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EDITORIAL NOTES

The British Columbia Chamber of Mines will not allow the hold they have secured by the success of this Convention to slip. They will continue a publicity in B. C. on the plane which it deserves.

Many mining men who have followed their calling for years were most forcibly impressed by the minerals displayed and the figures shown by the different engineers of the Provincial Government. These reports impressed them with the great possibilities of British Columbia.

The Convention was successful from every point of view and demonstrates what the get-together spirit will do when applied properly and British Columbia must not let the results of this Convention stop at this. The chance is here to drive home the publicity campaign which is already started and which will bring results of untold value to the Provinces, if properly followed up.

Mr. Rickard's address is well worth perusing and will give the investor something worth while to consider. British Columbia wishes investors to look at the mining possibilities in British Columbia from Mr. Rickard's point of view and the results of any investments made by them in B. C. properties should certainly be worth while if they follow the precepts as laid down in this address.

When mining men from Grand Forks, B.C., are registered at the Convention in Vancouver as delegates from the Northwest Mining Association of Spokane, Wn., bringing credentials from that Association, it surely shows that British Columbia has not looked after her interests properly. It also shows how other places have used the opportunity to turn out and keep in touch with the mining fraternity at every chance.

The response to the invitation from the British Columbia Chamber of Mines to the members of the mining fraternity to attend the first Annual International Mining Convention at Vancouver on March 17, 18, 19, far exceeded expectations. The result has been one of the greatest mining conventions ever held on this continent. The British Columbia Chamber of Mines certainly appreciates the response made to their

invitation. From the results of this Convention the British Columbia mining industry has received an impetus which, without doubt, will carry it far as regards future results.

DEVELOPMENT OF MINERAL DEPOSITS IS A BUSINESS FOR THE VENTURESOME

One of the best things of the Vancouver Convention was the address by Mr. T. A. Rickard on "Mining: An Investment, A Speculation, or a Gamble?" We reproduce it on another page. We commend it to the attention of those who would attempt by legislation to remove the risk from investment in mining enterprises. Those who would heavily tax the mining industry may also read it with profit. More particularly we would call it to the attention of all who put their money in mining ventures. Such addresses will help to keep the very timid out of the industry and will at the same time attract the venturesome. Mining is a hazardous business as well as a hazardous occupation for the workers. It is a business for the strong, not for the weak. It is a business for the venturesome, not for those who are unwilling to run big risks.

There are fortunately in Canada many well established mining companies, employing large numbers of men and doing a profitable business. The big operating mines are the backbone of the industry, a great national asset. But to many of us the history of a property from the time of its discovery until it becomes a producing mine is much more interesting than its later history. Mines that are, are not so often in our minds as mines that may be.

We can sometime predict from surface examination what the results of development work in a new area may be. But such predictions are at best, a mere approximation to the truth. To obtain more information it becomes necessary to spend money, sometimes large amounts, in development work. It is well that those who provide the money should understand they run big risks.

We believe that there are plenty of people willing and able to risk money in developing mineral deposits, so long as there remains the possibility of some being richly rewarded. In Canada we have splendid opportunities for such adventurers. They should be encouraged by honest treatment, not discouraged by unfulfilled promises of certainty of success.

ROYALTIES UNDER DOMINION LAWS.

Until recently, the regulations affecting minerals occurring in quartz on many Dominion Lands have not been subjected to serious scrutiny. During the last few years, however, in which considerable interest has been taken in gold and copper properties in Manitoba, criticism has necessarily been somewhat more pointed. The change from a freehold system to a leasehold system, and the fact that that change was made by Order in Council, stirred the interest of all who were seriously concerned with the future of mining developments in this district. It is noteworthy that no action has yet been taken on this matter by any organization without the boundaries of Manitoba. More recently, however, it has been realized that another situation connected with the regulation for the disposal of quartz mining claims demands attention. In Clause 94 of the Regulations it is stated that "The lease of a mineral claim shall reserve to the Crown such royalty on the sales of the products of the location described in such lease as may from time to time be fixed by Order in Council—the royalty to be collected in such a manner as may be prescribed by the Minister."

The developments in Northern Manitoba have now reached the stage where exploring companies of standing are willing to invest considerable capital in preliminary development work. It is necessary, however, for such companies to look ahead to the period of production, and to the probable action of the State in exacting taxation. While it may be freely admitted that the subject bristles with difficulty, and while it cannot be reasonably expected that an absolutely clear cut policy be laid down in the Regulations, it is none the less clear that the clause above quoted is so lacking in definiteness and concreteness as to be objectionable to the investor. There have been several instances of companies, desirous of carrying on exploratory work in this territory, who object in no uncertain terms to the vagueness of the above quoted regulations. On another page will be found the text of the resolution passed by the Manitoba Branch of the Canadian Mining Institute on this matter. As in mining laws generally, so in taxation, the experience of the Provinces is wide and varied; and a discussion on the regulations adopted by the Department of the Interior would doubtless be illuminating.

A SUGGESTION.

"Why could not mining flotations be put under the jurisdiction of the Bureau of Mines?" Such is a suggestion now being made by some of the most conservative mining men in the business.

Why couldn't they? There appears to be no reason why they could not and should not be. The Bureau of Mines, through the Mining Commissioner, and through Mining Recorders in each mining division, is in a position to benefit from the advantage of opinion in the mining fields. By adding to its already competent staff of geologists, which staff would have authority to enter any mine at any time and report to the government, the Bureau of Mines could readily recognize false or misleading literature circulated for the purpose of selling stock. In other lines of business punishment is handed out to those who get money under false pretences. Why not enforce similar measures in the business of mining? Such a plan would quickly eliminate the wildcat. Incidentally, it would give added impetus to honest mining.—J. McR.

MANITOBA BRANCH OF CANADIAN MINING INSTITUTE.

A meeting of the Manitoba Branch of the Canadian Mining Institute was held at The Pas on March 17th, at a time when the town was en fete by reason of the Hudson Bay Dog Derby, which was the season's event in the Northland. It was decided to make this an open meeting, and there was a very large attendance in the Assembly Hall of the Community Building. Two papers were presented to the meeting.

Mr. G. R. Bancroft discussed "The History and Possibilities of Prospecting in Northern Manitoba." The author dealt with the earliest period of prospecting in the copper and gold areas, in which he had taken a considerable part. He went on to deal with the present situation, and took up in detail the features of the various districts where discoveries had been made within the last two years, the nature of the surface indications, and the general economic possibility.

Mr. H. C. Carlisle gave a paper on the Mandy Mine. Mr. Carlisle, who has been manager of the mine for the last two and a half years, discussed somewhat fully the mineralogy of the orebody, the folding and faulting systems, and their relationship to the high grade copper sulphide lens and the low grade general orebody. He dealt with methods of operations that have been adopted in excavating the high grade lens and discussed the economic situation with reference to the mixed copper, zinc, and iron sulphides blocked out in the mine.

A general discussion ensued, and several matters relative to developments in the district were taken up. The question of royalty regulations applicable to quartz properties was taken up, and a committee consisting of Messrs. Bancroft, Bunting and Vickers was appointed to draw up a resolution. The following resolution was then unanimously adopted:

"Whereas in the regulations for the disposal of Quartz Mining Claims approved by Order in Council dated May 25th, 1917, it is laid down in Section 94 that such royalty may be reserved to the Crown on the sale of the products of leased claims, as may from time to time be fixed by Order in Council;

"And whereas in the experience of those interested in furthering the development of mining in Manitoba it has been found that the terms respecting the matter of fixing royalties on leased properties are so indefinite that financiers hesitate to support exploration enterprises until a more concrete plan of charging royalties is outlined;

"Therefore be it resolved that the Manitoba Branch of the Canadian Mining Institute assembled in session at The Pas unanimously request the Council of the Canadian Mining Institute to present the situation outlined above to the Minister of the Interior, and to recommend that the section referring to royalty be so amended as to give as clear an idea as may be of the plan which the Government intend to adopt in charging royalties on operating mines; and further to indicate whether it is the policy of the Government to permit mining companies to operate for a certain period of years before royalties are charged on their properties."

The chairman of the meeting was Mr. R. C. Wallace, President of the Manitoba Branch.

The Vancouver Mining Convention

March 17, 18 and 19, 1919.

With representative mining men in attendance from as far south as California, and as far north as the Yukon and with every intervening mineral section represented by leading mining men, the first International Mining Convention ever held in the City of Vancouver opened on Monday, March 17, and closed on Wednesday the 19th. The Convention in every way was a success. Its first feature was a stirring address by the Honorable William Sloan, Minister of Mines, and its closing incident was the ringing appeal of M. J. Carrigan, of Seattle, Washington, to all interested in the promotion of the industrial welfare of the Pacific North-West to unite in a determined effort for the establishment of an iron and steel industry either on the Canadian or American side, or both. Mr. Carrigan dwelt on the fact that Mr. Sloan had been the first man in public office to declare in unqualified terms that British Columbia possesses iron ore in sufficient quantity and of such quality to permit the opening and permanent continuance of a furnace modest in size in this province. He congratulated the Minister of Mines on the courage of his statement, and the vision which it indicated. He stated that he had known this to be a fact for fifteen years, but that Mr. Sloan had been the first man in a responsible position to publicly make the announcement. Reference was made also to the very great importance of such an industry, if the shipbuilding of the Pacific Northwest, the foundations of which have been laid through the exigencies of the war, is to be perpetuated.

