed, is distinctly unsatisfactory and discouraging and is likely to remain so, unless the Dominion Government can be brought to realize the stringency of the case, and accord to the industry a measure of protection and assistance commensurate with its requirements.

In an interview published in a Nelson paper, Mr. Mathys, the managing director of the Payne, is reported to have said:—

"I see by a Coast publication that our finances are supposed to be exhausted, and that we may call upon our shareholders for an assessment. This would of course mean a reconstruction of the company, as all our shares are paid up and non-assessable, and I can assure you that the matter has never been even thought of by the directors. There has never been any necessity for such a thing at any time, and just now we have practically made all our expenditures, and certainly do not propose to reconstruct; the idea is preposterous. We are not buying or selling stock, and are quite independent of the stock market, but such a statement as the one I refer to is likely to damage the whole Slocan section, and I do not hesitate to contradict it."

Mr. Mathys' remarks have reference to an editorial paragraph in the last issue of the MINING RECORD, in which it was suggested that the company having, according to the published balance sheet, exhausted its cash resources, a reconstruction might be necessary unless the mine in future proved self-supporting. We

are very glad indeed to receive the assurance which, however, is somewhat superfluous, that the prospects at the mine are so promising; but with all due deference to Mr. Mathys there was certainly nothing preposterous in the remark, that judging from recent expenditures, more money might be required for development purposes, and that, consequently there being no funds still available, a reconstruction might be necessary to provide them, assuming always the mine earnings were insufficient for the purpose. It is hardly necessary to add that in suggesting a possible reconstruction of the company we had not, as Mr. Mathys appears to imagine, the remotest intention of speaking disparagingly of the property, which is, we are well aware, in a more satisfactory condition today than for some years past.

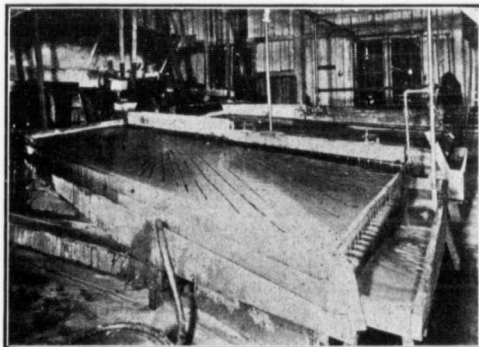
"Resources" is the suggestive title of a new monthly publication issued in Montreal, Quebec, a copy of the first number—that for the month of June—of which has been received. Its aims and intentions are stated in its introductory article, from which the following excerpt has been made:—"Hitherto, in order to gain a knowledge of the vast developed and undeveloped resources of the Dominion of Canada and the Crown Colony of Newfoundland, one was forced to peruse numberless industrial and other magazines and government publications, as well as all the leading newspapers of the country. 'Resources' will be a great time saver along these lines, putting before its readers only such items as have been proven or can be readily authenticated, giving an unbiased and well-balanced presentation of industrial and live news from each province and territory, and forming in itself a harmonious mosaic of the whole of British North America." Following some general Dominion notes each of the several provinces and territories of Canada, and the Colony of Newfoundland, has attention under its own headline. It is evident, though, that in this initial number "Resources" has fallen short of its very commendable stated intention to put before its readers "only such items as have been proven or can be readily authenticated." For instance, under the heading "British Columbia" the following items are included: (1) "It would be difficult to indicate any defined section of British Columbia in which gold or silver has not been, or will not be, found. Until a comparatively recent date the work was practically all placer mining, a mere scratching of the surface, and yet over \$63,000,000 have been scraped out of the rivers and creeks." In regard to this it may be noted that whilst it is true that the total value of the yield of placer gold to the end of 1902 was officially given as \$64,627,683 (of which \$48,648,834 was obtained to the end of 1880) the aggregate value of all other minerals produced was \$122,218,926, in the following proportions: Lode gold, \$22,049,732; silver, \$18,475,882; lead, \$10,447,521; copper, \$12,256,219; coal and coke, \$58,989,572. Further, the returns from placer gold during twenty years 1881-1900 were \$13,935,609; from lode mines (gold, silver, lead and copper), \$24,784,146, and from coal and coke, \$42,953,763. Another mis-

leading statement is that a conservative estimate of the gold and silver production of British Columbia during the year 1902, exclusive of the Atlin district, shows a total production of \$11,516,000, whereas the actual production, as shown by official figures, including Atlin's production of placer gold, \$400,000, was \$7,902,737. Then there are absurd statements relative to the erection of coke ovens at Midway in connection with the Ashnola smelter, and the expected finding of an unlimited supply of coking coal surpassing that of the Crow's Nest Pass, on the North Fork of Kettle River within 50 miles of Grand Forks," which are simply emanations from the over-vivid imaginations of certain well-known "hot air" boosters of the schemes concerned. These gross mis-statements certainly are not of the kind that "have been proven or can be readily authenticated," so that if they are a fair sample of the news "Resources" will continue to supply its readers the sooner it shall cease publication the better. On the other hand, if it will use care and discrim-

machine drills supply the mill and only about 20 miners are employed including muckers and timbermen. The ore is hoisted from the different levels in a self-dumping skip which deposits it in a large bin at the top of



Stemwinder Mill and Buildings.



Ostenburg Concentrating Table used in Stemwinder Mill.

ination it may eventually do much towards serving the purpose for which it avowedly has come into existence, and should make headway until in due course its usefulness shall be sufficiently appreciated to ensure its bringing in a profitable return to those who are enterprising enough to engage in such a venture.

THE CYANIDE PROCESS IN FAIRVIEW.

A CORRESPONDENT writes: A force of 50 men are now working on the Stemwinder mine and the mill is crushing about 100 tons per day. Only 30 stamps are being run at present, as a few more vats in the cyanide plant have to be erected before it will be able to treat the product of the whole mill of 46 stamps. This work is being pushed forward as rapidly as possible and should be completed within two months. The manner of working this property is thoroughly up-to-date and less men are employed than in any mine of similar capacity in the country. The mine is well opened up and the veins are very large and the ground easily broken. Two

iron doors at the bottom of the tanks, and runs away to a lake a mile off. One man can sluice out a tank in eight hours. The solution runs through precipitation boxes which extracts the gold and after standardizing this is used over again.

After being leached and the solutions pumped to the sump tanks above, which are 24 feet in diameter by 10 feet high and the pulp is sluiced through four large



Stemwinder Cyanide Plant.

iron doors at the bottom of the tanks, and runs away to a lake a mile off. One man can sluice out a tank in eight hours. The solution runs through precipitation boxes which extracts the gold and after standardizing this is used over again.

The mill is at present being driven by water power, a Pelton wheel being installed. There is a large Corliss engine which is used when the power may not be sufficient for all purposes. The boiler house is separate and in the centre of the buildings and steam is distributed to all points from this centre. To the left is the hoist and compressor; to the right is the sawmill and planing mill, and below is the large stamp mill. The services of only four men (two by day and two by night) only are required in the stamp mill and in the cyanide plant only one man in the day and one at night does the work.

It is the intention to install a belt-driven compressor in the mill and for a considerable portion of the year do away with the use of steam altogether. All the workings are well lighted by electricity, generated in the stamp mill. The mine is in excellent condition and recently work has been started to supply a considerable portion of the ore from surface workings similar to the manner of working the large mines at Phoenix. The superintendent expects to be able to mine and treat the ore for less than \$2.00 per ton.

VALUES IN SLUICE CONCENTRATES.

MR. J. B. HOBSON, manager of the Consolidated Cariboo Hydraulic Mines at Bullion, writes to the MINING RECORD as follows: "I send you herewith copy of analysis by Mr. J. O'Sullivan, assayer, of Vancouver, of a sample of heavy sand, sulphurets, and other concentrates obtained last year after cleaning up the sluices at the Consolidated Cariboo Hydraulic Mine, which may be of some interest to your readers.

"Having made some qualitative tests before sending the sample to the assayer, I found indications of the presence of palladium and requested Mr. O'Sullivan to make a careful quantitative analysis for that metal—the large quantity of which came as a great surprise to me. I do not remember of having noted any report of the presence of palladium in any of the assays of concentrates from the auriferous alluvials of British Columbia; and it might be well for those operating alluvial mines to have their concentrates carefully examined for the presence of this metal—which belongs to the "Platinum-osmium-iridium" group and possesses a commercial value higher than that of platinum."

RESULTS OF ANALYSES.

Mr. J. O'Sullivan, F.C.S., Etc., of Vancouver, found the sample of alluvial deposit to contain:—

Gold	147.51	ozs. per ton of 2000 pounds
Silver	138.34	" " " "
Palladium	46.55	" " " "
Platinum	15.12	" " " "
Osmiridium	4.73	" " " "
Copper (wet)	14.3	per cent.

Commercial Value of Sluice Concentrates from the Consolidated Cariboo Hydraulic Mining Co.'s mine, Bullion, B.C., figured on basis of attached assay:—

Metal,	Ozs. per ton of 2000 lbs.	Value per oz.	Value per ton.	Total value per ton.
Gold	147.51	\$17.00	\$2,507.67	
Silver	138.34	.50	69.17	
Palladium	46.55	19.00	884.45	
Platinum	15.12	16.25	245.70	
Osmiridium	4.73	29.00	137.17	
Copper	14.30 p.c. (wet)	10 c. lb.	28.60	
				\$3,872.76

COSTS OF LEAD SMELTING IN KOOTENAY

THE controversy, to which we briefly alluded last month, on the subject of the rates charged by local smelters for the treatment of lead ores, has provoked a not un-noteworthy discussion, to which during the past month some interesting further contributions have been made. These we propose to summarize, quoting as well from letters we have received on the subject from a number of the principal silver-lead mine operators in the Slocan and elsewhere to whom we propounded the following queries:—

(1.) What have been the smelting rates for different years since you first commenced operations, that is, previous to the time when there was competition from Canadian smelters?

(2.) What deductions have been made from the price of lead either by the duty from the American price, or for the marketing from the English price.

(3.) Have as good rates been obtainable from home smelters as foreign smelters? Has the treatment received in other respects been as satisfactory

Meanwhile it appears to us from the evidence that the case against the smelters has not been proved; and although it is true, several mine operators express dissatisfaction at the rates now in force, a large proportion believe that the charges are, under the circumstances, perfectly just and equitable, and do not represent more than a reasonable return to the smelters on their operations. The point which does not seem to be clearly understood is that before the change was made of payment on the basis of the London price, the smelter realized a certain profit which, of course, varied with the variation in the relation of the two prices to one another, and that this was taken into account in fixing freight and treatment rates; but that when the change was made of purchase on the basis of the London price, the local smelter, in order to avoid the risk attendant upon the previous method, adjusted the lead percentage deduction and the freight and treatment charge in such a manner as to give about the same gross results as before—although as a matter of fact, according to the published returns of mining companies' ore sales accounts it is shown that at the present freight and treatment rates and on the purchase basis of London market quotations, the mine owner would receive more for his ore to-day than under the old *regime*. It is, moreover,

plainly shown that immediately before and shortly after the establishment of local smelters rates were reduced, thus indicating that local competition exercised a salutary influence.

The effect upon the rates charged on ores low in lead or altogether dry has been much more marked, as in those cases the home smelter has had a much greater advantage over the foreign smelter. In the case of the heavy lead ore (besides the fact that the foreign smelter has wanted the lead as a carrier for his revenue producing dry silver ore) when paying freight on it to his smelter, he has conveyed thus far towards its ultimate destination the lead contents, so that he has paid freight on very little waste material, and in that way the home smelter has that much less advantage over him, but, as the ore descends the scale in lead contents, so does the disadvantage to the foreign smelter increase. For example, when the local smelters commenced buying Slocan "dry" ores, the rates charged were \$13.50 per ton or thereabouts. This charge has been since steadily reduced until at the present time the rate on different classes of dry ore varies from \$3.12 to \$10, the larger proportion paying a rate of from \$7.50 to \$8, while for certain silicious ores which the smelter requires for mixing, a freight and treatment rate of \$6.50 is afforded.

To compare the operation of local smelters with the large American Reduction Works, as has been done, is manifestly unfair, and proves nothing. It is a very different problem to get low costs with a very large plant, handling large quantities of ore of similar analysis, that is, handling the production from large mines, so that the problem of handling the ore and the metallurgical problem is greatly simplified, from cases where the smelter has to handle a large assortment of different kinds of ores purchased in small parcels and with a constantly changing combination to deal with in the furnaces, very often with unknown peculiarities about them that are only ascertained after experience; for the ordinary analysis does not tell you everything about how an ore will behave in a furnace. And as these latter are the conditions which confront local metallurgists, it is practically impossible for outsiders, not having access to the books of the smelter to determine whether or not the present charges are fair. All the grounds for argument there must rest on a comparison between rates to-day and those in force when the stimulus of keener competition existed. If the present rates are now higher, then that should certainly constitute reasonable cause for complaint. But if it is true that the local smelters are making the large profits, as they are credited with doing, it is somewhat remarkable that Nelson and Trail should be allowed to remain in sole possession of the field, particularly as we remember a bonus of \$50,000 was offered, without avail, by the town of Kaslo for the establishment of reduction works at that place. Meanwhile in reply to our enquiries we have received the following letters:—

From Mr. George Alexander, manager of the Ruth and other mines: "I have to acknowledge yours of the 9th inst., which reaches me just as I am about to

leave home, owing to which I am obliged to answer it without taking the time necessary for looking up the records on the points which you specify. But I may answer your enquiry generally by saying that I have been for some time past shipping the lead ores from our properties in the Canadian smelters, and that I am entirely in favour of the treatment in British Columbia of ores mined in British Columbia wherever this can be obtained without serious loss. Under the same freight and treatment rates as we are at present receiving from the Canadian smelters, we could at present sell to San Francisco, Everett, or to the American Smelting and Refining Company.

I think I am representing the opinion of the other shippers in saying that the existing freight and treatment rate (\$15, reduced by 20 cents per unit of lead under 40 per cent., 10 per cent. zinc limit) is satisfactory to the producers, and represents a fair living rate to the smelters and transportation companies. It can hardly be said to represent a fair living rate to the producers, and I am confident that any attempt to increase this rate would not be accepted by the producers. The result of a bounty on the lines submitted by the lead producers would be, I believe, to increase the supply to a point at which the existing freight and treatment rate would be a fully profitable one to the smelters and transportation companies.

"There has always been a strong feeling among the producers that if they can get better freight and treatment rates in the United States than in Canada, they should not be debarred from availing themselves of them. In my case, and I believe in all others, we are anxious to see this principle admitted only as a protection against unfair treatment resulting from a monopoly, and not at all as a means towards reducing the smelting business in Canada and kindred industries, which we are all interested in building up. I believe that solely as a protection against the abuse of a monopoly, and in view of the very limited provision for local smelting at present, the granting of a bounty should be accompanied by permission to smelt abroad ore mined in British Columbia, and bring back the smelted product subject to duty on smelting process only, if it can be shown that substantially better results will accrue thereby to the Canadian producer than by availing himself of home smelting; but I feel confident that under such a provision it would not be found necessary to export any ore for smelting abroad, and at the same time the Canadian producer of lead ore would be receiving reasonable protection against unjust treatment."

The following is excerpted from a letter by Mr. W. J. Cavanaugh, of the Slocan Star mine, which was published in the *Nelson Daily News* of June 10th:—

"For six years I have been in a position to know what one mine in the Kootenay received for its ore, and at different times have had access to the smelter returns of different properties.

"For several years after the silver-lead mines of Kootenay were opened, we were obliged to sell to the United States smelters; there being no lead smelters in operation on this side of the line. Several lead smelt-

ers were built, notably at Pilot Bay, Golden and Rev-elstoke, but none of them seemed to be a success. Various rates for freight and treatment (this term includes all charges for freight, smelting, refining and marketing) were paid during those first years, but the general tendency was a downward trend of rates; until the year 1899, when the prevailing rate (all charges included, except deductions for loss in smelting) was \$18.50 per dry ton.

"During the years 1898 and 1899, the Hall Mines smelter added a lead stack to its equipment, and the Trail smelter, which had been acquired by the C. P. R. did the same. The only prices quoted for lead ores was the New York quotations, less the duty. Freight and treatment rates (I am sorry to say I am unable to state what proportion was for freight and what for treatment) offered by all concerns buying lead ores were very close to the figures given. No matter how close to the mines the smelter may have been located, or how far distant, Omaha, Selby, Kansas City, Everett, Aurora, Trail or Nelson. All made the same charge. In 1899 the 'smelter trust'—so called—was formed. 'The trust,' for reasons best known to themselves, did not enter the market for Canadian lead ores. Shortly after the formation of 'the trust' and just prior to January 1st, 1900, a meeting of the western 'independent' smelters, viz., Everett, Selby, Trail and Nelson, was held at the Hotel Ryan, St. Paul, Minnesota, where an agreement was made, to purchase to a limited amount, the product of the Kootenay lead mines. The smelter purchasing the ore reserved the right to divert the whole, or any part of that ore, to any other smelter; the two railways operating in the district to share equally in any tonnage from common points. At this St. Paul meeting it was decided to change the basis of settlement for Canadian ores to the London market quotations; the miner was told that he could not get the full London price less treatment charge, as cost of freight to London must be borne; that a deduction of 70 cents per 100 pounds of lead in the ore would be made to meet this new charge. The rate for freight and treatment was fixed at \$20 per 'dry' ton. The average price for lead in London, for the year 1899, less 70 cents per 100 pounds, is equal to the average New York price for the same period, less the duty of \$1.50 per 100 pounds. At the first of the year 1901 (London prices having risen) a further charge of 30 cents per 100 pounds of lead was made, and the treatment rate reduced to \$19 per dry ton, once more equalizing the two markets quoted. What then are the facts? We are forced to sell to a trust equally as potent as the American Smelting & Refining Co. The territory is apportioned, and if one smelter made a bid for our ore it was useless to go to one of the others. If your output became too great for any one to handle, or if they had a stock of lead ore on hand, we were ordered to ship to another. We were told that we were selling on the London market, but we were in reality getting the New York price. Had this parity of prices been maintained, all would have been well; but when London prices went down there was no corresponding decrease in the rates

charged, and there never has been a return to the rates charged in 1899. I maintain that as good a freight rate can be had via steamer from Vancouver, Seattle, or San Francisco to London, as can be had from any of the points named via all rail to New York. If we were selling on the London market we should get the full London market price less the rates charged before the formation of the smelting trusts; and in the fact that we do not get those rates lies the overcharge of which the miner complains.

"Assuming that the average ore of this district carries 50 per cent. of lead (although many mines ship a 60 and 65 per cent. ore) and that I am correct as to freights, the Kootenay lead miner paid during the year 1900 for freight and treatment \$26.30 per dry ton; for 1901, \$28 per dry ton; and for 1902, \$24 per dry ton, which rate is still in vogue. If \$18.50 performed certain work in 1899 it should do as well or better to-day. In 1899 we paid freight to New York; to-day we are supposed to pay freight to London. Apply the simple rule of three, and any schoolboy will easily prove that we are mulcted by the difference in rates charged in 1899 and those charged for the same work at the present time.

"Nor is this all. The average London price for lead in the years 1901 and 1902 was very close to \$2.45 per 100 pounds. Taking 1902 for example: The lead miner received \$1.45 per 100 pounds; add the United States duty of \$1.50 per 100 pounds for lead in ore and we have the actual cost of Canadian lead smelted in the United States. The average price of New York lead for the same period was \$4.05, leaving a very nice margin for that portion of the western 'independent smelters' on the other side of the line; and allowing the home 'independents' to ship their lead to the States, pay the extra duty (\$2.12 1-2 per 100 pounds) for lead in pigs, with a margin in their favour of 47 1-2 cents per 100 pounds, plus what they save in freight by shipping no waste material.

"The first year our markets were changed, *i.e.*, 1900, we paid \$7.80 more per ton for freight and treatment than in the previous year; for 1901 we paid \$9.50 more, and for 1902 up to the present we are paying \$5.50 more per dry ton. This rate of difference increasing with the percentage of lead in the ore. On a 60 per cent. lead ore the relative differences, for the same years, being \$9.06, \$11.30 and \$7.30 per dry ton.

"To put the matter in another way: If we were receiving the full London price for our lead, with a freight and treatment rate on a basis of the rates charged in 1899; for one ton of 50 per cent. lead ore we would get the following:

1,000 pounds lead at £12 12s. 6d., being \$2.51	
per 100 pounds	\$25 10
Less 10 per cent. (loss in smelting)	2 51
	<hr/>
	\$22 59
Freight and treatment	18 50
	<hr/>
Net price per ton	\$ 4 09

Actual returns, same quotations—	
1,000 pounds lead at \$2.51	\$25 10
Less 10 per cent.	2 51
	\$22 59
Freight and treatment	24 00
	\$ 1 41

A net difference of \$5.50, as above stated.

"Mr. J. L. Parker in a recently published article, makes some statements which need qualification. The smelters composing our western combination, not Trail and Nelson alone, did on January 1st, 1902, make a reduction of \$4 from the \$28 then charged. But that reduction, as Mr. Parker states, was not owing to the receipt of a bounty on the refining of lead. Everett, Selby and Nelson made the same reduction, but they received no bounty. The reduction was made in response to a demand from the miners, and a move on their part to smelt their own ore, if they got no redress. Several conditions attached to this quasi reduction; the zinc limit was reduced from 10 to 8 per cent., making the reduction only \$3 on nearly all Slocan ores; the old rates were to have been put in force as the London market recovered. The time for settlement was put at 90 days after the receipt of the ore, thus forcing the producer to stand all market fluctuations. Other and more stringent conditions were to have been imposed on the 1st of January last (the manager of the Nelson smelter stating in his annual report that steps were being taken to extend the time for final settlement to six months) making the miner wait from June to December to know what he had accomplished in that month.

"The advent of the American Smelting & Refining Company has been cried down, but it made our little combination recede from its position, put the zinc limit back to 10 per cent., give us immediate settlement for our ores, and a \$24 flat rate for a 50 per cent. lead ore, regardless of the price of lead on the London market."

In a letter to the MINING RECORD Mr. N. J. Cavanaugh writes:

"I send you herewith the different rates charged by the smelters for treating Slocan ores from 1896 to the present time. This, you will understand, is on an ore carrying better than 40 per cent. lead: 1896, \$24; 1897, \$22; 1898, \$21.25; 1899, \$18.50; 1900, \$20 plus 70 cents per 100 pounds of lead in ore; 1901, \$19 plus \$1 per 100 pounds of lead in the ore; 1902, \$15 plus \$1 per 100 pounds of lead in the ore, zinc 8 per cent.; 1903, the same as 1902, zinc 10 per cent.

"Your third question can hardly be answered by saying "yes," or "no." Beyond a doubt there has been a combination, consisting of Trail, Nelson, Everett, and Selby since January 1st, 1900. They have all been offering the same rate; whether that rate is an equitable one, is another matter. In the matter of weights, and assays (as made) the treatment is fairly good, but it is to the methods of making those assays that the miner objects. We should be given the wet assay less 10 per cent. loss, but we get the fire assays less 10

per cent. (See Ed. *Engineering and Mining Journal* November 11th, 1902.)"

From Mr. S. S. Fowler, President of the British Columbia Mining Association and manager of the Enterprise, Whitewater and other mines:

"The best figures I can give are those pertaining to the Whitewater mine. Freight and treatment rates were as follows: 1896, \$22.50; 1897, \$18.75; 1898, \$18.75; 1899, \$20. These were charged by American smelters. Everett got most of this material, but some of it went to Great Falls. All ore which went to the States was paid for at the New York brokers price, which was always from 15 cents to 30 cents lower than the real price realized by the refiner, per 100 pounds of lead. He also got ahead of us by charging duty for 100 per cent. of the lead although for at least some of the lead he did not pay the duty, the lead being treated in bond. It is certain that little, if any, B. C. lead was consumed in the States after 1898, the American mines supplying all that could be consumed. Prior to 1st July, 1897, the U. S. duty was 3-4 cent per pound; afterwards and since then the duty has been 1 1-2 cents. In 1900 the settlements were made at the English market price less 70 cents per 100 pounds. Since then same market less \$100 per 100 pounds.

"So far as I know we have never been charged higher rates than would be given by the American smelters. One price for one class of ore has been the rule which I have heard no breach of. Our dealings have been perfectly satisfactory with the smelters.

"I have given the *Daily News* here an article, rather hastily written, showing just how we would have come out under the arrangement formerly prevailing and that now prevailing. We actually do better under the present rates and English market less the one dollar per 100."

Mr. Fowler's letter in the *Daily News* contained the following statements:

"It seems to be the impression of some, in discussing the rate question, that a smelting rate can be arrived at like a milling or manufacturing rate, but this of course is very wide of the mark. With the same prices for wages and material, and with equally well equipped plants and able metallurgical supervision, the cost of smelting one assortment of ores may be double what it would be with another * * * I certainly hope for lower rates in the near future, with the increasing development of mines supplying larger quantities of ore, and a more nearly self-fluxing combination than is the case at present.

"Mr. Cavanaugh shows that he is under an evident misapprehension, which has naturally led to a belief that the smelting rates could be materially reduced without giving the smelters and railways a smaller earning than they had some years ago. That is due to Mr. Cavanaugh's not knowing, apparently, that the lead from ore bought in Canada was not used for domestic consumption in the United States, for the American mines have been, for several years past, supplying the domestic lead for the United States. The foreign lead was smelted and refined in bond, and 90

per cent. of the assay contents of the ore or bullion exported, leaving a small amount which might be sold at home without payment of duty. The smelter therefore had, in addition to his freight and treatment charge, a profit on his lead over the price paid the Canadian miner based on the New York price less brokerage, and duty on the lead paid for and on the lead not paid for, i.e., payment was made for 90 per cent. assay contents and duty charged on 100 per cent. When we sold ore to American smelters the brokers' price paid to the miner was always from 15 cents to 30 cents per 100 pounds less than what the refiner received in New York.

"To make clear the improvement there has been in smelter rates since 1896, I have taken examples of Whitewater product, for different periods, and made comparisons, showing on the one hand what we received, and on the other what we would have received if we had had the advantage of settlement on the basis of London price less \$1 per 100 pounds and the present freight and treatment rate:—

refers us to Mr. Cavanaugh's letter, which, he states, "explains the whole situation regarding lead from its early days," and adds, "I can only say that I fully agree with Mr. Cavanaugh and that he expresses my views."

Mr. J. Laing Stocks, business manager of the Duncan United Mines, and other companies, sends us the following letter, which was also published in the *Daily News*:

"I am not going to enter into a discussion about smelter rates, for I know enough about the smelting business to know how complicated the question is, and how many factors there are which affect the charge for any particular kind of ore, besides the cost of smelting the whole charge. I realize that rates for silicious ores, for limy ores, for irony ores, for lead ores, vary with changing conditions and are affected by the law of supply and demand. I hope to see lead smelters continue in business in Kootenay, because in my connection with two lead producing mines I have found it advantageous to sell

OLD METHOD.

Date.	Per Ct. lead.	Gross Lead Contents per ton, lbs.	N. Y. Price Less 20 c 90 p.c. of total	Value Lead in Ore.	Freight and Treatment.	Duty 3/4c. per lb.	Net Value Lead per ton. Ore.
1896.....	30.8	616	\$2.78	\$15.41	\$22.50	\$ 4.62	\$11.71 loss
Jan. 1907.....	33.7	674	2.84	17.23	18.75	5.06	6.58 "
Dec. 1897.....	33.7	674	3.50	21.23	18.75	\$10.11	7.63 "
1898.....	30.9	618	3.58	19.91	18.75	9.27	8.11 "
1899.....	46.6	932	4.27	35.82	20.00	13.98	1.84grain

NEW METHOD.

Date.	Per Ct. lead.	Gross Lead Contents per ton, lbs.	Average London price.	Equivalent in \$ Less \$1.00.	90 p.c. of total Value Lead in Ore.	Freight and Treatment.	Net Value Lead per ton. Ore.
1896.....	30.8	616	11- 3-9	\$1.417	\$ 7.86	\$13.16	\$5.30 loss
Jan. 1907.....	33.7	674	11-15-0	1.539	9.33	13.74	4.14 "
Dec. 1897.....	33.7	674	12-12-6	1.728	10.49	13.74	3.25 "
1898.....	30.9	618	13- 0-0	1.809	10.06	13.18	3.12 "
1899.....	46.6	932	14-18-9	2.228	18.69	15.00	3.69grain

Mr. J. L. Retallack writes: "I regret that the data I have with me here does not permit of my answering your questions categorically. If my memory serves me the original freight and treatment rates charged by the American smelters (exclusive of the deduction for duty and marketing charges) were \$27.50 per ton f. o. b. any steamer or railway.

"These rates have gradually been reduced by both American and Canadian smelters. The existing freight and treatment rates, plus the marketing charge imposed by Canadian smelters, or in fact by American smelters when treating B. C. ore, are, I believe, less than similar charges on similar ore in the United States. I have yet to hear the claim made by responsible people or sustained by irresponsible people that the Canadian smelters do not give satisfactory treatment and as low rates as foreign smelters."

Mr. A. C. Garde, of the Payne Mine, in a brief note,

my ore to a local smelter rather than to send it out of the country, and my companies have always received fair and just treatment from it, and I believe that in the development of a large and prosperous home smelting industry, dependent upon home lead mines for its supply of ore, lies the greatest probability of material reduction in freight and treatment charges; because I am connected with a quartz mine which has concentrates to sell, and those I can sell at home to much better advantage than I could to a smelter at a distance; because I am connected with a mine, the ore from which has been sold to the Nelson smelter at a freight and treatment charge which has been usually about \$4.50, and sometimes as low as \$3.12, and I hope and expect that this mine will soon be the producer of a large tonnage of ore, and without home smelters to take its ore the mine so far as can be seen at present could not be operated; because I have other

interests in British Columbia, and desire to see smelting and other home industries flourish in order that our country may grow and prosper as it should. There has always been sufficient reason for us to have our ore smelted at home in the fact that it was directly advantageous to do so on account of the saving effected at first in freight and treatment charges and later on in incidental expenses, and I was therefore surprised at the ground taken by Mr. Cavanaugh. I was aware that articles attacking the Canadian smelters had appeared in the *Paystreak* and *Ledge*, but these contained such gross misrepresentations that I had not paid any attention to them. After reading Mr. Cavanaugh's letter, however, I investigated the ore sales of one of my companies from the beginning of its operations. I took down the particulars of the returns of a number of cars of ore, taking a few from each period, but otherwise at random, and then ascertained what we would have received for our ore if we had been selling it on the basis of the London price less \$1 per 100 pounds with the present freight and treatment charges, viz., \$11 per ton of ore carrying 20 per cent lead, graded up to \$15 on high-grade ore. The following are the results of those calculations. I will take one ton from each carload, and leave the silver contents out of the question.