Addresses.

There were many notable addresses during the Convention, but before referring to them, the British Columbia Chamber of Mines should be congratulated on the splendid judgment exercised in the preparation of its programme and in the satisfactory manner in which it was carried out. Vancouver is not essentially a mining town, but on this occasion, if the very large crowds which thronged the Vancouver Hotel is any criterion, a large proportion of the leading merchants, business men and citizens generally turned out, both to welcome their visitors and to acquire information as to the mining possibilities and the future of mining in their Province and in the countries adjacent. Certainly they gave the delegates from outside points a warm welcome and treated them with every hospitality and consideration. Reverting to the addresses, it is fitting that brief introductory reference be made to that of Mr. T. A. Rickard, of San Francisco, California, the subject of which was "Mining as an Investment." Couched in simple, but effective, language, and containing the essence of long years of experience as a mining man, it was a liberal education in itself and furnishes a guide to those contemplating such investment which could not well be bettered. Then there was the address of Mr. H. M. Lawrie, Chairman of the Oregon Bureau of Mines on "Gold." In view of the exceptional interest in this subject, to say nothing of the very able manner in which it was handled, in this case, keen interest was manifested by the assembled delegates. Some of the other papers may be briefly enumerated as follows: "Government Control of Smelters," Sydney Norman, Spokane, Washington; "The Better Preparation and Utilization of Coal," G. W. Evans, Coal Mining Engineer, Northwest Experiment Station, U.S. Bureau of Mines, Seattle,

and Francis W. Glover, Princeton Coal and Land Company, Princeton, B.C.; "The Prospector, What He Should Be and How to Encourage Him," J. P. McConnell, Vancouver; "Taxation of Mines," Valentine Quinn, Granby Consolidated Mining and Smelting Company, Vancouver, B.C., T. W. Bingay, Consolidated Mining and Smelting Company, Trail, B.C., Nicol Thomson, Chairman, Mining Committee, Board of Trade.

The Price of Silver.

There were not many resolutions acted upon by the Convention, but several of them are of first importance. That which may be said to take premier position in this respect relates to the fixed prices placed on silver. The resolution asked that the Canadian Government use its influence with the Government of Great Britain with a view to the abolishment of the present fixation of the selling prices of this metal. The mover of this resolution claimed that the authorities were not treating silver fairly, following out the policy indicated. He said that Canada, as a producer of silver, was losing a lot of money as a result of this action, placing the figure roughly between \$4,000,000 and \$5,000,000. His opinion was that no argument could be advanced to justify the maintenance of this fixed rate, it was unjust to the producer and unjust to Canada and he expressed the hope that the Convention would not hesitate to go on record in favor of its abolishment. Silver, like any commodity should, now that the war is over, be permitted to find its own level as to price. He was convinced personally that, if this course were pursued, silver would rise considerably above a dollar an ounce, as the demand was great and would, beyond a doubt, grow greater as time went on. There was a market for any quantity in the Orient, Russia, as was true of any country which is misgoverned as those are. Being distrustful of those placed in power, the people hoarded their gold and their silver, and the latter was particularly in demand as a medium of exchange. It was only fair to those who are producing this metal that they should be allowed to reap any reward that might be coming as a result of these conditions. He predicted that silver, if placed on the market without restriction would advance to \$1.20, \$1.30 and perhaps \$1.40 an ounce. Mr. Smith Curtis was responsible for the foregoing observation, and he was endorsed by Mr. T. A. Rickard, as well as by the great majority of the delegates including Mr. G. A. Caldwell, who represents the producers of the boundary district of British Columbia. Mr. Caldwell spoke very vehemently, and warmly endorsing the sentiments expressed by Mr. Smith Curtis and declaring that the fixing of the price of silver was the work of plutocrats. He expressed the belief that Governments these days were particularly keen to keep their fingers on the pulse of public opinion; that Governments would be careful under present conditions to do nothing that could be avoided antagonistic to the general sentiment; and that if the International Convention went on record in this matter it might have the desired effect at Ottawa. There was some opposition to the proposal, several speakers asserted that the policy with respect to silver had been adopted by Great Britain only after very careful consideration in order that the social equilibrium of the Indian Empire might be maintained. They declared that any interference with this would embarrass the Government of Great Britain and that under the cir-

circumstances it would not be wise to take the action suggested. Their view was that it was an Empire question and that the question of the welfare of the Empire should be placed before any monetary advantages to Canadian silver producers. The resolution, however, carried.

A Government Exploration Party.

Mr. S. S. Fowler, of Nelson, B.C., was sponsor for a resolution proposing that the British Columbia Government be asked to provide for and equip an exploratory party, the duties of which would be to explore the vast North-Eastern section of this province, of which to date very little is known. It was true, Mr. Fowler said, that the section referred to from what little information was available did not seem to offer exceptional promise as a mineral producing zone. Very little, however, could be told of the resources of the region in question and he was of the opinion that the Government would be amply repaid for the expenditure that might be involved in assembling detailed data relating to the territory he had in mind. He instanced the Black Hills of Arizona as being a striking illustration of what an unpromising district may ultimately develop into. Every one knew the Homestake Mine of the Black Hills. It had produced millions of dollars in gold and there were associated with it other gold producing properties not as much heard of because overshadowed by the Homestake. But the Black Hills originally had been looked upon as barren of mineral of any kind. Was it not possible, he asked, that the vast unexplored region lying along the northern boundaries of British Columbia did not possess such riches as these. It was a section 107,000 square miles in extent, only ten per cent smaller than Great Britain and Ireland combined. At any rate he felt that the Government should undertake such work as suggested. Mr. Fowler's resolution met with the hearty approbation of the Convention and was carried without dissent.

University Education.

That the Provincial Government should be asked to provide a more substantial vote for the carrying on of educational work at the University of British Columbia was the purport of another resolution. Mr. Smith Curtis, in dealing with this, pointed amid some amusement that the University of the Province, notwithstanding the first importance of the mining industry of the country, was allowed only \$15,000 this year for the maintenance of its geological and mineralogical departments. He declared that it was very important, in order that Canada maintain a high position industrially, that the technical education of its young men and women be of a high standard. This could not be more aptly illustrated than in the case of Germany, which country had gained its prominence in the industrial world through its system of intensive technical education. He was not by any means suggesting that the example of that ruthless Empire should be followed in its application of knowledge but was strongly of the opinion that, in order to obtain the best results in the development of the country's natural resources, provision should be made for teaching the younger generation all that modern science has to offer. For these reasons he endorsed without qualification the proposal that the Provincial Government be asked to provide more generally for its mining educational facilities of the University

of British Columbia. This resolution also carried with enthusiasm.

Other resolutions, all of which were endorsed, may be summarized as follows:

Other Resolutions.

That the Provincial Government be asked to provide an Assay Office and facilities for the assay of ore at Prince Rupert, British Columbia.

That the Minister of Mines for British Columbia be requested to arrange for a tour through British Columbia with a party of British and American Mining Engineers, expenses of the same to be defrayed by the Government of British Columbia.

That the Department of Trade and Commerce be requested to arrange for the filming of British Columbia mineral samples and to use said pictures in connection with the advertising programme it now is preparing.

That the Postmaster-General of Canada be petitioned to remove the present restrictions placed by the Dominion on the importation of such second-class mail as representative American mining magazines.

That Members of the Convention assist in a movement proposed by the Spokane Chamber of Commerce, having as its object inauguration of a campaign of cleanliness in America (the idea of the Spokane Chamber of Commerce is to endeavor to induce the large cities to begin repainting their public buildings as well as private dwellings on a large scale. It was pointed out that this would increase the consumption of paint which is made up of a very large percentage of lead, and that, if the movement is successful, it not only will do good in the improvement of the appearance of communities, to say nothing of the improvement of sanitary conditions, but will in a very short time remove the present embarrassing surplus of lead.

The Opening.

The International Convention opened at 10.30 o'clock on Monday morning, March 17th, a short address of welcome being delivered by Acting Mayor Woodside. He congratulated the Chamber of Mines on the representative character of the gathering, referred to the importance of the mining industry to Vancouver as well as to the country generally and assured the visitors of the hospitality of the city of Vancouver. He advanced the suggestion that the work of opening up mining possibilities of the Province might be greatly assisted by the returned soldiers. There were many of these men unquestionably who would not wish to go on the land, and it was his opinion that the Government would be well advised to extent those who might wish to prospect what small assistance might be necessary. He concluded by expressing himself as assured that the deliberations would be productive of much good, and the hope that all associated with the gathering would have not only a profitable, but an enjoyable time.