In 1897 when there were no local smelters buying lead ores:—

Date.	Tons ore.	Lead.	Lead contents less to per ct.	Price paid.	Total value lead.	Freight & Treatment Charges.	Duty and Customs Expenses.	Net value of lead in ore.
1897.								
Nov. 23 ..	1	70.8	1274	\$3.60	\$45.86	\$25.00	\$21.28	\$ 42
Dec. 2 ..	1	69.1	1244	3.50	43.50	21.50	20.73	1.31
Dec. 6 ..	1	65.9	1186	3.50	41.51	23.00	19.98	1.47

If sold on to-day's basis at the London price on these dates:—

London price.	Equivalent less \$1 per lbs.	Total Value lead in ore.	Freight & Treatment.	Net value lead in 1 ton ore.	Difference in favor of this method.
13-0-0	\$1.809	\$23.05	\$15.00	\$8.05	\$8.47
12-15-0	1.755	21.84	15.00	6.83	5.25
12-15-0	1.755	20.81	15.00	5.81	7.28

In 1898 when the Canadian smelters were talking of going into lead smelting, and there was perhaps on this account a reduction in the rates of outside smelters:—

Date.	Tons ore.	Lead.	Lead contents less to per ct.	Price paid.	Total value lead.	Freight & Treatment	Duty and Customs	Net value of lead in ore.
1898.								
Jan. 18..	1	62.0	1116	\$3.50	\$39.06	\$22.90	\$18.60	\$ 44
Jan. 24..	1	25.5	459	3.60	16.52	16.63	7.76	7.87
Jan. 29..	1	23.1	416	3.60	14.98	19.75	6.93	11.79
Sep. 19..	1	63.5	1143	3.75	43.15	20.75	19.17	3.25
Sep. 26..	1	24.4	439	3.50	15.37	16.50	7.32	8.45

If sold on to-day's basis at the London price on these dates:—

London price.	Equivalent less \$1 per lbs.	Total Value lead in ore.	Freight & Treatment.	Net value of lead in ore.	Difference in favor of present method
12-12-6	\$1.728	\$19.28	\$15.00	\$4.28	\$6.72
12-12-6	1.728	7.93	12.10	4.17	2.70
12-12-6	1.728	7.19	11.62	4.43	7.27
12-18-9	1.795	20.52	15.00	5.52	2.29
12-18-9	1.795	7.88	11.88	4.00	4.45

In February, 1899, when the Hall Mines smelter had actually begun to compete for lead ores:—

Date.	Tons ore.	Lead.	Lead contents less to per ct.	Price paid.	Total value lead.	Freight & Treatment	Duty and Customs	Net value of lead in ore.
1899.								
Feb. 3 ..	1	33.8	608	\$4.20	\$25.54	\$16.50	\$10.35	\$1.31
Feb. 15..	1	64.7	1165	4.20	48.93	20.75	19.62	8.56

If sold on to-day's basis at the London price on these dates:—

London price.	Equivalent less \$1 per lbs.	Total Value lead in ore.	Freight & Treatment.	Net value lead in 1 ton ore.	Difference in favor of
15-10-0	\$2.349	\$14.28	\$13.76	\$0.52	\$1.83
15-0-0	2.241	26.11	15.00	11.11	2.55

On February 18th, 1899, we sold our first ore to that smelter, and as we got more favourable rates than we had hitherto done, the comparison between those and the results on the present basis is not so striking:

Date.	Tons ore.	Lead per cent.	Lead contents less to per ct.	Price paid.	Total value lead.	Freight & Treatment	Duty and Customs	Net value lead in 1 ton ore.
1899.								
Feb. 18..	1	33.0	594	\$4.20	\$24.05	\$14.30	\$ 9.90	\$ 7.5
Feb. 19..	1	64.0	1152	4.20	48.38	20.00	19.20	9.18

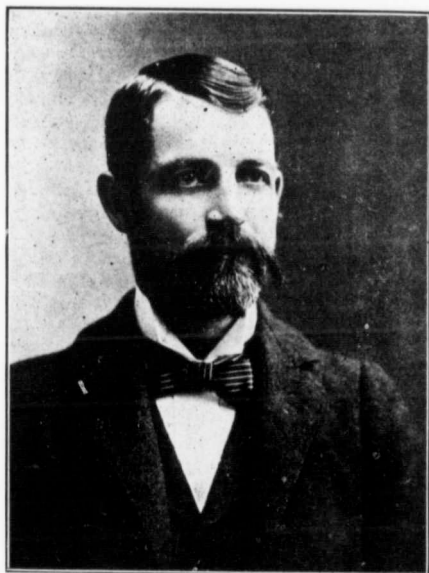
If sold on to-day's basis at the London price on these dates:—

London price.	Equivalent less \$1 per lbs.	Total Value lead in ore.	Freight & Treatment.	Net value lead in 1 ton ore.	Difference in favor of present method
15-0-0	\$2.241	\$13.31	\$13.60	\$ 29 against	\$1.04
15-0-0	2.241	25.82	15.00	10.82 in favor	1.64

In giving us the history of lead smelting rates and combinations Mr. Cavanaugh makes an important statement, viz: "That it was after the Trust withdrew from the Canadian market that the system of payment was changed from the basis of the New York price to the basis of the London price." This would lead to the deduction of cause and effect and would indicate much. But the trouble is that Mr. Cavanaugh is

absolutely and entirely wrong on this point, and the facts in this instance are of common knowledge, and I must say my confidence in the accuracy of his circumstantial account of other matters about which I do not know anything, and about which from their nature as described by Mr. Cavanaugh, the public will not be well informed, is destroyed.

"We first sold our ore on the basis of the London price in January, 1900. All the smelters buying ore in this country bought ore here at that time on the London basis. Among those was the American Smelting & Refining Company, called by Mr. Cavanaugh 'the trust,' and it continued during 1900 to buy British Columbia ores on that system. When this change was made the reasons given us were as follows, and I have never had any occasion to doubt their accuracy:



The Hon. R. F. Green, Minister of Mines in the McBride Government.

"That all smelters, whether American or Canadian, buying ore in British Columbia, had been for some time past (I don't know how long) selling all of that lead abroad on the basis of the London price (excepting such part as the United States Government allowed to be retained in the United States free of duty; that the freight and treatment charges were based on the relation of that price to the New York price, upon which basis payment for lead had been made; that this was unsatisfactory and unbusinesslike; that the fluctuations in the price in London and New York did not correspond, and that obviously the proper market to govern the buying price was the market which governed the selling price; that instead of the deduction of the duty from the New York price there would be an arbitrary deduction from the London

price, but that this must not be understood to represent exactly the cost of refining and marketing, but that the freight and treatment charge and this deduction were taken together to cover costs of freight, treatment, refining, marketing and profit.'

"We found that the change worked out to our great advantage during the year, as a few examples will show. Taking a quotation from each of the months of the year 1900 for lead on the London and New York markets and making an average of the same we have the following:—

London price, £17 5s., at \$4.84 exchange (per 100 lbs.)	\$ 3 73
New York price, less brokers' commission (per 100 lbs.)	4 08
<i>On the London price, one ton of ore assaying 65 per cent. lead:—</i>	
1,300 lbs. of lead at \$3.73 per 100 lbs.	\$48 49
Less 70 cents per 100 lbs.	9 10
	<hr/>
Less 10 per cent	\$39 39
	<hr/>
Net value	\$35 45
<i>On the New York price:—</i>	
1,300 lbs. of lead at \$4.08 per 100 lbs	\$53 04
Less 10 per cent.	\$ 5 30
Duty on 1,300 lbs. at 1 1-2c	19 50
	<hr/>
	\$24 80
	<hr/>
Net value	\$28 24
	<hr/>
Difference in favour of London price	\$ 7 21

Later in 1900 another lead mine with which I was connected approached the producing stage, but we found the market for lead ores not so advantageous as at the first of the year. All the smelters, including the American Smelting & Refining Company were buying ores from British Columbia, but it was generally reported that they were dissatisfied with the present rates, that the business was unprofitable to them and that at the expiration of their contracts there would be an advance probably by means of an increase in the deduction from the London price for lead, the reason being that since an increased charge was necessary it should be made by bringing the deduction from the price of lead nearer to the equivalent of the refining, transportation and marketing costs. In this way the producer of 30 per cent. lead ore would not be taxed for the benefit of the producer of 65 per cent. lead ore. As our ore was in the latter class this did not suit us, but we had to bow to market conditions and make a contract with a greater deduction from the London price of lead than had been exacted in contracts made earlier in the year.

"At the beginning of 1901 we found that the American Smelting & Refining Company would not buy ores in this country at the rates offered by the other smelters, and this seemed to fully corroborate the statements made that the smelters had lost money on British Columbia business and that the increased rates

were as low as could be expected under existing conditions, and we were glad to have the assurance of the local smelter of a market for a fair production, the difficulty then seeming to be with the sudden withdrawal of a large purchaser to find smelter capacity at short notice for the production stimulated as it was by the high prices then current.

"In what I have written I have not reflected in any way on American smelters, nor have I sought to make invidious comparisons, but I have felt compelled not to become a 'silent partner' in what seemed like a conspiracy of falsehood and misrepresentation directed for some other purpose than the good of the lead miners against the Canadian smelters."

We have received from a correspondent the following letter in reply to Mr. Cavanaugh's communication to the *Nelson Daily News*:—

"I am glad that we have in a letter from Mr. N. J. Cavanaugh, who is, I understand, in the service of the Slocan Star mine, operated by the Byron N. White Company of Spokane, Wash., U.S.A., a statement of the case against the Canadian smelter rates. It did not seem much use to continue a discussion of a business subject with a newspaper editor who got beyond his depth when you gave him plain figures to deal with, and whose dishonesty of purpose was made plain by his methods of reply, and whose arguments were mainly inuendo or irresponsible mis-statements of facts. In Mr. Cavanaugh I expect to find a gentleman generally conversant with the sale of lead ore, who, if he is in error, will see it when pointed out to him and frankly acknowledge it.

"First, then, I must tell him that in 1900, when he implies that British Columbia was suffering from the absence of the "trust" in consequence of which we were supposed to have been paid on the basis of London price, the North Star alone shipped more than 13,000 tons of ore to the smelters of that powerful institution, and were paid for all of it on the basis of the said London price, and very good business it was for us that we were so paid, as we received a great deal more per ton of ore than we would have done on the basis formerly in vogue.

Mr. Cavanaugh talks of the Canadian smelters selling the lead in the United States. A little study of the production, consumption and exports of lead of the United States as given in the "Mineral Industry" would show him that there was no room in the United States for Canadian lead; that they were producing in that country all they needed for themselves; and that the refineries through which our lead would have to pass whether smelted in the United States or Canada, were so controlled that no outside lead that was not wanted on that market could be forced there.

It is well known that, excepting such percentage as refiners were not required to export when treated in bond (upon the assumption that it was lost in manufacture), all Canadian lead was treated in bond and exported, and that the smelters were obtaining more in the world's market price than the New York brokers' price less duty, especially as they charged the miner

duty on 100 per cent. of the lead contents of ore, but only paid him for 90 per cent.

Mr. Cavanaugh will therefore see that the smelter did not simply get \$18.50 freight and treatment in 1899. It got \$18.50 plus the difference between the London price and the price it paid the miner.

"I am supposing that Mr. Cavanaugh is right, and that some mine got such a rate. I know that there was a hot smelter fight on at that time and much cutting of rates, but I did not know that any mine got so low a rate as that. If so, it does not prove much, as it was not a general rate. Let us, however, figure out one example, taking the rate and price (N.Y.) named by Mr. Cavanaugh:—

February, 1899:

1 ton ore, 65 per cent. lead equals 1300 lbs.
Less 10 per cent. equals 130 lbs.

1170 lbs.

1170 lbs. @ \$4.05 per 100 lbs. equals.....\$47 38
Less duty on—

1300 lbs. @ 1 1-2 c. per lb. equals..... 19 50
\$27 88

1 ton ore, 65 per cent. lead, equals 1300 lbs.
Less 10 per cent. equals 130 lbs.

1170 lbs.

1170 lbs. @ London price, £15 10s. equals
\$3.35 per 100 lbs.....\$39 20

Difference\$11 32
Add freight and treatment rate 18 50

\$29 82

So that the smelters received in all \$29.82 to pay freight to smelter, for treatment, freight to refinery, refining, cost of marketing silver, freight and cost of marketing lead.

On the same ore to-day he would receive:—

Freight and treatment\$15 00
Deduction of 1 c. per lb. from London price,
equals 1170 lbs. @ 1 c. equals 11 70

\$26 70

and it is therefore a false and misleading comparison that has been made in the *Ledge* and in Mr. Cavanaugh's letter. It must surely be plain that, had it not been for this arrangement of buying on one basis and selling on another more advantageous, an additional deduction from the price of lead or an additional treatment charge would have been necessary.

"With this falls to the ground all Mr. Cavanaugh's figures for subsequent years, and any honestly intended man qualified to make correct use of figures can satisfy himself that the smelter and railroad are getting less to-day for handling a ton of ore and its resulting lead than they did at any former time.

"I form the conclusion from Mr. Cavanaugh's letter that the Slocan Star is paying the American Smelting & Refining Company the same rates as Canadian smelters are charging, viz., \$15.00 per ton for ore

40 per cent. lead and over, and that love of the Stars and Stripes, or personal friendship, or anti-Canadianism, or some other motive than dollars and cents draws its ore across the line.

"The *Ledge* tries to convey the impression that the Canadian smelters are unpopular, and that the mines are generally shipping past them to the United States, and I have accordingly made some enquiries, and have ascertained that 58 British Columbia mines shipped about 20,000 tons of carrying over 15 p. c. lead in 1902; and that, of these 55 shipped to the two Canadian smelters their production of about 22,000 tons, and that three shipped to American smelters. Of one of these mines, the Secretary is the ore buyer of an American smelter; another is the American Boy of Spokane, Wash., which was true to its name; and the third was Mr. Cavanaugh's mine, the Slocan Star.

"The *Ledge* quotes Mr. Campbell Johnston regarding smelter rates, and a more misleading use of figures by one who should be qualified to use them properly, it would be hard to find.

"Leaving out of the question the impossibility of making a comparison between such different sets of conditions, rates of wages, etc., and taking the figures given as being the cost per ton of charge, how much has that to do with the rate charged on any particular class of ore? In the first place, the cost per ton of ore will depend on the proportion of ore in the charge. The greater the proportion of flux, the greater will be the cost of smelting apart from the cost of the flux itself.

"To make it clearer: Supposing a charge of self-fluxing ore costs to smelt \$5.00 per ton, and the furnace smelts 100 tons, the cost will be,

100 multiplied by 5, equals \$500.00.

but supposing the charge be made up as follows:—

12 tons limerock,
25 tons iron ore,
18 tons matte (calined),
45 tons ore.

100 tons @ \$5.00, equals \$500.00.

In this case you have 45 tons of ore to bear the whole cost, making \$11.11 per ton of ore.

"Now, while that shows how the cost per ton of ore would be affected by the proportion of flux in the charge, there is another factor that affects the charge for any particular class of ore, and that is the rate which is being paid on other kinds of ore going to make up the charge. For instance, a few years ago in the United States (and this is still the case to a less extent), there was abundance of high grade dry silver ore which could afford to pay high treatment charges, and high lead ore was required to smelt with it, and the smelters obtained that ore at whatever it was necessary to take it at, and in some cases they smelted it for nothing. In such cases, the dry ore provided the payment for smelting the whole charge.

"Supposing that of the 45 tons of ore in the charge in my illustration, 30 tons was lead ore and 15 tons silicious ore, and the rate charged for the silicious ore was \$15.00 per ton, you would have \$225, leaving \$275, or about \$9.00 per ton, for the lead ore to make

up the smelting cost. Supposing, however, that the silicious ore is so low grade that it can only be mined with a \$5.00 treatment rate, the earning from it would only be \$75, leaving \$425, or over \$14.00 per ton for the lead ore to earn.

"These are not extreme instances, and any one who knows much of the situation, knows that B. C. smelters must be getting very low rates on a good deal of their silicious ore. That is not their fault; it is the fault of conditions.

"I do not want to be forced into a defence of smelter rates because they always seem higher than I want them to be, but it is too bad that false impressions regarding the disabilities under which we labour should go down East and damage our chances of getting relief from the Government, as is undoubtedly being done by such mischievous articles as those in the *Ledge*."

Mr. J. Cronin, manager of the St. Eugene mine, Moyie, writes:—

"Replying to your questions I would wish to state that as far as I know there is no reason now nor has there been at any time to complain of the home smelters.

(1.) I shipped ore first in '98 and '99 to the Trail smelter, selling it at \$20.00 freight and treatment charges and paying the deduction of 11-2 c. per lb. duty. I could not do as well with American smelters, at that time. In 1900 when we increased our ore output the Trail smelter or Nelson smelter together could not handle one-third of it, and therefore we were obliged to sell to the American Smelting & Refining Company, London market price less 70 c. per 100 lbs. for lead paid for and \$20.00 for freight and treatment. In 1901 the American Smelting & Refining Co. withdrew from British Columbia, obliging us to seek markets abroad, and through the Trail smelter succeeded in selling our output to German smelters, the ore being shipped to Antwerp. Since July, 1901, we have not sold any ore.

(2.) This is answered in the above.

(3.) Yes. Fully as good rates have been obtained and when trying to sell our ore on a year's contract last March when the London price of lead was reasonably high I received much better bids from the home smelters than I was able to do from any of the American smelters."

A Sandon mine operator, who does not, however, desire his name to appear, sends up the following information:—

"I give herewith the rates charged on Slocan Star ore for freight and treatment from 1894 to date. 1894, \$28.00 per ton; 1895 (first shipments) \$26.50; 1895 (later shipments), \$24.00; 1896, \$24.00; 1897, \$22.50; 1898, \$21.25; 1899, \$18.50; 1900, \$20.00 plus 70 c. per 100 lbs. of lead in the ore; 1901, \$19.00 plus \$1.00 per 100 lbs. of lead of lead in the ore. (Zinc limit for 1901 and previous years, 10 per cent.) 1902, \$15.00 plus \$1.00 per 100 lbs. of lead in the ore. (Zinc limit 8 per cent.) From the beginning of shipments to July 31st, 1897, there was deducted for duty from the New York price 75 c. per 100 lbs. of assay contents of lead. From July 31st, 1897, to January 1st, 1900,

there was deducted from the New York price \$1.50 per 100 lbs. assay contents of lead. From January 1st, 1900, to January 1st, 1901, there was deducted from the London price 70 c. per 100 lbs. actual contents of lead. From January 1st, 1901, to January 1st, 1902, there was deducted from the London price \$1.00 per 100 lbs. actual contents of lead.

"Prior to January 1st, 1900, the 'home' and foreign smelters made the same deductions. The same general treatment was given by all.

"Your third question can hardly be given an abstract answer. The home smelters gave us the same rates as the foreign smelters who were buying here, but an understanding existed between them. The foreign smelters buying here did not give us the same treatment that they gave to sellers on the other side of the line. Over there they had to compete with the American Smelting & Refining Company and of a necessity had to meet their price. Here they met the price offered by the 'home' smelter. As a consequence we were losers by the operation to the extent of the difference between the Coeur d'Alene price less the duty, and the London price less \$1.00 per 100 lbs. amounting in 1902 to about 65 c. per 100 lbs. of lead in the ore.

"The prices we have given you are taken from our smelter returns for the different years, and you are at liberty any time to verify them by personal inspection should you happen to be in Sandon."

For the purposes of comparison with the above quoted charges the following table giving rates charged by American smelters to Coeur d'Alene lead producers is of interest. In making such a comparison it should be remembered that the American smelters are much more favourably situated than Canadian works, in that the plants are larger; they are able to secure a much more nearly self-fluxing assortment of ores; and they succeed in getting an especially high rate on ore rich in silver:

Year.	Lead. per 100 lbs.	Ore below \$50.00 value.	Between \$50 & \$65.	Above \$65.
1897	\$3.60	\$16.75	\$18.75	\$20.75
1898	3.65	16.75	18.75	20.75
1899	4.40	18.00	20.00	22.00
1900	4.46	18.00	20.00	22.00
1901	4.00	19.00	21.00	23.00
		(Jan. 1 to Sept. 1.)		
1902	4.00	19.00	21.00	23.00
		(Sept. 1 to Dec. 31.)		
1902	4.00	16.00	18.00	20.00
Year.	per 100 lbs.	\$50.00 value.	\$50 & \$65.	Above \$65.

ELECTRICAL TRANSMISSION AT VANCOUVER.

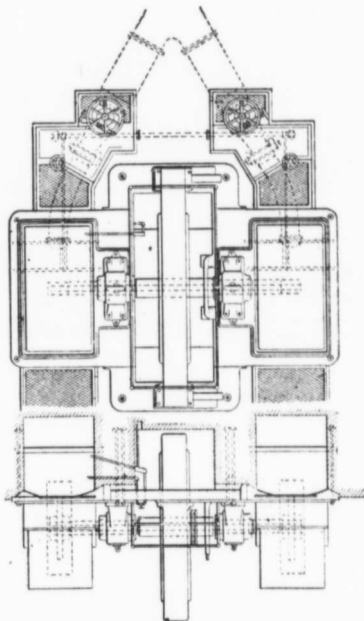
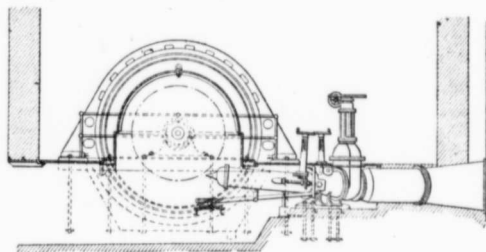
(Specially Contributed.)

THAT Vancouver is destined to become the metropolis of the Canadian Pacific Coast is unquestioned by those who are interested in the development of the Great West. No better evidence of this fact can be given than that the directors of the Vancouver Power Company have already started an undertaking of great magnitude, the cost of which will be very nearly a million dollars.

The Vancouver Power Company, realizing that, in a large measure, the prosperity of Vancouver as an

industrial centre depends upon manufacturers being able to secure a cheap power, and also having the greatest faith in the growth of Vancouver, are now developing a hydro-electro transmission plant which will be capable ultimately of delivering 30,000 horsepower to Vancouver and the surrounding districts.

It will not be amiss to point out how very favourably Vancouver is situated for manufacturing purposes, when it is taken into consideration that the



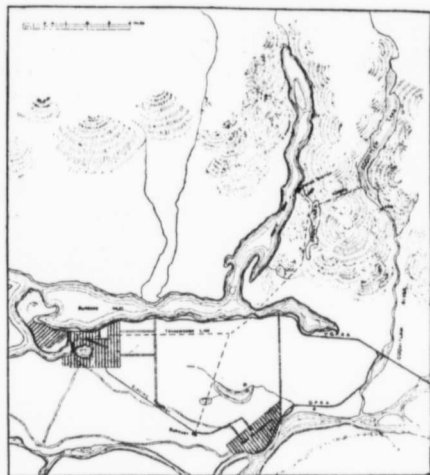
Elevations and Plan of Water Wheels and Generators.

town has one of the finest harbours on the Pacific Coast, the advantages of railway communication with all parts of the Dominion and the United States, and a climate that cannot be surpassed in any portion of the world.

The Vancouver Power Company should, meanwhile, be given due credit for embarking an undertaking involving so large an investment of capital with a view to developing Vancouver's natural resources, and it is safe to say that the result will be to greatly stimulate and encourage the establishment of other industrial enterprises at the Pacific mainland terminus.

Work was commenced in the early summer of 1903, and while the final completion of the undertaking is yet a matter of a year or more, the generation of power sufficient for immediate requirements will, it is expected, be possible by December of this year. Primarily the installation of the plant is for the purpose of furnishing light and power for operating the street and interurban railways in Vancouver, New West-

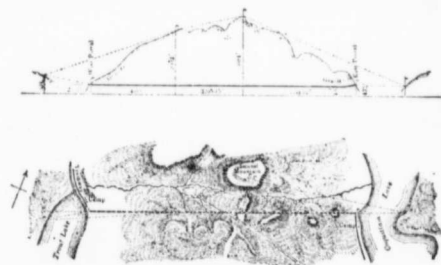
feet, or nearly two and one-half miles in length, is being driven to connect the two lakes for the purpose of using the stored waters of Coquitlam for the main supply and Trout Lake as a balancing reservoir.



Map of Proposed Development.

minster and Burnaby, but the installation has been designed to furnish 30,000 horse-power, for which the hydraulic end of the plant is being developed; the initial installation of machinery being equal to the generation of 9,000 horse-power.

The sources of water supply for power are two very deep glacial lakes, known as Coquitlam and Trout, or Lake Beautiful. Their situation with respect to one another and to Vancouver is shown on the accompanying map. The first mentioned lake has an area of



Cross-Section and Plan of Tunnel.

2,300 acres, and it is at an elevation of 32 feet above the latter, which has an area of 460 acres. Both lakes are surrounded to their outlets by rugged mountains, rising abruptly from the shore lines, and between the two, towers a granite range, 4,000 feet above water level. It is through this range that a tunnel, 13,000



Trout Creek Dam Site in process of clearing.

Trout Lake alone as a source of power is of no value whatever, as the watershed is very limited and the outlet is practically dry except during the rainy season.

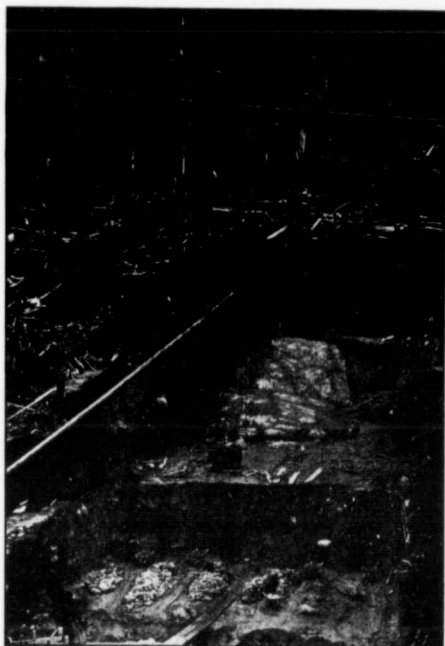
The first plan of development proposed some years ago was to convey the Coquitlam Lake water by



Dam Excavation, North End.

means of a flume along the steep hillside a distance of about seven miles, placing the power-house on Bur-

ard Inlet nearly opposite Port Moody. The soil along the proposed flume route is of glacial silt and exceptionally subject to landslides which would make expensive construction and be subject to serious inter-



Showing Bed-rock in Trout Creek dam excavation, south end.

ruptions which would cripple the service for long periods, no matter what precautions were taken.

This scheme was discarded on account of there being no storage at the end of the flume and the heavy cost of depreciation and maintenance, and the unreliability



Trout Lake Portal, sluicing out the Portal Excavation.

of service. It was then suggested that a tunnel connecting Coquitlam Lake with a point on the North

Arm be constructed. While such a tunnel would be slightly shorter than the one now under construction, the main objections were that there was no possible



Temporary log crib dam in Trout Creek, to control the water during construction of the concrete dam.

means of procuring storage to act as a balancing reservoir, and also that the tunnel would of necessity be large enough to carry water for the highest peak load. It was then decided to run the tunnel from Coquitlam to Trout Lake. Under this plan of development Trout Lake acts as a balancing reservoir, and



Incline Tramway to dam and Trout Lake portal of tunnel.

the tunnel required is only large enough for the average instead of the peak load. The depreciation and maintenance on the hydraulic system will be ex-

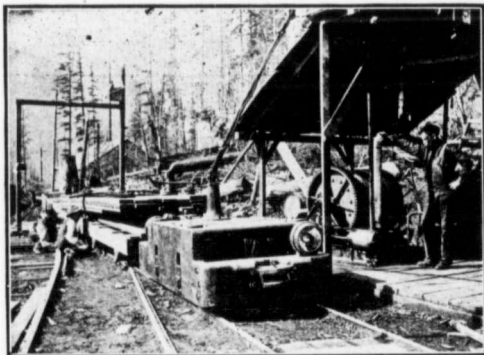
ceedingly low and the reliability of service to be obtained will make an ideal installation.

Both lakes will be controlled by dams at their outlets, and from the dam at Trout Lake steel pipe lines will convey the water under an effective head of 390



Sluicing out excavation for concrete dam.

feet to the power station, located just above high tide mark on the shore of the North Arm of Burrard Inlet, into which the water wheels will discharge. The dam at the outlet of Coquitlam Lake will raise the water 12 feet above low water level. It will be constructed of rock-filled timber crib, a type which has proven thoroughly successful in many mountain streams. The materials are provided by nature in ample quantity at the point where they will be used. The dam will be



Electric Locomotive and Hoisting Engine at top of incline.

planked, and constructed with an apron, extending far enough down stream to prevent any back-cutting action by the water flowing over.

The tunnel is nine feet wide by nine feet in height, with rounded corners, and is being driven from both ends by compressed air drills. At the portals, open cuts were carried into the solid rock, and at one end, where the depth of the open cut became inconvenient, a tunnel was driven for a short distance, temporarily

timbered, and the ground above the roof of the tunnel sloped down through chutes in the roof directly into the car. Before the machine drills and air compressors arrived, hand drills were used, and the average progress was two feet per day in each heading, but since the advent of the drilling machinery, this has been increased to ten feet per day. A system of electric haulage has been installed to facilitate the rapid and economical removal of the muck. The plant at each end includes a 100-h.p. boiler, 60 k.w. 500 volt generator and a 4-drill two-stage Leyner air compressor, 3 3-4 Rand air drills and General Electric Company's locomotive.

Ventilation is provided for by a 12-inch galvanized iron pipe through which the air is exhausted by means of an air jet under 100 lbs. pressure, acting as an ejector. This is only put in operation for a few minutes after each blast to remove the smoke, the exhaust from the air drills furnishing all the fresh air necessary at other times.



Excavation at power house site.

A concrete dam 350 feet long on the crest and 50 feet high is now in course of construction across the outlet from Trout Lake, and arrangements have been made for bringing out ten 54-inch pipe lines from the dam, but only three lines will be completed at the present time. Each steel pipe line will be 1,600 feet in length, 48 inches in diameter at the upper end, 44 inches in the middle section, and 42 inches at the power station. The contract for pipes has been awarded to the Vancouver Engineering Works. Close to the power station site on the shore of the North Arm, a wharf has been erected, at which steamers and barges from Vancouver may discharge their freight on to the cars of an incline tramway built from the wharf to the tunnel portal at Trout Lake. By this means all material for the camp at the tunnel portal and for the dam and pipe lines is delivered rapidly and with the least possible handling.