Mr. A. M. Whiteside, President of the B.C. Chamber of Mines followed. His discourse was the same general character as the preceding speaker, but he continued by giving an outline of the programme prepared for the entertainment and edification of the delegates. Honorable William Sloan, Minister of Mines, then was introduced and formally opened the Convention in the following terms:

The Address of the Minister of Mines.

It is in my opinion a great honor to be permitted to perform the official duty of opening such an International Mining Convention, the first of its kind to be held in Vancouver. I wish, therefore, Mr. Chairman and gentlemen, to assure you at the outset of my appreciation both of the honor accorded me and of the responsibility of my task. My experience is that it is important that a Convention such as this should start well in order that it may progress and finish well. The proper understanding of our subject in gathering together should be developed and we should from the beginning allow full scope to that fraternal spirit and that common enthusiasm which mean everything if we are to derive the full benefits, in instructions and entertainment, from our three days association.

I want to congratulate the officials and members of the British Columbia Chamber of Mines. It is only necessary to glance about this hall, and to note the representative gathering of mining men, men of all classes of mining and from all parts of the Western Continent, to realize that the Vancouver Organization already has scored a pronounced success. We have visitors, distinguished visitors, here from California, Oregon, Washington, and other states of the neighboring republic, and I would be remiss if I did not, at this point, explain to them, not only as Minister of Mines of the Province of British Columbia but as a citizen of Canada deeply interested personally in the advancement of the mining industry in this country, that they are most heartily welcome. We are indeed glad to see them, and we shall look forward to hearing their views on the varied problems we are all facing as well as to the few days of pleasurable association before us. They have come, in most instances, from long distances to take part in the discussions which our programme proposes and to assist by giving us expression of opinions gained, in many cases, from practical and long experience. We appreciate their presence, we shall listen to and profit from what they have to say, and we sincerely hope that they will enjoy in every sense their stay in this city. As Minister of Mines I wish also to express my appreciation of the large attendance of British Columbia mining men. It is a pleasure to witness so practical a demonstration of their interest in the mining industry. I am sure that they will find their time well spent, in fact that must already be patent to them, at least to those of them who have had the opportunity before this of inspecting the very creditable exhibition which the British Columbia Chamber of Mines has prepared for our edification. And now just let me say that in my judgment it would be difficult to arrange for an event with greater possibility of good results in the advancement of the mining industry of the American West. I use the term "American" because it is applicable to the entire North American Pacific Coast, and I take it that the presence here of representatives from California to the extreme British Columbia North means that we appreciate that our interests, in so far as mining and its allied industries are concerned, and in no sense divergent but, in all their big and real problems, of a common nature. It is, therefore, very pleasing to face a Convention so constituted because of the confidence it gives that we are prepared to go forward, should to shoulder, with the united purpose of developing the great mineral resources of our united countries.

Now I might launch into an exhaustive account of the history of the mining industry of our province from the earliest years of its settlement, but it is not my intention

to so occupy your time. We have all read with keen interest of the discovery of coal in the early fifties on Vancouver Island and know of the subsequent development of that industry; most of us are well acquainted with the chief incidents of the Cariboo gold rush in the Sixties, and I venture that there are few mining men of this Province who have not listened to romantic stories from the lips of our worthy pioneers; there are men within hearing who could recount anecdotes of fortunes made by lucky holders of stock in those companies which sprung into prominence when Rossland Camp came into its own; and there are many here, no doubt, who are capable of giving a connected history of the development of the metalliferous mining of Kootenay, Boundary, and North and Southern Coast Districts of the Province. For myself I could, were I so inclined, regale you with some stories of the Klondyke, of fortunes made and fortunes lost overnight, of hardships endured and grim struggles having for their goal both life and gold, that would make the misfortunes of Robert Service's Sam McGee look tame. But again, I am not going to inflict these upon you. We are not here, I assume, to turn our eyes back in contemplation of the past but rather for the purpose of casting our eyes forward and preparing, in some measure, for the great task that lies before me.

A Good War Record.

It is interesting, however, for a moment that we should give ourselves the satisfaction of considering British Columbia's mineral production for the year 1918 because the record created, according to the conservative estimate prepared by the Department of Mines, is one upon which all our mining men may congratulate themselves. I trust that our visitors will not think that we are "patting ourselves on the back" unduly when I point out that the value of British Columbia's output for the last year was greater than that of the previous year while decreases are shown in six of the adjoining states. I refer to Utah, Nevada, Idaho, Colorado, California and New Mexico. The monetary value of the production of the Province for 1918 was \$41,083,093, which is \$4,072,701 greater than 1917, or the equivalent to an increase of 11 per cent. Only once in the history of the Province's mineral statistics has this output been exceeded and that was in 1916. And it is specially gratifying to contemplate the results of 1918, when it is remembered that 1916 was a phenomenal year, metal prices being abnormally high owing to war conditions.

If we take metalliferous mining alone we find that the difference as to value of output is not substantial, the total for 1918 being \$27,288,161 and that for 1917, \$27,284,474. These figures, however, are not a fair basis on which to estimate actual production for the reason that the war in 1917 was at its height and prices still were in the same position while in 1918 they began to drop. Thus we find that, while in 1918 our mines produced 63,387,010 pounds of copper as against 59,007,565 pounds in 1917, there is a decline in value of \$356,310. We also produced more lead last year but again, owing to price, a decrease is shown as to valuation. As to zinc there was a decline both in quantity and value. Coming to silver we find the condition reversed, production being slightly smaller but an increase in value of \$335,371 being recorded through improvement in prices. As to gold, British Columbia, I am happy to say, is in the exceptional position of having increased her output while most other countries, owing to

its fixed value and generally rising costs, have fallen back. It was our lode mines which sent production ahead, the improvement amounting to \$883,705. Our placer grounds, both in respect of hydraulic mining companies and the Individual miner, did not do as well, and as to the latter, to their credit be it said, the explanation is found, to a considerable degree, in the fact that those who could get away had volunteered and were fighting the battles of Canada and the Empire on a foreign field. Costs, of course, affected this class of mining seriously, but it is a notable fact that British Columbia placer mining camps were practically denuded of their young and able-bodied English-speaking manhood by the war. They were among the first to go, and they have brought honour to their country and to themselves. Before passing from this subject, it is interesting to speculate on the possibilities of the future of the Province with respect to gold mining. As I have said, despite handicaps which threatened this phase of the industry throughout the world, which were considered so serious that representative business men and mining men in the United States and elsewhere, discussed the expediency of bonusing the production of gold, British Columbia made a better showing in 1918 than in the previous year. It is to be remembered, too, that the Rossland Camp during this period was practically closed down, and it isn't necessary for me to explain to British Columbians that this is the largest single gold producing centre of our Province. The explanation, Mr. Chairman and gentlemen, is to be found in the accession to the shipping mines of the Province of the Surf Inlet property of the Belmont-Surf Inlet Mines, which made an output of 43,000 oz. And the reason that I mention this specially is to indicate the potentialities of British Columbia as a gold producer alone. When one mine is found sufficiently rich to so materially affect the Provincial production what may we not look forward to with the proper development of our resources in this respect? Should we not, I ask, with Rossland working to the extent of its capacity; with our other notable lode mines continuing production and other good prospects being developed; with our placer grounds being exploited to the fullest extent as in the past; and with labor more plentiful and costs at a more normal level—should we not, under such conditions, look forward to our Province taking a leading place on the continent as a producer of that standard of exchange for which the world, after the extremely trying ordeal through which it has passed, is very much in need in order that its economic equilibrium may be maintained?

Coal Mining.

Leaving the metalliferous branch of mining for the moment I want to refer to coal mining—one of the most important of the mining industries of the Province. I am pleased to note here that there are representatives of the collieries of British Columbia in attendance and that the programme committee has recognized the place they fill in our industrial life by providing for a discussion on questions which are of peculiar interest to them. I wish further to congratulate the collieries on the splendid effort they made during the four or more years of war to meet the urgent need which we, and the empire as a whole, had for their product. Both the operators and the miners are to be felicitated on the plucky manner in which they stuck to their guns throughout the whole period of the war. They have the satisfaction of knowing that they did their bit to the fullest extent and I for one would have them under-

stand that their work is appreciated. And I would not have it taken that in making this reference I am considering only the coal operator and the coal miner. They occur to me in this connection, perhaps, because I hail from the coal mining city of Nanaimo, which constituency I have the honor to represent in the Provincial Legislature. After all, all mining endeavor, of whatever class, is so inter-related as to be inseparable. So if I mention coal miner and his war work, I wish also to be understood to include the metalliferous miner. For though coal was a prime essential for the successful prosecution of the war so was copper, and lead, zinc and coal—and I might go right down the list. The operator of the Province and the miner of the province, whatever you found him, did his best. There were, of course, some misunderstandings, but they were quickly righted in most instances and generally, throughout the years of conflict, the spirit of patriotic service was so manifested as to make on proud of our country and of its people.