To deliver material to the tunnel camp at the Coquitlam portal is quite a different undertaking, since it can only be reached by wagon road from a station

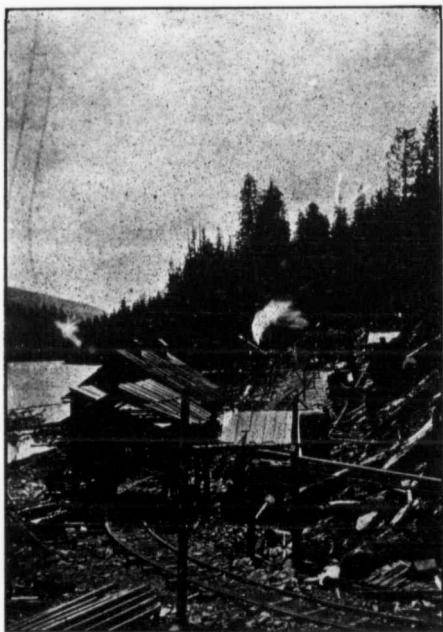
on the Canadian Pacific Railway, ten miles distant. For the greater part of this distance, the road penetrates the dense forests, and in winter can be kept in a passable condition only by constant attention.

The power station will be constructed of granite masonry, and much of the material excavated to obtain a building flat will be used in the walls.

The water wheel equipment will consist of three sets of Pelton impulse wheels, each set capable of developing a maximum of 3,000 horse-power at 200 revolutions per minute, under the effective head of 390 feet, and one set consisting of 200 horse-power wheels for

joint permits of effecting regulation by deflecting the nozzle by governor or hand, independent of the control of the needle, thus permitting of load and speed variations, independent of any change of velocity in the pipe lines. The deflecting portion of the nozzle is counterbalanced by hydraulic pressure, so that quick operation can be secured from the governor on account of the absence of inertia of heavy counterbalanced weights. The taper pipe of the nozzle is provided with the necessary geared connections for hand control of the needle, and will have a tell-tale indicator showing the size of the stream for all positions of the needle.

The shaft of each unit is 13 inches in diameter in the journals and will be carried in two ring oiling ball and socket bearings. The enclosing shells of the oil compartments are provided with cooling pipes, connected through the pedestal with the main wheel compartments and controlling valves, so that cooling water



Tunnel Plant at Coquitlam from mouth of tunnel.

driving the excitors at 580 r.p.m. Each of the main units will consist of two overhung wheels, one mounted on each end of the shaft of a 1,500 k.w. Westinghouse engine type rotating field generator. The wheel centres are of the steel disc type, and fitted with cast steel buckets, secured to the wheel rims by turned steel bolts driven in reamed holes. The hubs of the wheel centres are bored out for a press fit on a shaft 12 inches in diameter, and will be pressed on in place at the lower station. Each wheel will be enclosed in a cast iron housing, and provided with centrifugal discs and pockets, and suitable drain pipes for preventing leakage of water along the shaft.

Probably the most interesting feature of the equipment is the single combination, deflecting and needle regulating nozzle provided for each water wheel, and fitted with a high pressure ball joint, which is leather packed, and rocks on forged steel trunion bolts. The



Coquitlam tunnel camp and plant.

after being discharged from the wheels may flow continuously through them to keep the oil cool.

For each wheel is provided a 24-inch high pressure gate valve, with roller bearing thrusts. The gates are all furnished with the usual hand wheel, and in addition there is provided a worm gear device which can be connected at will to facilitate the working of the gate when nearly closed.

The governing of the water wheel units will be effected by means of three type "E" Lombard governors. This type operates under water pressure, and the water used by them will be first passed through a filter tank located some 200 feet above the power house.

The two 80-k.w. excitors with their respective wheels will be mounted on a common bed plate, with a 120-horsepower induction motor between the two excitors. Each exciter will be provided with a pair of jaw clutch couplings and shifter rigging, so that either water wheel will drive its exciter and the induction motor at the same time. The motor leads are connected to the main bus bars, and the motor is normally run at synchronous speed, neither giving nor taking electric power. Should the exciter water wheel nozzle become clogged and the speed fall, the motor immediately takes power from the bus bars and drives the exciter

until the nozzle is cleared by the attendant, or the other exciter unit started up. The deflecting nozzles of the exciters are arranged for hand regulation for the exterior of the wheel case through worm gearing.

The contract for the entire electrical equipment has been awarded to the Westinghouse Electric and Manufacturing Company and includes the apparatus



Showing Dump at Coquitlam.

for the generating station and the sub-stations at Vancouver and Burnaby. The three 1,500-k.w. 60 cycle, 2,200 volt alternators for the power station are of the rotating field type, and are arranged for a movement of the external frame in a direction parallel to the shaft, to allow access to the windings.

For the control of the apparatus at the power station, the switchboard will contain nine panels, one for the induction motor and one for each exciter, three panels for control of the main units, and three for the control of the three sets of 550 kilowatt air cooled



Ventilating station at Coquitlam Heading.

transformers, with their motor blower sets, consisting of 20-horsepower motors and 110-inch Sturtevant fans.

The step up transformers, static interrupters, high potential switches and lightning arresters will be in-

stalled in a separate building located on the hill above and just back of the power house. As the static interrupters contain oil they will be separated from the main room and each other by brick partitions.

The machinery for the sub-stations includes the usual transformers, rotary converters, switchboards, etc., for the reception and distribution of transmitted power.

The route of the transmission lines to Vancouver is sixteen miles in length, and involves the crossing of a navigable arm of Burrard Inlet, with a span of 2,800 feet. On one side two steel towers 140 feet in height will be erected to support twelve 9-16 inch galvanized plow steel cables with wire centres, but on the opposite side there is high ground and the cables will be supported on poles.

Two independent transmission lines, each consisting of two 3-wire circuits, of No. 2 copper, will be constructed on the same right of way, to a point near Barnett. From here one line will be continued to Vancouver and the other to Burnaby.

A transmission line already exists between Burnaby and Vancouver, which will be reconstructed to carry 20,000 volts, the pressure to be used on the new lines, and a new line will be built from Burnaby to New Westminster, thus providing what is in effect a double transmission line over the entire distance between the power station and each of the sub-stations.

Mr. Wynn Meredith, consulting engineer of the Engineering Offices, of San Francisco, is directing the entire work, assisted by Messrs. Hermon & Burwell, civil engineers, of Vancouver.

Mr. R. H. Sperling, chief engineer of the B. C. Electric Railway Co., is supervising the work on behalf of the B. C. Electric Railway Co., whose shareholders hold the controlling interest in the Vancouver Power Co.

TREATMENT OF LOW-GRADE COPPER ORES.*

(By Dr. Edward Dyer Peters.)

INTRODUCTION.—In the introduction of Mr. Muir's paper reference was made to the fact that extremely low-grade ores are treated in the Lake Superior district of the United States of America, one of the mines actually finding it profitable to work an ore that contains only 0.65 per cent. of copper, or 13 pounds of the metal to a ton (2,000 pounds) of the ore.

It seemed to the writer that when making use of Lake Superior results, as a standard of comparison, in a paper on the treatment of sulphide-ores of copper, reference should be made to the fact that the conditions at Lake Superior are extraordinary, and unparalleled anywhere else in the world. It is, of course, well known to all who are interested in copper that this metal, in the Lake Superior veins, occurs in minute (and sometimes large) particles of pure metal, that only require a cheap washing process to be recov-

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

ered in a nearly pure state; and that a single refining operation yields ingot-copper of the very highest grade and value. To the public at large, therefore, should be afforded the opportunity of realizing that the metallurgical operations at Lake Superior do not furnish a standard that can properly be compared with any other mining district in the world.

Mr. Muir is grappling in Australia with almost exactly the same problem as that which confronts many of us in the United States. For, although we have the unusually rich and extensive copper areas of Montana, Arizona and Utah, we have also far greater areas of low-grade, disseminated and highly silicious sulphide ores, situated far from a market and from fuel, and too often scantily supplied with water.

In order to narrow the field of enquiry, it may be well to enumerate all the methods that seem to have any claims at all to consideration, in connection with the treatment of the ores in question. We may then eliminate all those processes that, on examination, appear economically inapplicable, and consider the few that then remain. (1) Direct smelting; (2) mechanical concentration, followed by the smelting of the concentrates and the lixiviation of the tailings; (3) lixiviation of the ore direct, with a solution of ferrous chloride and salt; (4) lixiviation of the ore direct, with hydrochloric and sulphuric acids, which are regenerated in the solution by the precipitation of the copper from a chloride solution by means of sulphurous acid; (5) lixiviation of the ore direct, with sulphuric acid; and (6) the Rio Tinto method of gradual lixiviation in heaps.

1. *Direct Smelting.*—Wherever it is in any way practicable, the American metallurgist prefers smelting to any form of wet process. The perfect continuity of the operation, the ease and simplicity with which the unpulverized ore pursues its steady course from the mine to the blast furnace, from the blast furnace to the converter, and from the converter to the refinery, lend themselves to operations on a very large scale, and permit the substitution of mechanical appliances for hand labour to an extent unapproachable in any other method. Another great advantage of smelting (absent in the present case) is the almost complete recovery of the precious metals present, with but little extra cost.

Nor need we be deterred from the employment of direct smelting, by even a very considerable excess of silica, and a corresponding deficiency of iron in the ore. Perhaps this was most clearly pointed out by Mr. F. R. Carpenter in the Deadwood and Delaware smelter, South Dakota, U.S.A. He demonstrated conclusively that highly silicious ores, containing a little pyrites, and with extremely expensive coke could be smelted direct in the blast furnace, with the production of slags containing 50 per cent. of silica, 30 per cent. of lime and magnesia, and only 16 per cent. of ferrous oxide. The lime and magnesia were added to the ore in the form of barren dolomite; 20 to 30 tons of ore produced one ton of matte; the slags

were exceedingly clean; and the precious metals and copper (very little) that were contained in the ore, were almost entirely recovered in the matte.

The most interesting features of this unusual type of smelting are the fusibility of the very acid silicate of lime and magnesia with but little iron, and the high rate of matte concentration. The latter result is due to the very acid slag which decomposes the pyrites present, carrying their iron contents into the slag as ferrous oxide. It is not always understood by blast furnace smelters that, other things being equal, an acid slag means a high-grade matte, while a basic slag is accompanied with a low-grade matte.

The writer has only gone into this detail in regard to the direct smelting of very silicious ores in the blast furnace in a raw state, in order to call the attention of metallurgists to possibilities that may solve certain difficult metallurgical problems.

In the case cited by Mr. Muir, however, it may be feared that the absence of silver or gold in the ores, and the non-existence of limestone ores for fluxing purposes, with the high cost of fuel, would compel us, most reluctantly, to give up the idea of direct smelting.

2. *Mechanical Concentration, followed by the Smelting of the Concentrates and the Lixiviation of the Tailings.*—The writer has met with, or been cognizant of, so many difficulties and failures in attempting to concentrate low-grade, disseminated sulphide ores of copper, that he has always advised exhaustive mill tests on a large scale before venturing to employ this method. It is only suitable for very exceptional ores and conditions.

Mr. Muir's results seem to be stronger arguments against the employment of this process than any that the writer could adduce. Without attempting to analyse his experiments in detail, the writer would simply point out that the results of Mr. Muir's concentrating tests show a saving in the concentrates amounting to about 20 per cent. of the original copper contained in the ore, and a loss of nearly 80 per cent. in the tailings. This, of course, means no concentration whatever, and there must be some reason, not apparent to the writer, why Mr. Muir attempted to concentrate at all.

If a portion of the copper in the ore were present in the shape of some mineral that would exercise an injurious effect upon the subsequent lixiviation, and if this mineral had a higher specific gravity than the remainder of the sulphides present, there might be some question of attempting to remove it by concentration. But, as the 20 per cent. of the copper that was removed by concentration had, as the writer understands, exactly the same chemical composition as the 80 per cent. left in the tailings, he fails to see the use of employing concentration; nor does he believe that these ores should be subjected to concentration. (It will be understood that the writer is referring solely to the ordinary methods of wet concentration in making this statement, and that he is not expressing any opinion as to the results that might

be obtained by one or two novel patented methods of which he has no personal experience.)

It seems to the writer most advantageous, therefore, to subject the entire mass of ore to lixiviation, rather than to complicate matters and increase expenditure by any preliminary concentration.

3. *Lixiviation of the Ore direct, with a Solution of Ferrous Chloride and Salt (old Hunt and Douglas Method).*—Considerable quantities of ore have been successfully worked by this process in the United States. The method depends upon the fact that oxide of copper is decomposed by ferrous chloride solutions, forming insoluble ferric oxide, while the copper goes into solution as cuprous and cupric chlorides. It is precipitated in a very pure metallic form by iron, the ferrous chloride solution being thus also regenerated, and requiring only the addition of a little salt to fit in for further use. The consumption of metallic iron in this method is very small, as much of the copper is in solution as cuprous chloride.

As the copper must be in an oxidized form, in order to go into solution quickly and thoroughly, the ore will require a preliminary roasting of sufficient thoroughness to convert most of the copper present into oxide or sulphate. This means that the ore must be crushed dry, though not to nearly so fine a state as would be required for its concentration. Therefore, instead of wet crushing followed by concentration, the writer would suggest dry crushing followed by roasting.

It is impossible to make a comparison of the costs of these two different plans of operation without being accurately acquainted with the physical and chemical character of the ore under consideration. By the use of modern high-speed rolls of great diameter and weight, and of the automatic reverberatory roasting furnaces so generally in use in the United States of America and elsewhere, the cost of dry crushing and roasting should not exceed the cost of wet crushing and concentration, while the condition of the pulp for lixiviation is incomparably better when produced by the former treatment. Apart from the advantage gained by the coarser condition of the pulp, and the much lesser proportion of very fine powder, the ore undergoes a physical change in roasting, which makes it much like sand and gravel, and enables the solutions to permeate it with a completeness and rapidity that are quite surprising. The advantages thus gained will only be fully appreciated by those members who have had experience in leaching the same ore both before and after roasting. There are so great that, in several instances in this country, tailings are roasted previous to lixiviation, solely for the purpose of improving their physical condition, and of increasing the thoroughness and rapidity of the latter operation.

The writer desires to emphasize this dry crushing and roasting as being, in his opinion, the most important step towards a successful leaching of these ores by the methods that he has called Nos. 3, 4 and 5.

4. *Lixiviation of the Ore direct, with Hydrochloric and Sulphuric Acids, which are regenerated in the Solution by the Precipitation of the Copper from a Chloride Solution by means of Sulphurous Acid (new*

Hunt and Douglas Method).—By this method, the copper is precipitated from its chloride solution, by means of sulphurous acid gas, which throws down the copper as a very heavy white cuprous chloride, that settles almost instantaneously. Sulphuric and hydrochloric acids are generated in the solution, which only requires the addition of salt to make it ready for further use.

One great advantage of this method is the rapid dissolving of the oxidized copper present by the strongly acid solution, which even attacks sulphides with considerable energy. Any lead and silver present remain undissolved. The ores require to be roasted, as in the previous process. A supply of pyrites is essential to the economical working of this method, and, of course, it is very advantageous if these pyritic ores contain some metal of value.