As to the coal production of 1918 a few figures may not be amiss. The Provincial Collieries show outputs, both of coal and coke, exceeding those of the previous year; the increased output of coal being some 142,093 tons, while that of coke was 30,751 tons. As the value of coal has advanced substantially the product of our coal mines for 1918 represents about \$12,794,932, an increase over 1917 of \$4,310,589.

If I may be permitted I wish here to make a few statements of facts as to the policy of the Provincial Government in respect of the Mining Industry. One of my first acts as Minister of Mines was to divide the Province into six mineral survey districts under the terms of what is known as the Mineral Survey Act. Over each District was placed a competent, fully qualified mining engineer. The object of this, briefly and generally, was to bring the Government and the mining fraternity of British Columbia into closer touch one with the other. The work entrusted to these mining engineers and the powers given them are laid down in the Act to which I have referred, and it is not necessary for me to recapitulate them in detail. It is sufficient to say that they were to meet each season in person as many of the prospectors, mining men and operators of their respective districts as possible. Listen to their difficulties and their problems and assist them in reaching solutions. Examine mineral claims, prospects and mines which required roads, trails, or bridges to facilitate their development and report as to whether in their judgment the future of such properties was such as to warrant an expenditure of Government moneys to assist in such work. They also were to obtain an intimate knowledge of their districts from a mineral and geological standpoint. Personally, I believe that they have done and are doing their work well. On their recommendations the Government has expended \$207,523.34 in assisting the development of the mining industry under the mineral survey and development act. Since January 1st, 1917, there have been built 98 $\frac{7}{8}$ miles of mining roads; 75 $\frac{5}{6}$ miles of mining trails and there have been repairs 437 $\frac{1}{4}$ miles of mining roads and 420 $\frac{1}{4}$ miles of mining trails. This is a record which, I think we are entitled to view with some satisfaction.

The engineers to whom I have referred have accepted invitations to address this convention, and I believe that you will find what they will have to say regarding the mining conditions in their respective districts will be interesting and valuable. They have been requested to deal with two special points, namely, the particular



HON. WM. SLOAN,
Minister of Mines, British Columbia.

sections of their respective districts that offer opportunity, and the best chances of good results, especially to prospectors looking for profitable fields in which to give their attention and the particular sections of their districts that offer the most promising possibilities for mining development. In my judgement we all find a discussion of these points by men who know of what they talk, most interesting and it will be specially valuable to mining men actively interested in the advancement of the industry in British Columbia to obtain this information and also especially valuable for those with capital for investment in mining properties.

Then there is the question of the development of our iron ores and the laying of the foundation for an iron and steel industry. This, gentlemen, is a big problem. It is one that might easily be made the exclusive subject of an address. I am not going to attempt to go into it exhaustively. When I assumed office it was with a conviction of the importance of this matter and an ambition to do something that would give the Province a start. How to begin was the question. It seemed to me that the first step was to secure ample data as to our resources and the work was instituted and still is in progress. I next recommended that the Government offer a bounty on the production of pig-iron in the Province and this was done. An Act now is on the statutes providing a bounty of \$3 a ton on pig iron manufactured in British Columbia from local ore and \$1.50 for pig-iron manufactured in the Province from foreign ore. My attention having been drawn to the possibility of overcoming the difficulties existing in the smelting of our

magnetite ores without the haematite for fluxing purposes by means of the electro-smelting method, I decided to have an expert make a report on this phase of the question. Accordingly, Dr. Alfred Stansfield, an acknowledged authority on this continent on the question, was given a commission to investigate and submit a report on the feasibility of treating British Columbia iron ores by the electro smelting process. His report has been received and was laid before the Provincial Legislature at the session now in progress. He finds that the treatment of our ores by electric smelting is not only feasible but practical. The only difficulty he finds is in the expense of electric power. That must be overcome in order, if we are to treat the iron ores of this province in this way, that British Columbia pig iron may be produced at such cost as will enable it to take its place successfully in the markets of the world. And now I come to our most recent declaration of policy on this question. There are at present two firms possessing small smelters close to Vancouver whose representatives came to me recently and said, in effect, "If the Government will guarantee us a supply of magnetite ore at a certain rate for a specified period, we are prepared to make necessary changes in our plants to put the electro-smelting process of these ores to a practical test." After consideration the Government agreed to this, and the result is the introduction of legislation at the present session giving the Minister of Mines power to take ore from iron properties which are lying idle for such experiments, the owners, of course, to be recompensed. In leaving this subject I wish only to add that the Government is sincere in its desire to promote this industry, that it is fully alive to its importance, and while it will continue to offer every encouragement to those manifesting a desire to assist in launching such enterprise. I am hopeful that, as in Nova Scotia, where one of Canada's premier industries grew from a small forge-shop in a trifle over sixty years, one or both of the small plants to which I have referred will prove to be the basis of the industry which we are all so anxious to see flourishing in this province.

The Future.

The future, Mr. Chairman and gentlemen, is bright. We are now busy making preparation for an assured season of pronounced activity. Keeping the conditions in mind it is gratifying to find in our province that the largest companies are pursuing the policy of keeping their organizations as well staffed as possible by undertaking development work, improvements, additions to plant in order that their men may be kept busy and their industrial machinery prepared for the opening of the reconstruction period. The tendency of the future is and will be towards closer co-operation between employer and employee.

The development of this policy to the fullest extent, in my opinion, will brush away many industrial troubles and lead to amity, prosperity, and mutual goodwill in all industrial centres.

As far as the Government of this Province, of which I have the honor to be a member, is concerned, I have no hesitancy in saying that, while it will use all its influence towards the preservation of these good relations, it realizes the importance also, and in fact the necessity if our resources are to be developed, of pursuing such a course as will assure Capital a legitimate and fair return on investments which must necessarily be made in the opening up of our undoubted mineral resources.

If this spirit is engendered now and if we all face the present with tolerance and in the united determina-

tion to bridge the gap the reward will come as surely as the sun will rise tomorrow. And when the nations turn their eyes and thoughts from the tremendous and deadly struggle into which they have been plunged and direct attention to the reconstruction of all that has been destroyed by the scourge of war. This change cannot be much longer delayed. Soon the world will be plunged, almost as feverishly and as largely, into the work of re-building as it did into the task of defeating that evil which the Kaiser's Germany represented. And then will come the demand for everything into which the metals of our mine goes. There will be a good market, a steady market, and what is particularly gratifying, our product will go, not into implements of destruction, but into articles for the acceleration of peaceful pursuits—the advance of civilization. There will be plenty of work for all our mines and smelters, if, I may venture on a further prophesy, will be figuring on means of increasing their productivity.

I wish again, Mr. Chairman and gentlemen, to thank you for the opportunity given me of addressing you. I trust that you will have a very pleasant and profitable time in the course of this convention. It seems to me that it cannot but be of great benefit to the mining industry of this province as well as to the entire Pacific Coast.

Once again, on behalf of the Government of the Province of British Columbia, I extend a cordial welcome to our visitors, and more especially to those visitors from across the line. Mr. Chairman, there is no line. We on this continent have lived in peace and harmony for over 100 years. In the great Conflict, which has just been so triumphantly concluded, the sons of the United States and of Canada, your sons and our sons, have mingled their blood on the field of Flanders in the fight for common freedom. We have been cousins in the past, but now and for the future we are brothers.

Mr. Chairman, I have pleasure in formally declaring this convention open.

COL. LEONARD AT THE Y. M. C. A. LUNCHEON.

At noon there was a complimentary luncheon under the auspices of the National Council of Y.M.C.A. Industrial Department, the chief speaker being Lieutenant-Colonel R. W. Leonard, St. Catharines, Ont., President of the Coniages Reduction Company, and President of the Canadian Institute of Engineers. Colonel Leonard in a brief address explained that he was on the coast on a holiday when approached to say something as to the benefit of Y.M.C.A. industrial work to the Convention delegates; he, therefore, was not present as the official representative of the Canadian Institute of Engineers, but was sure that he was conveying the sentiments of the members of that organization when he extended their greetings and their best wishes for the success of the Convention. As to Y.M.C.A. work, there were no terms too emphatic in its commendation. He had seen it in operation overseas, and the only criticism ever heard was that the Y.M.C.A. bases were all at the front, and few were to be found very far back from the line. Experience gained in Eastern Canada in connection with industrial concerns was that the Y.M.C.A. was a great help in providing means of education, of entertainment and other profitable lines of occupations for the workers. He had no hesitation in recommending employers of large bodies of men to permit the co-operation of the Y.M.C.A. Industrial Department for the maintenance of good relationship between management and men and for the creation in industrial centres of a general feeling of contentment and happiness.

In the afternoon the chair was taken by Déan Henry Landes of the University of Washington, who filled it very acceptably. This session was featured by a series of addresses by the mining engineers of the Province of British Columbia. This Government staff of technically qualified men has a membership of seven at the head of which is Mr. William Fleet Robertson, Provincial Minerologist. The other six preside over the mineral survey districts into which the province has been divided under the terms of the Mineral Survey and Development Act. Each of these engineers had been asked to prepare a paper on the mineral resources of his particular district bearing in mind two specific points, namely: areas in which good results might be expected from prospecting endeavors and areas which, in his judgment might be expected to furnish good returns on invested capital. As these are two important matters, and as the information expected is of great importance to the prospectors and to the intending investors the addresses of the engineers were looked forward to with much interest, and the hall was crowded when they were announced.

Mr. Fleet Robertson was first called, but confined his remarks to the statement that the estimated value of the mineral production of British Columbia for 1918, as contained in the official bulletin entitled "Preliminary Review and Estimate of Mineral Production, 1918" was well within the facts. This showed that the 1918 production reached the total value of \$41,083,093. Mr. Robertson was glad to say that this figure was more than within the mark and that when final returns were available it would be increased to a slight extent. He excused himself from going further into the matter of the mineral resources of the province on the ground that the engineers who were to follow were more closely and directly in touch with conditions within their respective districts.

THE NORTH WESTERN MINERAL SURVEY DISTRICT, B.C.

By G. A. CLOTHIER.

Mr. George A. Clothier, Prince Rupert, engineer of the North-West Mineral Survey, Number 1, then was introduced. His address follows:

A year and a half ago the Provincial Government divided the Province into six Mineral Survey Districts, and placed a qualified Mining Engineer over each District.

I was appointed for North Western District No. 1, which, as the name indicates, includes all that North-Western portion of the province extending from Seymour Inlet, north to the Northern boundary of the province, a distance of about 600 miles. It varies in width, exclusive of the islands, of from 100 miles along the G. T. P. to the full width of the Province in the North, where it includes the Liuid Mining Division.

It contains many distinctly favorable features and advantages, both geographically and geologically, which are probably not appreciated by the prospector and mining people.

Of the 600 miles in length there are about 300 miles of direct coast line, the remainder consisting of that portion lying behind the Alaska strip, with the exception of the Rainy Hollow section lying west of the Lynn Canal and accessible by waggon road from Haines.

The Coast Range consisting of grano-diorite, extends the full length of the district and is bordered on each side by the sedimentary rocks through which it has intruded.

For convenience in description of the prospecting areas the District may be divided into three parallel zones or belts, viz.: the main, granite, coast range, which varies in width from 50-100 miles; the Western Contact Zone, extending practically from the coast line westward and including all the inshore islands and those of the Queen Charlotte Group further West. In my district the Western contact belt therefore extends from the head of Vancouver Island north to Portland Inlet which forms the Southern boundary of the Alaska strip, and also an area in the extreme north-west corner known as the Rainy Hollow Section. The third is the Eastern Contact Zone, extending roughly from Terrace on the G.T.P. north to the Yukon-B.C. boundary line, a distance of between 400 and 500 miles, the Kitsumkalum and Lakelai Valleys probably marking the immediate contact of the granite and interior formations.

Taking the first mentioned belt, the granite coast range, its importance from a prospecting standpoint is exemplified by such showings as the magnetite deposits on Seymour and other inlets in the Bella Coola Mining Division; the quartz veins of the Belmont, Surf Inlet Mines Co. on Princess Royal Island; the Drum Lummon property on Douglas Channel; the immense pyrite deposits on the Estall River; the Outsider and Maple Bay groups at Maple Bay on Portland Canal; the Georgia River Mining Co.'s showings in Portland Canal, each representing a different class of ore deposit withing the granite, and as such of special interest to the intelligent prospector.

The Belmont Surf Inlet.

The Belmont, Surf Inlet, ore consists of a quartz vein carrying pyrite and chalcopyrite with gold and silver, averaging in all values about \$12.00 per ton, and in width 14th. or more, recent work showing an increase in vein width over the upper and older workings.

The vein has been formed in a sheared belt in the granite, the shearing action providing the channel through which the silica and mineral bearing waters have circulated and deposited their loads, in the form of a quartz vein. Prospectors should therefore note any signs of movement in the granite.

The property is equipped with an up-to-date plant, in every way. The Concentrator is of 300-ton daily capacity, using both water concentration and flotation the ratio of concentration is 10-12 into one, and the recovery very satisfactory.

The company has made an enviable first year's production of approximately a million dollars, mainly gold, but with some silver and about a half million lbs. of copper. Quartz veins in the granite seem to pay pretty well.

The Drum Lummon represents a different type of deposit in that it is a replacement vein following along an acidic dyke, which has formed the necessary channel for circulating waters. These replacements of the granite in quartz vary from a foot to ten feet in width, and carry varying amounts of the high grade copper sulphides, corellite and bornite, with chalcopyrite. The equipment consists of a small compressor and a recently installed mill of the Gibson type, with which experiments will be taken on in the Spring.

The extensive pyrite deposits on the Estall river represents still a different type, occurring in a wide belt of sedimentaries enclosed in the granite.

The Maple Bay deposits are quartz, mineralized with pyrite and chalcopyrite, and seemingly are filled fissures in the granite.

The Outsider group shipped several thousand tons of ore some years ago to the Crofton Smelter, returns from which show an average of 56 lbs., or 2.8 per cent copper per ton. It has again been under development during the past year with very encouraging results, showing a big tonnage of concentrating ore which I judge would respond well to flotation treatment.

From the above samples of properties which have been found in the granite, I would think that this zone would be well worth the prospector's attention. It is the cheapest and most accessible area to prospect that I know of. Fishing tackle and a gun will furnish 75 per cent of a prospector's grub and there are thousands of miles of bays, inlets and canals, curving into the mainland, providing not only prospecting routes, but assuring unequalled transportation facilities for lower grade ores than could otherwise be handled.

Opportunities for Prospectors.

It has never been systematically prospected, though there have been hundreds of claims staked by fishermen, hand-loggers and trappers; if there is a real prospector present I would ask him what the general run of loggers or trappers know about mineral. What this Section and in fact the Province needs more than anything right now is prospectors—what I am.

I might add that there are a number of promising looking prospects requiring a little money to try out.

Taking up then, the second, or Western Contact Zone, which includes all the islands, the Queen Charlotte and those near the Mainland, we have practically the same prospecting conditions, but a different formation. This is composed of sedimentaries, altered more or less near the granite, and intruded by many spurs, and isolated masses from the main granite range, as well as cut by many dykes of all kinds of igneous rocks, all tending to produce conditions exceptionally conducive to the circulation of mineral bearing solutions and ore deposition.

The Ikedo Mines on Morseby Island of the Queen Charlotte Group has shipped for several years producing several thousand tons of high grade chalcopyrite ore.

The South-Eastern, on Graham Island, has been under development for the past year with results that warrant further extensive investigation. Several other properties are also being explored by mining men.

There are good and sufficient reasons why the oil showings on the Islands should receive a thorough investigation, something they have never had yet.

The islands near the coast have never had any amount of real prospecting.

The third belt, on the Eastern Contact Zone extending as stated from the G.T.P. north to the Yukon-B.C. boundary line, a length of 400-500 miles. This zone has been opened up principally at the head of Portland Canal and Observatory Inlet or Alice Arm, and I have no hesitation in saying that if the balance of the zone equals the known portion, it will prove the greatest mining area on the continent.

This portion of the District lacks the natural transportation facilities of the Coast Section, it being only accessible in spots, but they have proved and are still proving to be, some spots.

The furthest south available point on it, in my District, is on the G.T.P. where the granite range is about 100 miles wide. Some little prospecting has been done in this Section resulting in some fair showings on the Zymoetz River, Thornhill Mountain, and around Kitsumkalum Lake. I noticed a fine specimen of free gold in the exhibit from Thornhill Mountain, just across the Skeena River from Terrace.

The only place on the belt on tidewater is at the heads of the Portland Canal and Observatory Inlet.

The Granby Plant at Anyox.

The operations of the Granby Consolidated Mining, Smelting and Power Co. at Anyox have of course provided the bulk of the output of the District. The production this year in copper being about 31,000,000 against 28,000,000 lbs. last year. The company has very extensive additions and improvements under way, notably the installation of a coke and by-products plant costing about two millions of dollars, and which, under normal conditions would have been completed early this spring.

The company has had a Pilot Mill, of 100 tons per day capacity in operation for over a year, experimenting with the concentration by flotation, of its own ores, both from Hidden Creek and its Alaska properties. The flotation of the silicious ores has presented no difficulties, and I understand that some measure of success has been obtained in the selective flotation of the heavy sulphide ores. This company has been a boon to mining on the coast, for its engineers are always in the field for ores suitable for its purposes. They have done a great amount of exploratory work principally by diamond drilling and at all times has been a God-send to the prospector and small operator when supplies were necessary.