5. *Lixiviation of the Ore direct, with Sulphuric Acid.*—Mr. Muir has already considered this method in his paper, though he confined it to the treatment of the tailings after concentration.

The writer can only add that, if lixiviation is at all suited to the fine tailings and slimes from the concentration process, it is still more feasible and more economical, when employed upon the coarsely crushed roasted ore; and, that instead of taking 11 weeks for the extraction of the copper, it is probable that, with roasted ore, an equally perfect extraction would be accomplished within two or three days.

6. *The Rio Tinto Method of Gradual Lixiviation in Heaps.*—The writer agrees with Mr. Eissler in having a strong leaning towards this process of slow, but inexpensive, lixiviation, in cases where the climate is suitable, and where the chemical and physical condition of the ore favours the gradual and persistent formation of sulphates. From the description of the ore given by Mr. Muir the writer fears that, in the present instance, the percentage of sulphides might not be large enough to maintain the energetic and persistent chemical action necessary for the gradual decomposition of the chalcocopyrite, and the formation of soluble salts of copper.

There is another very serious objection to the Rio Tinto method that does not always weigh sufficiently with the metallurgist, who confines his attention too closely to the perfection of his technical results, namely:—The time and money required to demonstrate on a large and safe scale that any given ore will eventually yield up its copper to this slow and tedious process. There is also great difficulty in finding reliable deposits of sufficient size to yield the enormous quantities of ore of a nearly identical composition that are required for the profitable installment of this method, as well as in raising capital willing to wait so long for returns.

This completes the list of methods that seem to the writer worthy of consideration in connection with Mr. Muir's Australian ores. There are one or two recent British patented methods that bear on this same subject. No doubt they have been investigated by British engineers who are interested in the mechanical concentration of difficult copper ores, and the writer does not feel at liberty to discuss them in this place.

Recapitulation.—After enumerating the six methods of treatment that seem to the writer to be best suited to these Australian ores, he has eliminated the first two, namely:—(1) Direct smelting, and (2) mechanical concentration and lixiviation of the tailings. The slow Rio Tinto method of leaching, which he has called No. 6, demands most careful consideration in the few cases where the magnitude of the ore bodies and of the financial resources will permit of its application.

This leaves only the three methods of direct and rapid lixiviation of the ore without any previous mechanical concentration. An intimate knowledge of local conditions and costs, wide technical experience with modern lixiviation methods, and long and careful experiments on an extensive scale, on the ore to be treated, can alone decide the method to be chosen.

The writer is pretty well convinced, however, that if the choice should fall upon any one of these three methods, it will be found advantageous to crush the ore dry and roast it, before lixiviation.

Mr. James Douglas (New York, U.S.A.) wrote that he concurred with Dr. Peters' preference for smelting over leaching, whenever conditions made the former possible. The greater simplicity of plant and process was overwhelmingly in favour of smelting, and the large size of the cupolas now used, 22 feet by 42 inches or 48 inches, enabled a small plant to do a large amount of work. The Rio Tinto method could be employed, even on suitable pyritic ore, only in a hot climate; and many ores (even though their chemical composition would point to this process as applicable) would not heat up and decompose.

THE B. C. MARKET IN LONDON.

(From our own Correspondent.)

THE most important development since my last letter has been the reconstruction of the London & British Columbia Goldfields Co. To those who have followed recent developments in connection with this group the announcement did not come altogether as a surprise, but to the general public it was undoubtedly a sad disillusionment. People had expected such grand things from the London & British Columbia Goldfields and its various offsprings, that their entire failure to fulfill these anticipations even in part has caused much disappointment. The Chairman spoke so hopefully at the meeting called to pass the reconstruction proposals that there was no support forthcoming for the appointment of a Committee of Investigation suggested by one of the shareholders, but it is worth noting that the shares of the company are only quoted at a rubbish price in the Stock Exchange, where they are usually supposed to have an at all events appropriate idea of intrinsic merits. The whole group has fallen from the front rank of British Columbian shares, but it is to be hoped that it will yet be able to partially at least justify that renewal of confidence in the board which the acceptance of the reconstruction proposals indicates. One of

the favourable features has been the generous support accorded to the shares of the Tye Copper Co., which have been lifted to well over £2, whilst Snowshoes continue to attract favourable attention. Le Roi No. 2 have also been a rather better market of late, although like the Le Roi, closing below their recent best figures. New Goldfields have been fairly firm, but Velvets hang a good deal, and those behind this group seem to have a difficulty in maintaining the price at much over 3-8. Hall Mining & Smelting, after having been a heavy market, have hardened a little, but movements have been few and unimportant, and the volume of business doing in London in British Columbian shares has been of the smallest possible dimensions. Generally the outlook is regarded as more hopeful, but the public have explained so many disappointments in connection with British Columbian mining companies in the past six or seven years, that it is not perhaps surprising that they continue to adopt a cautious attitude towards the market generally, apparently overlooking the fact that at their present levels shares of the leading companies are in many cases really well worth buying and putting away for what we call here "the long shot." Their continued abstention is of course in large part due to the apathetic condition of the mining market in London generally, for the recent excitement in the Canadian Railway and Industrial Department should have in ordinary times been reflected by a revival of interest in Canadian mines. But then these are not ordinary times; we are passing through a period of depression in the mining section, and it is vain to expect the Canadian Department to emancipate itself from conditions, which although in no way due to developments in the Dominion, are yet all embracing in their adverse influence. By and by no doubt there will be an improvement in these conditions, and mining shares will once more come to the front, but until the South African Department emerges from the dark clouds which at present overhang it, there is not likely to be any real recovery in the mining market as a whole. Let us hope that in the meantime British Columbian mining developments will continue to proceed on such a satisfactory basis, that when the recovery does come it will be justified not only by market conditions, but also by intrinsic merits. Recent political developments have been made a good deal of in the London press, and it is hoped that the reported change in the Government will not in any way delay the concessions to the mining industry which it was understood had been decided upon.

RECENT B. C. PATENTS.

MR. ROWLAND BRITAIN, patent attorney of Vancouver, sends us the following report for the month of May: Two U. S. patents have been issued during the past month to G. A. Roedde, of Vancouver, on improvements in loose leaf binders. This inventor is keenly alive to the many advantages of this system of binder as applied to ledgers, account books and registers generally, and as a practical book binder has for several years past set himself to remedy the defects which up to the present stand as a bar to any general adoption of the system.

Mr. Roedde has aimed to combine with the convenient removal of leaves by an authorized person, the free and flat

opening and handsome appearance of a spring-bound volume, and he has succeeded in evolving a binding that is entirely novel and promises to supercede anything in the market when he is in a position to manufacture, which he regrets to say he will not be able to do for some little time.

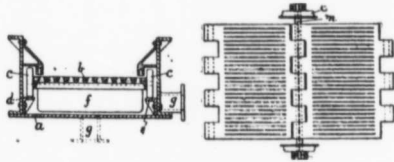
A United States patent to E. Perceval, of Vancouver, on an improved device to be used as a substitute for lacing in the outer casing of a double tube tire. It consists of a light metal shank having recurved ends, at one a small ball, and at and at the other having a flattened button. The flattened button forms the permanent attachment of the fastener in the lace hole of the outer tube; the ball and end being inserted in the opposite lace hole can be readily removed when desired and as quickly replaced.

The device is simple, cheap, and has in practical service extending over nearly two years, proved itself an efficient and convenient substitute for the troublesome lace in common use. An alternative and even cheaper design is made of wire bent to form a cross bar at one end and a hook member at the other.

V. D. Sibley, of Port Hammond, received the United States allowance on a wire snap hook which is ingeniously designed to afford a light and particularly strong hook in a very simple manner.

Patent of Interest to Mining Men.—Hot-Coke Conveyor, U. S. patent No. 728,390, issued May 19th, 1893, to Maurice Graham, of Leeds, Eng.

Claim: In a hot-coke conveyer, in combination, a trough, a perforated travelling grid or conveyer (b) working therein, means for supporting the said grid or conveyer above the level



of the bottom of the trough, an outlet or series of outlets, (g), and a scraper (f), whereby the coke after being quenched is drained of its superfluous moisture during its transit along the trough, substantially as set forth.

MACHINERY NOTES.

CHERRY CREEK, VERNON MINING DIVISION.

THE Cherry Creek Gold Mining Co., Ltd., capitalized at \$1,000,000, the stock being held principally in St. Paul, Minn., has sent in to the claims it is developing at Monashee Mountain, Cherry Creek district, a four-stamp mill, which it is intended to operate by water power. The company has under bond two groups of claims, known respectively as the McPhail group and the Morgan group. Across the claims constituting the McPhail group run two ledges of quartz, carrying galena, iron pyrites, and, it is reported, tellurides. A tunnel has been run on one of these veins, this showing thirty inches to five feet of quartz. It is now in more than 200 feet and has a good body of quartz in the face. A cross-cut tunnel cut No. 2 lead at about 210 feet in. Where cut this second vein is about two feet in width of similar ore to that occurring in No. 1. From the strike of the veins it looks as if they will come together at about 700 feet in. About 15 men have been employed on this property under Mr. F. Williamson, foreman, since the beginning of the year. On the Morgan group there are three parallel ledges, averaging 18 inches in width and said to carry gold in arsenical iron. It is stated to be the intention of the Cherry Creek Gold Mining Company to prove the value of these two groups of claims. Several claims, known as the Monashee Mines in this vicinity, were among the earliest lode claims worked in the province, and a comparatively large amount of money was spent in buildings, plant, ditch-making, development, etc., before the property was left to lie idle.

THE ELMORE PROCESS AT ROSSLAND. . .

Consignments of machinery for the Le Roi No. 2 Elmore plant are being received on the ground, there having been delivered this month about ten tons of machinery including mixers, piping, etc.

EQUIPMENT OF THE WHITE BEAR.

This Rossland company has placed an order with a Canadian company for a twenty-drill compressor, and a 200-h.p. hoist has been ordered from a Denver firm.

ZINC SEPARATION AT THE PAYNE.

The result of the tests in zinc separation by the use of the Wilfley tables at the Payne mine has been so satisfactory that the company has placed an order for six tables in addition to the one installed for experimental purposes. This marks an important advance in connection with zinc mining industry of the Slocan.

MACHINERY AT THE SPITZEE.

Installation of compressor plant and hoisting machinery at the Spitzee has commenced. The plant is to be operated by electric power supplied by the West Kootenay Power and Light Company.

LEAD REFINING AT TRAIL.

Activity is being displayed in and about the lead refinery at Trail. The plant for the treatment of silver slimes is rapidly nearing completion, the work being delayed somewhat by reason of the slow delivery of lumber and other necessary materials. The brick is all done and as soon as the building is finished, it will be a very commodious one for the purpose intended. Plans are out for the erection of a new melting plant to be used in connection with the refinery. This building also will be made of brick, and be a valuable adjunct to Trail's new and growing industry of lead refining. The operations of these plants will be in charge of Mr. Robert L. Whitehead, formerly manager of the Seattle refinery, who is a metallurgist of considerable reputation in this particular line. The Trail refinery is now attracting the attention of the mining world in general, and its process of refining is being investigated to an extent that augure well for the future of refining lead by means of electricity. In fact, many authorities are predicting that it will surely do away with the old zinc desilverization process, now being adopted universally.

THE SNOWSHOE (BOUNDARY.)

The main incline shaft at this mine will be operated with a 150-h.p. electric hoist—the largest hoist in the Boundary—which has been installed for some weeks past. About the middle of July the new 150-h.p. boiler, ordered some months ago from the Jenckes Machine Co., of Sherbrooke, Quebec, is expected to arrive. This will be the largest single boiler yet installed at a Boundary mine.

THE NICKLE PLATE STAMP MILL.

Construction is proceeding steadily on the flume and stamp mill at this Hedley mine, the framework of the mill being now completed. It is stated that upon the completion of the mill, the erection of a smelter on the Indian reserve land, situated between the mill site and the Simikameen River will be commenced. The smelter and stamp mill will be the property of the Yale Reduction Works, which will be in the market for custom ores (especially yellow copper ores) when the plant is ready for operation. The copper ores will be needed in smelting the arsenical iron of the Nickel Plate mine.

THE RAMBLER-CARIBOO.

A new pump has been installed at this mine. The mill and compressor are being operated by water power. Recent development work has proved highly satisfactory.

STAMP MILLS AT CAMBORNE.

At the Oyster-Criterion, foundations of concrete are being laid for the compressor plant, and the final clearing up of the floor of stamp mill site is being done. Another force is at work building the flume and clearing out the line. Timber

is rapidly accumulating on the ground and framing for the mill is expected to be commenced shortly.

At the Eva the framework of the vanner room and power house is now completed.

COLLIERY EQUIPMENT AT NANAIMO.

A representative of a Chicago firm is now at Nanaimo taking measurements for an extensive plant of the most modern machinery; part of the new equipment being intended to load ships direct from the mine without cars, an arrangement absolutely unique, being unknown elsewhere.

A NEW YMIR COMPANY.

The Pilot (Ymir) Gold Mining & Milling Company, Ltd., which is a new local company, organized recently for the purpose of developing the Pilot and Exchange claims, is making preparations towards installing a stamp mill on the property.

IVANHOE CONCENTRATOR.

The Ivanhoe concentrator will before long undergo extensive improvements for the milling of zinc.

THE CARIBOO SEASON.

INTELLIGENCE from Cariboo is to the effect that the present season is not expected to be a long one, the snow-fall having been somewhat inadequate and warm weather set in early. After, too, many of the mines had commenced pining a cold snap intervened and the water failed. After the thaw the snow disappeared very rapidly and water was wasted. Nevertheless, considering all things, the Barkerville mines appear to have done well, and a fair output is anticipated. The Keithley Creek claims are also said to be operating profitably. Meanwhile full crews are at work on Stout's Gulch, etc. Mr. Fry, on Stout Gulch, picked up an \$87 nugget the other day, whilst Mr. Jarvis, of Richfield, is stated to have found one worth about \$100.

The Cariboo Gold Fields is running two shifts, the new bucket machinery being all set and in working order, and Mr. Bailey is making good progress with the new boring machine at the Eleven of England. Some 25 men are at work, and work is being rapidly pushed ahead.

COAL EXPORTATIONS AND TRADE.

AS we go to press we learn that the differences between Mr. Dunsmuir and his employees at Ladysmith have been at length adjudicated and the men have returned to work. The strike has, meanwhile, caused a shortage of coal in the San Francisco market, of which the Washington collieries have been taking rich advantage.

Customs returns are stated to show that as a result of the colliery troubles, 13,733 tons of coal, worth \$62,657, have been imported from Japan.

Work at the Nanaimo collieries is meanwhile proceeding satisfactorily, and it is expected that an output of three thousand tons daily will be shortly maintained. Sinking is in progress at the new Northfield slope, and at any moment the coal may be reached. The opening of this mine will add greatly to the productive capacity of the colliery. In the neighbourhood of Comox and Courtenay, the Comox Coal Company is boring for coal.