The Dolly Varden.

In the Alice Arm Section a great deal of development work has been done principally by the Dolly Varden Mines Co., whose holdings lie about 19 miles from tidewater up the Kilsault River, this property and the Wolf Group belonging to the same company, and lying about two miles further up on the river on the east side, has an immense tonnage of commercial ore, estimated at a half million tons, proven by diamond drilling. The average ore will make a fine grade for milling purposes, and there are several thousands of tons of high grade shipping ore ready to be mined.

The company has been engaged during the past two summer seasons in constructing a railroad from tidewater to the mine. This work has been delayed for different reasons, but it is hoped that all difficulties will be early adjusted in order that the district dependent on the operation of the railroad will have the opportunity for activity which transportation will give. A very complete report on this section was made by Professor Turnbull and published in the Minister of Mines Report of 1916. I went over the Section again during the past season, and as the yearly report will be published shortly, think it unnecessary for me to go into detailed description of the different properties. I was very favourably impressed with the whole section, and I look to see at least eight properties other than the Dolly Varden quickly develop into shipping properties as soon as rail transportation is assured. In fact, I have never before seen, in such a comparatively small area, so many strong, well defined veins and no section where there are better chances for the mining investor. From a prospector's view the Kitsault River has been fairly well staked on both sides, but I believe there is still plenty of vacant ground higher up. There is one good feature of this particular section, and that is that there has been little or no blanketing of the country by individuals staking claims, and therefore there are more individual owners and more assessment work, and good intelligent work, too, in the majority of cases, than in most sections, all going to show that where this East-

ern belt is intelligently prospected and good horse-sense used in development work, it will give satisfactory results.

The rock formation which has, so far, been most prolific of ore-bodies, is the greenstones or andesites, locally known as the Silver belt, since all the silver showings occur in it. The general vein filling is a pyritized quartz, or a pyritized silicified greenstone carrying the metallic minerals, native silver, the silver sulphides, argentite and ruby silver, and in places, galena and zinc. Such deposits or veins are shown in the Dolly Varden; the North Star adjoining the Dolly Varden on the North and possibly containing the continuation, down the hill of the Dolly Varden vein; the Toric Group; the Tiger Group; the Musketeer; the Wolf; the Second Thought; the Moose; Last Chance; Silver Horde, and other groups, all with big, well-defined veins of from 5 ft. to 30 ft. in width and the majority of them showing in places, high grade silver values and well worthy of further development.

Around the borders of these greenstones where in contact with the slates are sedimentaries, or near dykes intruding the slates, are found the copper, in the form of chalcopyrite, deposits. In this class of ore deposits there are the Homestake Group, at the head of Kitsault River, and several individual claims above it; the Vanguard Group, south of the Homestake, and on which there is a fine surface showing of calcopyrite about 6 ft. in width; the Wild Cat, on which shipping ore is exposed; and several other groups, all on the west side of the Kitsault River.

Further south, or nearer Alice Arm, the rock formation changes to a slate in which occurs the small high grade quartz silver veins of the La Rose, the Black Bear, or Roundry property, each of which made small shipments of high grade during the past season. A trail, 2 miles long was built with the assistance of the Mines Department from the railroad to the La Rose Mine. There are also other promising looking properties such as the Independent Group in this slate formation which are under development by the owners.

Up the Reliance River, which flows into the head of Alice Arm, the slate formation of the lower Kitsault River prevails, and has the same small, high grade, quartz veins as noted on the La Rose and Black Bear properties.

So far as prospected yet the most encouraging showings are pretty well up the river, from 10 to 16 miles from tidewater. Considerable prospecting work has been done on the United Metals and the Seven Bell groups on the west side of the river, and on each of which there are several small high grade, silver-bearing veins. No depth has been obtained on either property, but there is every reason to believe, from the number of exposures of shipping grade ore, that they will become producers of a small tonnage of high grade ore. The Monarch groups on the east side of the river also make a fine showing, several other properties equally as promising might be described, but that is not the object of this paper. There is a fair trial from the beach to the head of the river. About four miles from Alice Arm on McGrath Mt. are several fine showings of zinc ore, notably that of the Standard group which, where an open cut exposes apparently a width of quartz of 60 ft. carrying disseminated blend, which also occupies in brushes and hands of up to 2 ft. in thickness. The continuity of the vein has not been determined, but it is a remarkable out cropping of zinc ore. Further up the hill the Silver Band group also has a very promising showing.

Taking the out-croppings, the very encouraging results of any development, and the proven properties, into consideration, one cannot help becoming enthused with the possibilities of such a section. If the prospector could be made to understand the difference between living in luxury the rest of his life by getting, say \$25,000 for his property, instead of plugging along and dying poor by wanting \$100,000, there would be little difficulty in financing the promising looking prospects I look for this section to make one of the permanent mining camps of the province.

Bear River.

Further north this eastern contact belt is again being prospected and developed in that section of the District at the head of Portland Canal, up the Bear and Salmon River Valleys. There was a considerable boom on the Bear River Valley in 1910-1911, in which a lot of experience was gained by a lot of people. The Section has been more or less idle ever since, and there is no possibility of the revival of the mining industries, except absolutely on the merits of the properties.

Geologically the section is similar to Alice Arm and Angot, consisting of areas of sedimentaries intruded by dykes of all kinds, and areas of igneous rocks, principally greenstones, which appear, so far as development has reached, to be the most favourable formation for ore bodies. The remarkable discoveries up the Salmon River have done much to restore the confidence of the old timers, who have stayed with the camp, and turn the attention of the mining world to this once over-looked camp. Above the town of Stewart, up the Bear River Valley, work has been continued on several properties with results that justify the faith of the owners in their properties. It has been a hard and discouraging time, for they knew that only time or exceptional merit in a property could start anything. However, there are several properties that have the ear marks of developing into producers.

On Glacier Creek there are several good showings, while the copper showings at the head of the Bear River are improving steadily with each year's work. I look for gradual resumption of development in some of the older properties which were exploited in the earlier days. It has been the history of all camps that such properties usually receive investigation later. This valley will some day be the outlet for all that portion of the province lying north of Portland Canal and back of the Alaska Straits.

Salmon River.

The Salmon River has had the greatest attention, due to the remarkable development of the property of the Salmon-Bear River Mining Co., better locally known as the "Bush" mine. The property was worked for a couple of years by New York interests, who failed to develop any commercial ore. The present owners came along, and with practically no work opened up a high grade shoot of ore lying in the mineralized zone of actual greenstones which the former people had exploited for a couple of years.

Estimating from average samples taken all along the present working tunnel, for the length exposed along the ore shoot and the depth of backs from the surface, give a rather startling gross value of possible ore. The company constructed a sleigh road last summer from the mine to the beach, a distance of 16 miles, which has been utilized this winter for hauling down ore. Some 200 tons have been shipped, and about 450 tons have been

hauled to the beach and will be shipped as soon as possible, and it is expected that 300 or 400 tons more can be taken out this winter. It is estimated that this ore will run well over \$200 per ton, which will give a minimum production of \$160,000 for 800 tons, in say 6 months, from a property as yet being worked by hand. Truly a wonderful showing of gold-silver ore. The very fact that so much work was done by thoroughly competent mining men without results, and the disclosure of such a remarkable shoot of ore, with other shoots only partially opened up, gives every property or showing in that section the possibility of developing into a winner. Two other properties above this one, the Mineral Hill group and the Big Missouri, have surface showings practically identical, with that of the Salmon Bear River property. The Big Missouri heretofore has been considered an immense deposit of complex ore requiring unlimited capital to develop and treat, but the uncovering of high grade ore apart from the old known deposit has placed the property on a different basis entirely. I understand that the present bondholders, D. D. Mann and associates, intend diamond drilling the new find the coming season.

Should this prove satisfactory it will mean the opening up of a section of country in the upper Salmon River Valley, for which rail transportation will be provided, and which will, I believe, become one of the great mineral producing areas of the province. Such other properties as the Yellowstone and 49 groups above the Big Missouri, the Pay Pool, the Indian Mines Co.'s property, the International group and several others, give good solid reasons for believing that the future of the section is assured with the outlay of the necessary capital to develop it. The Sleigh Road to the Salmon Bear River property will be converted into a waggon road this coming summer, and will probably be extended as a winter road for 5 or 6 miles further up the valley, on a route selected to serve the greatest number of properties. When completed this road will provide adequate facilities for getting in any machinery, etc., necessary for development work on any scale.

From a prospecting standpoint the one unfortunate feature in this and the Bear River Valley Sections is the tendency of a few individuals to stake all the country from year to year to the exclusion of others who might do some real prospecting. Several new finds were made last summer, and work done on older showings has proven very satisfactory.

Considering everything, the Portland Canal and the Alice Arm Sections give every opportunity for prospecting, and I know of no other country where an investor can get a better real run for his money than these mineral areas.

The two sections represent a length on the Eastern Contact Zone of possibly a hundred miles. Should the balance of the zone north and south prospect with results equal to this portion, the statement made a moment ago that this zone will make the biggest mineral producer in the province seems very reasonable, and looking into the future the possibilities of rail transportation, along the eastern flank of the coast range from Iskut River South to the outlet to the sea by the Bear River valley, may not be so very remote at that.

There has been some little activity in mining up the Stikine and Iskut rivers, but the navigation of these rivers has been the handicap to the prospecting of these sections. From reliable information from Dominion Public Works officials, I believe these rivers could be made navigable for six months in the year for light draught

river boats. I went up the Iskut a year ago, but unfortunately ran into a snowstorm, and was able to see only a portion of the country along the river. I expect to make a trip this year from the Iskut south along the east of the coast range to the Bear River valley.

Of the country at the head of the Stikine and the Dease Lake section I have no knowledge except reports by men who have operated in there, and who are very optimistic. This section I hope to include in my work for the coming year.

Further north the same eastern contact zone is again found in the Atkin Lake section reached from Skagway by the White Pass R.R. to Carcross, where the lake steamer loads for Atkin. This section has produced many thousands of dollars in placer gold, and from my observations this year will, I judge, produce for many years to come. Lode mining has always been neglected for placer, and I was surprised at the small amount of prospecting that has been done. It is probably one of the finest sections in the province during the summer months. Atlin Lode being 2,200 elevation, the surrounding hills are comparatively low, with little or no timber except along the lakes and in the creek gulches, therefore an ideal country to prospect so far as weather and other conditions are concerned.

The only properties under operation, other than the placer, were the Engineer and the Lacediere Group. I visited several showings all about the same characteristics, quartz veins lying in the sedimentary rock formation, which is the prevalent formation of the section. I also went over the Venus and Venus extension groups just across the B.C. Boundary in the Yukon Territory.

The Engineer Mine.

The Engineer Mines is the most important property in that section, and has been developed to that stage where a larger plant is necessary. I believe the owner, the late Capt. Alexander, who went down on the Sophia, was on his way out to complete negotiations for the sale of the property. It is a wonderful showing of Bonanza ore and when put on a good working basis should make the largest gold producer in the province. 600 lbs. of ore taken out in ordinary development work from the drifts from the shaft, produced 24 lbs. of gold. Comparatively little work has been done on surrounding properties, no doubt because of the prohibitive cost of everything pertaining to mining, and especially there, where incoming freight costs from \$50 to \$60 per ton. The White Pass Railroad were giving a rate of \$8.25 per ton in car lots from Atlin to Vancouver or Tacoma, showing that the freight rates on ore are not excessive.

There is an immense area of accessible country, practically unprospected except along the lake shores, from the Yukon-B.C. boundary line, south of Take Inlet, along this Eastern zone, which should be as favourable a section for exploration as any in British Columbia.

This country was practically depleted of men during the war, but I have no doubt that with the return of so many whose training has fitted them for just such a life, that there will be quite a rush to the north again.

There are many exposures of quartz which have had only a small amount of work done on them, and which justify considerable exploration, so that there are opportunities for the investor in this section.

In conclusion, I would like to give you some idea of the importance, production and progress of this North Western District during the past four years. In 1914 the total output was..... In 1917 this had increased to \$..... and in 1918 was \$.....

an increase of \$..... over 1914 and \$..... over last year. The whole due mainly to the output of the Granby Cons. Co. The main feature, however, is the fact that last year there was a new shipper producing nearly a million dollars and several others, the Dolly Varden, the Salmon, Bear River Mining Co., and the Engineer Mines, brought up to the shipping stage, and which will probably in a year's time, increase the output while coming along are other properties which are being developed to the shipping stage, and lastly, are the prospects that require the money and are waiting for your investigation.

I trust the vocational training of the best of the returned men will be along the line of the prospector for this province has got to have them.

Mr. John D. Gallaway, Engineer of the North-Eastern Mineral Survey District then read the following paper:

NORTH EASTERN MINERAL SURVEY DISTRICT.

By JOHN D. GALLAWAY.

The object of this paper is to present briefly some information regarding that vast expanse of territory now known as the North-eastern Mineral Survey District. In particular, I wish to point out, first, partly known and prospected mineral areas where claims are new held which are worthy of and waiting for further development; and second, those areas which at present are unprospected but which may be considered as promising fields for prospecting.

To begin with I am going to give you an outline of the geographic features of the district and a brief review of its mining history.

The North-eastern Mineral Survey District embraces four mining Divisions — namely, Omineca, Cariboo, Quesnel, and Peace River — with an area of 100,000 square miles. It occupies a large part of the northern portion of B.C. its western boundary being roughly, 100 miles from the Coast, its northern and southern boundaries being about 200 miles from the respective Provincial boundaries, and its eastern boundary being the British Columbia — Alberta Boundary — line.

The northern, western and southern boundaries of this district are the arbitrary boundary-lines of the Mining Divisions, but these, where practicable, always follow the watersheds of the country. The western boundary is well marked, following, as it does, the divide of the Coast mountains. The southern boundary extends from the Coast mountains easterly across the Fraser plateau, following a much less definitely marked watershed to the Rocky mountains, where the line crosses obliquely the axis of the mountains. The northern boundary is country which is virtually unexplored, the Liard Mining Division.

This district is a part of the Province frequently referred to as "Northern British Columbia" all of it lying north of latitude 52 degrees, and extending up to latitude 58 degrees. A large part of the district is as yet very little known and many sections are hardly explored.

The North-eastern Mineral Division covers such an immense area that its topography embraces many widely different types. An almost infinite variety of mountain shapes and reliefs can be seen, giving way in places to great expanses of plateau areas. Lakes are numerous and many large rivers are included in the district.

In a general way this district consists of a section from the divides of two systems of mountains, with a plateau area — including mountains — lying between.

The Peace River Division is not included in this consideration, as it lies to the east of the Rockies system, and most of it belongs geographically and topographically to the Great Plains of the North-west.

Summary of Mining History.

I shall now summarize briefly the history of mining in the North-eastern District commencing with Placer Mining and then Lode Mining.

Mining in B. C. began with the discovery of gold in the Cariboo District in the early sixties, and for some time this was the only important mining being done in the Province. These placer operations centred around the old town of Barkerville, where a number of creeks yielded phenomenally rich pay. The placer production of the Cariboo District reached a maximum about 1863, amounting to about 4 million; since that time the annual output has gradually decreased, although fluctuating up and down, to about \$200,000 in 1917.

As the rich diggings were worked out many expensive plants have been put in to handle the large quantities of low grade ground left behind by the old miners, but in the majority of cases these enterprises have been unsuccessful due to inadequate preliminary testing of the ground and lack of proper engineering skill. In some cases where the engineering was all that could be desired the ground proved too low grade to work at a profit. Many low-grade areas probably could be worked hydraulically but water is not available unless at a prohibitive cost of installation. Dredging may yet be used to recover the gold in some of the areas.

In the Manson section of the Omineca Division placer mining has been carried on intermittently since 1864 but has never been as important as in the Cariboo District. This area is still remote from transportation and nothing would reawaken interest, which is now nearly dormant, like a discovery of some new rich creek.

Prospecting for lode gold, silver, copper and lead commenced about 1902 in the western end of the North-eastern District, in the territory contiguous to the Skeena, Bulkley, Telkwa and Zymoetz rivers. In 1909 and 1910 silver-lead deposits were discovered in the vicinity of Hazelton, and a little later copper deposits in the Rocher de Boule mountains were located. Comparatively, little development was done on these numerous claims, beyond annual assessment work until the completion of the Grand Trunk Pacific Railway was well within sight. In 1913 the railway was finished to Hazelton and shipments commenced from the Silver Standard mine. In October, 1914, the gap between Hazelton and Fort George was finished, and the new transcontinental railway became an accomplished fact.

Rocher de Boule.

In 1915 and 1916 there was considerable activity in the Hazelton and Telkwa sections but the high cost of supplies and scarcity of labour in the two last years have retarded development. The biggest producer in the District has been the Rocher de Boule mine which from 1915 to 1918 made an output of roughly 40,000 tons of ore worth nearly 1½ millions of dollars. About 90% of the value in this ore is in copper, the other 10% being in gold and silver in nearly equal proportions.

This property is well equipped with a 4½ mile tramway system hydro-electric power plant, commodious camp buildings, all necessary machinery, etc. It has been developed by tunnelling to a depth of several hundred feet. All this ore production so far has been shipped straight as taken from the mine without concentration or sorting. On one vein considerable tonnage of milling ore has been developed.

The mine was closed down in the fall of 1918, the reason given being: "It was thought best to suspend operations until such time as conditions became normal again."

The Silver Standard.