The output of the Crow's Nest mines in May was 57,226 tons divided as follows: Coal Creek, 17,796 tons; Michel, 24,849 tons; Morrissey, 15,081 tons. Production during June has been still greater and it is estimated the output will be in the neighbourhood of 70,000 tons. On the completion of the present contract for 250 ovens at Morrissey the company proposes to erect five hundred more ovens to the south extending down as far as Morrissey Creek. This will give the works there a coke producing capacity equal to almost twice that of Fernie. The slack bins to supply the ovens will be much larger than those at either Michel or Fernie. The output from Morrissey is steadily increasing and should shortly be not less than 1,000 tons daily. Coal bins of large capacity, it is stated, will be constructed at the upper end of

the coke ovens, and so arranged to allow of lorries being run in under them to be filled with coal and drawn to the ovens. Work has also been started on a water tank to contain 48,000 gallons, close to the boiler house. At the mines three seams and two prospects are being worked.

At Fernie three mines are being operated, and two others are expected to be opened shortly. Production is being maintained at the rate of about 1,100 tons a day. One hundred and forty-two ovens are in operation. At Michel the company has two hundred and twelve ovens working and stone bases are already laid there for two hundred and fifty additional ovens.

COMPANY NOTES AND CABLES.

VELVET (ROSSLAND).—The manager cabled the following information to the London office this month: "Have received the following returns from smelters: 78 tons first class ore yielded 71 ozs. gold, 7,200 lbs. copper; net return from smelter, \$1,600, or an average of £4 4s. per ton, 74 tons second class ore yielded 45 ozs. gold, 6,500 lbs. copper; net returns from smelters, \$1,050, or an average of £2 18s. 8d. per ton."

LE ROI.—In his report for the month of April the manager states in part: "The ore shipped during the month amounted to 12,156 tons, containing 4,851 ozs. gold, 6,488 ozs. silver, 307,532 lbs. copper, value per ton \$11.41. A portion, 130 tons, containing 363 ozs. gold, 209 ozs. silver and 2,358 lbs. copper, was sold to the Hall Mining and Smelting Company, Ltd., of Nelson, B.C., for experimental purposes; the balance was shipped to the smelter at Northport. The cost of breaking and delivering the ore on the railroad cars was \$2.77 per ton, while the cost of development was equal to 96 cents per ton. The smelting costs for April, on the basis of the tonnage smelted, were approximately \$4.09 per ton. This sum, considering the circumstances under which operations were conducted, is quite low."

As to April profits, although the manager refrained from making an estimate as to this in the cable sent early in the month of May, for the reason that the smelting expenses were difficult to determine at that time, he thinks that it may be fairly assumed that the profit from the ore shipped to Northport during the month would amount to not less than \$1.15 per ton. The ore sent to the Nelson smelter was below the average in grade, so that he estimates the profit upon it at 50 cents per ton.

The gross value of the ore mined and shipped to the smelter during April was \$11.41 per ton, equal to \$137,217
From this deduct smelter losses, refiners' settlement rates, etc., equal to \$2.05 per ton 24,653

Deduct cost of mining and smelting at \$8.21 per ton 98,734

Estimated profit on ore shipped to Northport smelter \$13,830
Estimated profit on ore shipped to Nelson smelter. 65

Total estimated profit \$ 13,895

ARLINGTON (ERIE).—The Arlington resumed shipments at the beginning of the month. The lessees have already marketed ore to the value of some \$20,000 and have several carloads *en route*.

LE ROI No 2.—In the report of the manager for the month of April the following appears:—

"Output—Since the last report there has been shipped to the smelter 2,367 tons, of which the value is \$26,650, from which mining charges have to be deducted. The details of each shipment will be forwarded to you as soon as I receive them.

"Exploration and Development.—Josie mine, 500-foot level, 381-4 feet were driven. Two streaks of ore showed in the face of the drift, the hanging wall side being slightly the better. This we followed for the above distance, but it has as yet shown no definite signs of improvement. 300-foot level, 85 feet were driven here. The ore here seems to be quite

hopelessly irregular. The ground is full of slips, and the ore values change from high grade to low in the most erratic manner, as you will see by reference to the plan. The ore here is twisted round in precisely the same manner as in the drift to the east of it, and, like it, is lying very flat."

ABE LINCOLN (ROSSLAND).—The directors of the Abe Lincoln Company, principally Chicago people, are making an effort to interest fresh capital through the sale of treasury stock, proposing with funds thus secured to resume operations at the mine. In the event of success attending the effort to replenish the treasury, it is understood the drift at the 200 level will be continued to the south for the purpose of intersecting the vein outcropping near the south line of the claim, toward which a drift 275 feet wide has been run. The drift will also be extended north from the main shaft, where what is claimed to be an encouraging showing was secured just before work was suspended last June.

BOSUN MINE (SLOCAN).—Telegram from the manager reports 60 tons galena and 60 tons zinc shipped during the month of May.

TYEE COPPER (MT. SICKER).—The following circular has been issued: "Smelter—A cable received to-day gives results of smelting during the month of May as follows: Ore smelted, 4,717 tons; matte produced, 616 tons; gross value of contents (copper, silver and gold), less costs of refining, \$64,550." (April smelting equals \$60,313.) "Mine—Cable advice received to-day states that the new ore body referred to in circular of 4th ult. has been struck at the 165-foot level, and proved by crosscutting to be 30 feet wide, and has an average assay of copper 7.8 per cent.; silver, 3.66 ozs. per ton; and gold, 0.83 ozs. per ton of 2,000 lbs."

TYEE SMELTER.—After a successful run of over three months, during which time the smelter did not stop, it has closed down to clean boilers, water jackets and generally overhaul the machinery, and allow the ore on the roast piles to accumulate for another and longer run. A second cage has been installed at the mine, so that the ore shipments from the mine in future will be fully up to the capacity of the smelter. It is understood that the smelter company has signed a contract with the lessee of the Van Anda mine for its entire product, and that shipments of this ore will be commenced within two or three weeks.

GIANT (ROSSLAND).—Operations have been resumed at the Giant, it being proposed to ship the ore accumulations amounting to sixty or seventy tons, and continue shipments at the rate of about ten tons a day.

ORO DENORA (BOUNDARY).—This company recently purchased the Iron Dollar claim adjoining its property on the south.

PORTLAND (ASPEN GROVE).—Stripping on the Portland, Aspen Grove, which has been carried on since the work was stopped in the shaft through an influx of water, is said to have resulted in the exposure of an immense body of copper ore, over 80 feet in width and of similar character to that on which the shaft was sunk.

ATLIN M. Co. (YMIER).—The carload of ore shipped recently by this company to the Hall Mines smelter gave returns of \$31 a ton.

WILCOX (YMIER).—An adjourned meeting of the Broken Hill Mining & Development Company, owning the Wilcox group, was held in June. The accounts show a satisfactory cash balance in hand, it being also stated that operations are being carried on at a profit.

The figures for the last run of the Wilcox (Ymir) mines are as follows: During eighteen days' work in which about 250 tons of ore were crushed, a gold brick weighing a little over 200 ounces has been produced, and about a carload of concentrates assaying about \$45 a ton. A further carload of concentrates is also on hand from the previous run. In spite of these good returns, the Superintendent states that the ore handled during this run was by no means the highest grade of mill stuff.

LE ROL.—Cable returns for May:—"Shipped from the mine to Northport smelter during May, 1903, 10,665 tons of ore, containing 4,715 ozs. of gold, 5,091 ozs. of silver, and

236,900 lbs. of copper. Estimated profit on this ore, \$14,500."

DUNDEE.—The directors of the Dundee Gold Mining Company have issued a pamphlet to the shareholders outlining the company's position in respect to finances and suggesting means whereby a better condition of affairs can be brought about. Their proposal is to issue 8 per cent. debentures to the amount of \$40,000 and with the funds thus secured to wipe out the mortgage of \$30,000 on the company's property and to arrange other liabilities.

SLOUGH CREEK MINES.—The second confirmatory meeting of Slough Creek, Limited, was held in London last month, at which it was stated that the reconstruction would go through without delay. A report from the manager stated that the continuation of the main tunnel 140 feet further had been completed, and the upraise had been commenced, so that news is now daily expected of having got into the gravel at bedrock.

RAMBLER-CARIBOO.—Seventy men are now being employed at this mine. The recent strike in the lowest level has just been unwatered and miners put to work further opening it up, and will materially assist to increase the mine shipments, which with mill now running amounts to about 500 tons a month. The compressor is being removed further down the hill where more water is available to generate more power.

WATERLOO (CAMP MCKINNEY).—Sinking is in progress and some good ore is said to have been encountered. The mill, which has been entirely refitted, is in steady operation.

CIRCULARS AND CATALOGUES.

THE CARD CONCENTRATOR.

THE Hendrie & Bolthoff Mfg. & Supply Co. of Denver, Colorado, sole manufacturers and sales agents of the Card Concentrating Table issue a comprehensive pamphlet descriptive of the merits of the device. The Card Concentrator is designed on the same principle as that of the Rittenger table, with, however, important modifications and improvements. Thus longitudinal channels having the same cross-section as the ordinary gold pan have been substituted for "riffles," these channels being so constructed as to widen and deepen for a portion of their lengths and then to narrow and shoal towards the end of the table over which the concentrates are discharged, the whole surface performing all the functions claimed for riffles in a far more effective manner. There is also an improved mechanical movement, or "head motion" combining very simply the differentials as to time and velocities. A further noteworthy improvement is the arrangement diagonally of adjustable baffle-buttons upon the plane surface intervening between the channels. The pamphlet may be obtained direct from the manufacturers of the appliance.

THE WATER LEYNER ROCK DRILL.

This drill, which has now been in practical use for five years, is well described in an illustrated booklet published by the J. Geo. Leyner Engineering Works Co., of Denver. The new model 5A Water Leyner is stated to have withstood every conceivable test.

"PUMP DATA."

This is the title of two circulars issued by the Allentown Rolling Mills, Allentown, Pa., descriptive of the Aldrich Quintuplex Electric Pump.

ELECTRICITY IN MINING.

The Westinghouse Electric & Manufacturing Co. have made in the issue of this little work dealing with the appliances of electricity to all classes of mining, a useful addition to their series of industrial publications.

REYNOLDS CORLISS ENGINES.

The Allis-Chalmers Company send out a printed partial list of users of the Reynolds Corliss Engines. The number of these is truly legion, for the names fill upwards of two hundred printed pages, 4½x86 inches.

STEEL WHEEL BARROWS.

The Archer Iron Works, Chicago, Ill., have issued a new catalogue and price list of steel wheel barrows.

MINING RETURNS AND STATISTICS.

THE YUKON

It is stated on seemingly good authority that the gold yield of the Yukon this year will exceed last year's production by a value of from three to five million dollars. Very satisfactory returns have already been received from the older creeks of Eldorado, Bonanza and Hunker, while Duncan Creek is beginning to yield very largely, the estimated output being valued at two million dollars.

ROSSLAND.

Production from Rossland to June 27th is as follows:—

	Tons.
Le Roi	90,695
Centre Star	39,082
War Eagle	28,089
Le Roi No. 2	13,225
Velvet	3,601
Kootenay	2,470
Giant	390
White Bear	250
Homestake	80
I. X. L.	40
O. K.	20
Total	177,942

BOUNDARY.

Boundary shipments to the end June are:—

	Tons.
Granby	157,608
Mother Lode	47,038
Snowshoe	23,910
B. C.	15,415
Enma	9,206
Sunset	5,437
Providence	591
Total	250,205

SLOCAN.

The mines of the Slocan and Slocan City Mining Divisions produced the following tonnage to June 20th:—

	Tons.
American Boy	481
Antoine	101
Arlington	40
Black Prince	17
Bondholder	2
Bosun	650
Bluebird	20
Dayton	4
Enterprise	290
Fisher Maiden	280
Hartney	21
Idaho	21
Ivanhoe	466
Monitor	436
Meteor	12
Ottawa	106
Payne	1336
Queen Bess	144
Rambler	554
Reco	153
Republic	50
Ruth	140
Rio	9
Red Fox	24
Slocan Star	995
Slocan Boy	16
Silver Glance	55
Surprise	5
Total	6392

THE COAST.

Our correspondent at Crofton writes: Shipments to Crofton smelter for June were approximately as follows:—

	Tons.
Lenora (Mount Sicker)	3000
Marble Bay (Texada)	1860
Van Anda (Texada)	50
Lone Pine (Republic)	974
Trade Dollar (Republic)	45
Redwing (Copper Mountain, Alaska)	110
Yreka Copper Co (Quatsino)	120

COMPANY MEETINGS.

LONDON & B. C. GOLDFIELDS.

At the extra-ordinary general meeting of the shareholders held in London last month the resolutions authorizing a reconstruction were carried. The chairman spoke in high terms of the valuable service rendered to the company by Mr. S. S. Fowler, who has consented to continue to act as general manager for the present on "terms which man a great saving." The directors have agreed to forego the amount of fees due them, and in future to draw £100 per annum with £50 extra for the chairman until the company is again successful. Stress was laid at the meeting on the value of the company's assets, as represented by holdings in the Ymir and Kettle River Power Company.

HEMATITE IN THE SIMILKAMEEN.

The *Similkameen Star* announces the exposure of a large body of hematite on Otter Creek. The lead is said to be in the neighbourhood of 100 feet wide and traceable for a length of 1,600 feet. It has been exposed by numerous open cuts. The ore body lies between a magnesian limestone and a schist, and along one wall a band of iron pyrites to feet in width parallels the hematite. The iron pyrites is in a quartz gangue while the hematite is in a matrix of lime. Small quantities of yellow copper are met with on one end of the lead, but the iron is fairly free from impurities. None of the present open cuts are over four feet deep.

TUNGSTEN IN THE SLOCAN.

It is reported that one of the lessees of the Meteor mine in the Slocan City division, noticing in the course of operating the property a material of somewhat uncommon appearance, took some samples of it, which being afterwards analyzed by Mr. W. S. Johnson, a local assayer, was pronounced to be tungsten. The two principal sources of production of tungsten are the United States and Australia, the annual output of either of which does not exceed two hundred tons. The price of the metal varies from about 60 to 65 cents per lb.; while the price of tungsten ore of from 45 to 50 per cent. WO₃ is about \$2 per unit, while ores of from 65 to 75 per cent. WO₃ content command from \$2.50 to \$3.00 per unit if free from sulphur and phosphorus. According to the *Slocan Drill*, which is responsible for this report, the ore was found in a narrow irregular seam of from two to three inches in width.

THE CANADIAN MINING INSTITUTE.

Mr. B. T. A. Bell, Secretary of the Canadian Mining Institute, writes to the *MINING RECORD* as follows:

"In consequence of the destruction by fire this morning of the printing establishment of The Mortimer Company, Limited Vol. IV. of the Journal of our Proceedings, which was nearly completed has been destroyed.

"I am glad to be able to inform you that nearly the whole of the original MSS. was in my possession and that all the numerous engravings for this edition have been saved so that our loss will mainly be in the delay and extra work entailed in the reprinting of the volume. The Journal will be reset immediately and I hope to have it completed in the course of a few months."

THE METAL MARKET.

THE markets this month have been somewhat featureless, although the outlook is not unsatisfactory. Silver has been fairly steady at prices ranging from 52½ to 53%. Copper quotations are nominal at Lake 14 to 14½ Electrolytic 14 to 14½; Cathodes 13¾ to 13¾. The American Smelting & Refining Co. has announced a further reduction in prices of \$5 per ton which went into effect on the 17th of June. This, it is expected, will stimulate enquiry for lead. The latest New York quotations are 4.05 to 4.10. Spelter is firm at 5.50 to 5.60, St. Louis; 5.70 to 5.80 New York.

THE GEOLOGICAL SURVEY IN B. C.

OWING to a reduction in the appropriation for exploration purposes in this year's estimates, a much smaller number of parties will be sent out than formerly by the Geological Survey.

The usual vote of \$60,000 was last year increased by about \$8,000, but this year it is only \$50,000. This year Messrs. Brock and McConnell will work in the Lardeau district, and Messrs. McConnell and Keele in the Yukon.

Industrial Supplement.

LOCAL INDUSTRIES—VICTORIA—VANCOUVER.

THE ALBION IRON WORKS CO., LTD.

FROM the small and vigorous beginning in 1862 this establishment has steadily grown to its present large proportions, embracing as it does the Albion Iron Works in Victoria, the Albion Stove Works in Victoria and the Albion Iron Works branch

Iron Works, Vancouver, W. H. R. Collister, local manager.

The two iron works in Victoria and Vancouver are each of them thoroughly equipped for handling every kind of mechanical engineering work; the foundry, pattern, machine and boiler shops being as complete as any in the country.

As specimens of the Albion's work we might mention the twin screw steamer "Joan" and the steel stern wheeler "Beaver," both of them constructed throughout by the Albion Iron Works. The triple expansion engines and boilers of the "Lorne" came from their shops as did also the thousand horse-power engines of



in Vancouver. The manufacture of stoves was commenced some time after the foundation of the engineering works and the special factory started has been most successfully operated for some years. Later still the branch works in Vancouver were added to provide for growing business on the Mainland. The three establishments being: the Albion Iron Works, Victoria, J. K. Rebbeck, manager; the Albion Stove Works, Victoria, T. Woods, manager; and the Albion

the B. C. Electric Company.

Boilers of the marine or Scotch type have been made here up to 14 feet 6 inches diameter, carrying 150 lbs. working pressure per square inch and built of 1 1-4 steel plate. Locomotive boilers for stern wheel boats of the largest size carrying 220 lbs. working pressure and engines for the same have been turned out by this firm.

Propellers—a line by the way almost entirely in the

hands of the Albion—made to Rebeck's pattern, have been cast up to 17 feet diameter and 10 tons in weight.

The steel pipe for the Goldstream power plant of the B. C. Electric Railway was furnished and erected by them, this water power displacing the tramway engine before mentioned. The few items above mentioned give one some idea of the diversity and size of a few of the Albion products.

They have also constructed a great variety of marine engines, compound and others of all sizes from almost toys for small steam launches up to a thousand horsepower. A great variety of other machinery is dealt with, including hoisting engines, log-hauling engines of special design, air compressors, dredging machinery, cannery machinery, pumps, etc., and the Albion

THE LUMBERING INDUSTRY.

THE COAST.

ONE hundred and twenty-one licenses to cut timber on Government land were issued during the month of May, sixty-six of them being renewals. These licenses represent a revenue of \$12,100.

The Victoria Lumber Company are extending their logging railroad two miles to tap some good timber land behind the north shoulder of Mount Brenton. This new field, to be known as camp No. 6, will be in operation next month.

The sawmills and timber limits at Sidney have been purchased by Mr. Jenkins, a Minneapolis capitalist.

At a meeting of the B. C. Lumber and Shingle Manufacturers' Association held recently the shingle outlook was thoroughly discussed. The night work has been completely stopped and the curtailment by 25 per cent. of the daily output is being observed by all members. It was, however, felt



Iron Works's reputation for excellent workmanship and design is well known.

In short, they handle every kind of mining, marine, sawmill and railway work. A large stock is kept of an assortment of engines and boilers up to 30 horsepower tested and stamped by the Government inspector and ready for instant delivery.

The Stove Works is now easily the most complete establishment of its kind on the Pacific. It occupies its own extensive premises in Victoria where over 25,000 stoves of every description have been turned out to date; one shipment to China alone a few years ago being over 250 in number.

THE BEHRING SEA FLEET.

TEN sealing schooners having outfitted in Victoria, have sailed to the West Coast to secure crews, and are expected to reach their sealing grounds in Behring Sea by August 1st. The Coast catch of 2,788 skins has been a little better than last year.

that this curtailment does not altogether meet the situation and it was proposed to entirely close down the shingle mills at an early date in order that the overproduction may be absorbed. The question was laid over to come up at a later meeting for decision.

The first case in the province under the Canadian Rivers and Streams Act was adjudicated upon during the month, when the matter of the application of the Brunette Saw Mill Company and others for the imposition of tolls of Chehalis Creek, a tributary of Harrison River, was decided. Down this creek will come 250,000,000 feet of timber board measure. Judge Bole appraised the improvements made by the company, charging the tolls at \$4,000, and permitted the company to charge 15 cents per thousand feet board measure on logs other than their own oated down the creek.

Machinery purchases are being made and other arrangements completed for the establishment of a shingle-mill at Toba River, 160 miles up the Mainland coast.

Mr. J. G. Hutchinson has sold a half interest in the Canada Lumber Company to American purchasers. The company has 4,000 acres of timber land on Howe Sound, and a flume three miles long has been built to carry the logs down to the mill at the water's edge. Mr. Hutchinson was president and manager of the company.

It is reported that a San Francisco syndicate is acquiring large timber limits on Vancouver and adjacent islands and intends to erect several mills having a capacity of twenty-five to thirty thousand feet a day at advantageous points immediately. Two hundred and fifty men will commence logging operations on the first of August and work will be prosecuted with the utmost vigour. A large sawmill, capable of turning out at least 250,000 feet of lumber per day, is also to be built in the vicinity of Nanaimo.

It is also stated that the E. K. Wood Lumber Company, of Puget Sound, has purchased a vast tract of timber on Vancouver Island in the Nanaimo district, containing 350,000 feet of fir.

The Ladysmith Lumber Company's mill at Fiddle Junction, Vancouver Island, was destroyed by fire on June 1st.

A notice has appeared in the British Columbia *Gazette* rescinding an order in council passed last March making a regulation that all timber limits must be surveyed before the issue of special licenses. Compliance with his regulation involved very considerable expense to the loggers, while any benefit to public interests was merely questionable. The regulation had the effect of checking the number of applicants and consequently its removal is a matter for congratulation.

REVELSTOKE AND LARDEAU.

There is much activity in these localities, and capital is being very considerably invested in lumbering undertakings. The Revelstoke Lumber Co. has now over three million feet of logs at the mill; the Harbour Lumber Co. is doubling the capacity of its mills both at Revelstoke and at Comaplix; improvements are being made at the Arrowhead Saw Milling Co.'s mills; one of the largest mills in the Interior is being built by the Arrowhead Lumber Co. at Arrowhead, and the King Mercantile Company is building a second sawmill of about 35,000 feet capacity on its limits. A contract has been let for the cutting of a million feet of logs at Trout Lake City and the work is well under way.

WEST KOOTENAY.

The Blue & Deschamps mill north of Rossland is employed getting out finished lumber products. The new planers recently ordered for the mill have been installed and are in running order.

The Porto Reco Lumber Co. are installing a brick burner to consume the waste of the mill.

Another shingle mill has been started, some three miles below Erie.

EAST KOOTENAY.

In the recent floods the sawmill of the East Kootenay Lumber Co. at Meadow Creek was partly under water for several days, and it became necessary to cut the boom and let a portion of the logs go in order to save the mill. The sawmill at Wardner also sustained a heavy loss by the high water taking a lot of their logs down the Kootenay. At Fort Steele the Kootenay River was in flood and a large boom located at or near Fenwick ranch broke loose and several thousand feet of logs belonging to the Crow's Next Lumber Company were carried down the river.

BOUNDARY.

The entire North Fork drive safely reached its destination—Smelter Lake. There were over five million feet of logs in the boom.

THE FISHERIES

THE sockeye fishing season has opened at Essington and promises well, it being anticipated that in consequence of the exceptionally heavy snowfall last winter, the run of fish will exceed that of many previous seasons. The foundation of this expectation is that the fish will be in no hurry to run up the river, as the high water will not be over till much later.

British Columbia salmon canners have organized a selling association embracing all the plants along the Fraser River and those owned by Canadian operators in the north. The

company will at once take charge of the entire Canadian output of salmon and control prices at home, in the United Kingdom and Australia. The Association does not propose to increase the present prices of canned fish, but to maintain them at a point sufficient to afford a fair profit.

The new cannery being erected at Steveston, on the site of the old Imperial will be about the largest on the entire river. The machinery is now being installed, and the big cannery will be in good working order by the time the season opens at the first of next month. There are four separate lines of machinery, so that, if the supply of salmon is sufficient, the cannery will have a capacity of 60,000 to 80,000 cases for the season.

The Burrard Inlet Cannery Co. propose to establish on the shores of North Vancouver a cannery for the canning of crabs and other fish. A wharf has been run out into the stream for the accommodation of the scows which will carry the fish, and the extensive buildings are now ready for occupation.

The Pacific Fish Company has recently experimented in the direction of smoking halibut for market. The experiment proved, after severe tests had been previously applied, to prove the keeping qualities of the smoked fish, eminently satisfactory, and it is likely that this branch of industry will receive further attention.

THE HUDSON'S BAY COMPANY'S PROFITS.

THE annual financial statement of the Hudson's Bay Company was issued to the shareholders recently.

The report is a most favourable one and indicates a progressive though conservative policy. For the past financial year there was a trade profit of \$710,000, compared with \$342,000 the previous trade year. Next year's fur sales promise to be up to the average.

The statement shows that 368,678 acres of farm lands were sold as compared with 196,844 acres last year, realizing \$2,086,603, or an average of \$5.66 per acre, compared with \$999,685, the previous year, and averaging \$5.08 per acre. The sale of town lots realized \$686,755, compared with \$57,082 in the previous year.

The Governor and Committee of the Company have meanwhile recommended from the trading profits a dividend of 2s. 6d. per share, leaving to be carried forward £90,748, as against £61,247 last year. In addition to the profits from trade the last account for the year ended 31st March shows a balance of £177,800. This, together with the receipts from the land sales up to the 31st of May, enables the directors to recommend a reduction of capital of £2 per share, absorbing £200,000, thus reducing the shares from £13 to £11.

MONTHLY FREIGHT AND SHIPPING REPORT.

MESSRS. R. P. RITHET & CO. LTD., issue the following report for the month of May:—"The spot grain freight market is extremely dull, last year's crop being practically cleaned up; the rate for new crop loading also shows a decided weakening tendency owing partly to less favourable crop conditions, and partly to the increasing tonnage list heading to this coast, mostly with Australian coals to cover shortage from British Columbia mines caused by labour troubles.

"The lumber freight market for the past month has been quite active, and our list of engagements is greater than for some time past. Rates remain steady, except an increase of 5s. in the South African voyage.

"We quote freights as follows: Grain—San Francisco to Cork, f.o.b., 18s. 6d. to 19s. 9d. Portland to Cork, f.o., 22s. 6d. Tacoma and Seattle to Cork, 20s.

Lumber. British Columbia or Puget Sound to Sydney, 32s. 6d. to 36s. 3d.; Melbourne or Adelaide, 40s.; Port Pirie, 37s. 6d. to 38s. 9d.; Fremantle, 47s. 6d. to 50s.; Shanghai, 37s. 6d. to 40s.; Kiaochau, 40s.; Taku, 40s. to 42s. 6d.; Vladivostok, 40s.; West Coast, S. A., 32s. 6d. to 35s.; South Africa, 57s. 6d. to 61s. 3d.; U. K. or Continent, 50s.

...Mining Machinery...

Our experience in designing and installing complete plants has extended over a period of many years, and this experience together with the fact that we are in close touch with many eminent metallurgists places us in a position to supply our customers with machinery of the latest and most improved type, and with plans for its installation in accordance with up-to-date and practical methods of handling ore so as to obtain the best commercial as well as metallurgical results.

COMPLETE POWER, LIGHTING, HEATING
AND PUMPING PLANTS.....

CHAS. C. MOORE & CO., Engineers

PACIFIC COAST AGENTS FOR

The Holthoff Machinery Co.,
CUDAHY, WIS.

MAIN OFFICE

63 FIRST ST., SAN FRANCISCO, CAL.

BRANCHES

NEW YORK, 1303 Havemeyer Bldg.
Adver. No. 223.

*EATLE, 218 Second Ave., So.
BAKER CITY, Oregon.

LOS ANGELES, 321 Trust Building.
SALT LAKE CITY, Utah.

FISH SCIENTISTS AT NANAIMO.

THE following notes were made by Prof. Jordan, one of a party of American scientists who recently investigated the fishing banks in Nanaimo Bay:—

The Albatross has dredged in Nanaimo Bay at a depth of about 40 fathoms and more. It has dredged the halibut bank opposite St. Mary's Mission in 12 to 30 fathoms and in the Straits of Georgia, between, at a depth of 250 fathoms, or more than a quarter of a mile. The life was scanty in all these localities. On the halibut banks was found a complete mass of sponges, with prawns in their cavities. The halibut doubtless on these prawns. Three new specimens of fishes were found, one on the halibut bank, the other in deep water. Neither is large enough to be of value as food. The following species of fishes have been taken about Nanaimo Bay by the Albatross:

I. Share Fishes.—*Oncorhynchus* Kisutch, the silver salmon; *chimaera* collicii, rat-fish; *squalus* sucklin, dog-fish; *ovithopsetta* sordida, left-handed flounder; *lipidopsetta* bilineata, rough flounder; *sevastodes* melanops, dark brown rock fish; *gastemtern* catophractus, stickle-back; *ammodytes* personatus, sand lance.

II. In Moderate Water.—(Dredged in 20 to 50 fathoms). *Raja* finoculata, barn door skate; *tarandicheltrys*, filamentous, tarandichitrys tennis, radulum asprellus, malacocottus zornurns, rhamphocottus richardsorie (all these are sculpins), *sevastodes* diploproa, *sevastodes* (new series: these two are red rock cod), *xeneretums* tnacanthus, the sea poacher; *ronquitus* jordani, the ronquil; *lyopsetta* exilis, the weak flounder.

III. Deep Sea Fishes.—(Dredged in 200 fathoms). *Bathyagonus* nigipinnis, the black-fin sea poacher; *paroliparis*, new species, the water sea snail; *furcimanus* diaptera, fork-finned wolf eel; *malacocattus* (new species), a soft-bodied sculpin.

The collection of invertebrates, shrimps, prawns, sea urchins, star-fish, sea worms, lamp shells, etc., is very considerable and valuable, including numerous rare forms, some of them perhaps new to science.

THE BANK OF MONTREAL.

THE Bank of Montreal has issued the following statement of the results of the business of the bank for the year ending April 30th, 1903:—

Balance of profit and loss account 30th April, 1902	\$ 165,856 00
Profits for the year ended 30th April, 1903, after deducting charges of management, and making full provision for all bad and doubtful debts	1,813,483 66
Premiums on new stock	965,468 00
	<u>\$2,944,807 75</u>
Dividend 5 per cent., paid 1st December, 1902	\$600,000 00
Dividend 5 per cent., payable 1st June, 1903	620,000 00
	<u>1,220,000 00</u>
Amount credited to rest account	1,000,000 00
	<u>\$ 724,807 75</u>

TRADE IN CANADA.

Ottawa, June 13.—The trade returns for the eleven months of the fiscal year ending Wednesday, May 31st, show an increase in the aggregate trade of the Dominion of \$38,371,462. The total trade for that time has now reached