The Silver Standard situated five miles from Hazelton is a silver-lead-zinc property which has made satisfactory progress since the completion of the railway. The property is developed to a depth of 450 feet and a considerable tonnage of milling ore proven. There are a number of parallel quartz-filled fissures, four of which have been shown to be valuable veins. Mineralization is with galena, zinc blende, and gray copper, and the ore runs well in silver.

The property now is equipped with a 50-ton concentration plant designed and built by the Faust Concentration Company of Vancouver. The lead concentrate which is shipped to Trail will run about 50% lead and 150 to 200 oz., in silver. The zinc concentrate which is shipped to the United States runs about 40% zinc and 60 oz., in silver. The property is well equipped and in good shape for continued production. It is impossible in this brief outline of the North-eastern District to do more than indicate briefly the mineral types found.

In the western portion of the district, viz, the Skeena River, Hazelton and Telkwa Sections many different minerals are found. The occurrences may be broadly divided into two groups, copper-gold and silver-lead-zinc which however grade into one another.

Ore deposits carrying the following metals occur in the district:— Gold, silver, copper, lead, zinc, cobalt, molybdenite and arsenic.

In the south-eastern portion of the district i.e., in the Cariboo District, gold is the one important metal found, the production of it as yet having been almost entirely from placer mining, but with the possibility that in the future it will also be obtained from lode mining.

Physiographically the whole western part of the Northeastern District is made up of a part of the Coast mountains and the Bulkley mountains. Geologically this area is a promising field for the occurrence of minerals as it consists of old sedimentary and volcanic formations intruded by batholiths, stocks and innumerable dykes of granitic alioritic and allied igneous rocks. All these injections of plutonic rocks caused fracturing, shearing and fissuring of the older rocks while the expiring stages of batholithic activity as represented by emanations of mineral laden solutions and gases, provided the necessary minerals for the formation in suitable places in the fractured zones of valuable ore-deposits.

Areas in the North-eastern District where there are claims which offer possibilities for the investment of Capital.

Along the Skeena and Bulkley rivers and their tributaries there have been hundreds of thousands of claims staked. Many of the showings of course are not

worth putting stakes on, but scattered throughout are claims which have sufficient merit to warrant more or less development with the promise of eventually becoming productive mines. The predominant mineral types in all this area are copper-gold and silver-lead.

The sections which warrant the attention of those seeking mining properties are the Skeena River section, Hazelton section and Telkwa section.

In the Skeena River section the most important places are claims in the vicinity of Usk, at the head of Kleanza Creek and on the Zymoetz River slope, at the head of Legate Creek, on St. Croix Creek and on Fiddler Creek. The showings at the head of Kleanza Creek consist of impregnations of high grade copper ore in sheeted zones, which are however generally indefinite and irregular. The possibilities of this camp are along the lines of developing a large tonnage of low grade ore rather than in mining in a small way the seams and bunches of high grade ore.

During the last two years the prospectors owning claims have shown considerable energy in working on their claims. The showing here consists of high grade copper ore — bornite — closely associated with galena and gray copper. The present development shows several well defined veins in which bunches of high grade ore are found. Several properties in this vicinity are worthy of serious investigation.

In the Hazelton section there are a number of claims on Rocher de Boule mountain in which the veins are similar in type to those of the Rocher de Boule mine. Some of these undoubtedly are worth investigation and further development.

Near Hazelton the **American Boy property** which is at present lying idle has a number of veins very similar in type to those of the Silver Standard. It is developed by a shaft to a depth of 250 feet.

Nine-mile Mountain, 10 miles from Hazelton, has a number of silver-leads showings, the more important of which are at present under option to an Ontario syndicate. Other claims on this mountain are worth more investigation.

In the Telkwa section there are number of claims on and near the head of Driftwood Creek in the Babine Range which have sufficiently promising showings to justify investigation. Of these the Victoria group owned by P. J. Higgins of Spokane and the Debenture group are silverlead properties, and the Harvey and McCabe properties contain high grade copper minerals. Cronin's property which has been intermittently developed for the last nine years and to which a 30-mile sleigh-road was constructed last year by the Government, is in this section.

Another area in the Babine range which is tributary to Telkwa is Dome Mountain on which a number of gold bearing quartz veins have been located but only slightly prospected.

Many claims have been staked near the headwaters of the Telkwa river and the South fork of that stream, and some of these may with further development prove valuable.

Intermittent development of claims on Hudson Bay Mountain has been carried on for some years past, and there are some possibilities here for leasers. These claims are not at a great distance from Smithers, the railway divisional point, and the side of the mountain is now served by a good sleigh road.

In the Cariboo district generally and in the Barkerville section particularly many attempts have been

made in the past to mine gold-bearing quartz veins, but no success has attended these efforts; many of the attempts were badly conceived and never had a chance to make good. Repeated failures have given the district a bad name with the result that it has been difficult to interest capital in any new properties or showings.

A few years ago E. E. Armstrong started prospecting in this section, and finally located claims on Proserpine mountain, about three miles from Barkerville. Mr. Armstrong spent a long time in tracing up indications of gold in the steam-gravels and panning the country far and wide, and now believes he has found the "mother-lode" of Proserpine mountain. It is to be hoped that his toil and optimistic faith will in the future be adequately rewarded.

There are number of well-defined quartz veins on these claims varying in width from 1 to 30 feet. These veins are mineralized in places with pyrite, arsenopyrite, and a little galena. The main valuable metal content is gold, the distribution of which is somewhat irregular. It would seem probable that the gold primarily was associated with the sulphides, but surface oxidation and leaching have in places scattered free gold through the quartz.

From the results of many samples taken, it is evident that at least portions of the veins would pay to work, and it is quite possible that further development would show considerable tonnages of ore which would pay to mill. The ore will have to be milled on the ground, and much further development is required before a large mill would be warranted. The possibilities for these claims are that when the veins are properly opened up they will furnish sufficient tonnage to mine and mill on quite a large scale, although average values may prove to be comparatively low grade. These properties warrant a thorough investigation by any company looking for gold properties.

Placer Mining.

Opportunities for small scale individual placer mining cannot be found to any great extent in the Cariboo District, although there are numerous places, especially on the Fraser River, where wages can be had by rocking, generally on bars of the streams. The easily reached rich ground is however worked out and during the last fifty years practically every creek in the Cariboo and Quesnel Mining Divisions has been tested by somebody. It is possible of course that some rich placer ground on the less known and far-away creeks still remains to be discovered — i.e., what might be called a new discovery — but this cannot be said to be a probability.

The Cariboo and Quesnel Divisions however now present opportunities for the investment of capital in large amounts for working the immense deposits of low-grade gold-bearing gravel which have not yet been touched. On Williams Creek there is an area which has been sufficiently drilled to demonstrate that it would pay nicely to work as a dredging proposition. Many of the creeks which are worked by the old-timers are virtually deserted, and on many of them ground suitable for hydraulicing is left. Of these the following might be mentioned: — Grouse, Antler, Cunningham, Harvey, Keithley and Fountain Creeks.

It is essential before undertaking any working of these deposits that proper testing of the ground be carried out in every case and thus not repeat the costly failures previously made in the Cariboo District.

Coal.

It has been known for several years that the North-eastern District contained many areas of coal-bearing formations, and at one time the probability of there soon being a number of producing coal-mines in the Division was regarded as almost a certainty. D. B. Dowling, in compiling the "Coal Resources of the World" for presentation to the International Geological Congress in 1913, credited the "Northern Interior" with a "probable reserve of 8,200,000,000 metric tons of coal. This estimate included all kinds of coal and included "seams of 1 foot and over to a depth of 4,000 feet." These hopes were based mainly on the coalfields along the Skeena, Bulkley, Telkwa and Morice rivers, and the Groundhog field, which lies partly in the northern part of Omineca and partly in the Skeena and Stikine Divisions; from 1910 to 1912 considerable interest was shown in the Groundhog field.

It is to be regretted that these early expectations have not materialized although in the last few months a small start has been made by the Telkwa Collieries which is now producing about 40 tons of coal a day.

There is no question but that there are some areas in which commercial coal exists in fairly large tonnages, and it is quite probable that eventually some of these will be mined.

Many other conditions besides the actual existence of coal are necessary before profitable coal-mining can be established. Transportation and market are vital factors; of these the market question is perhaps the most important. Given a good coalfield and a good market, the transportation problem can be overcome.

The coal areas in the Bulkley and Skeena, which are close to the Grand Trunk Pacific Railway, where tested have unfortunately not as yet been proved to be commercially successful. A number of these have been drilled, and the conclusion arrived at from these drillings has been that none of these areas was promising enough to warrant the expenditure of opening up and equipping a coal-mine. In some instances the area of coal-bearing rocks proved to be small; in others the measures are so badly faulted, twisted, and broken as to make mining unduly expensive; in others where other features are favorable, the ash content in the coal is so high as to render it unmarketable. It must be assumed that all the coal in the Northern Interior is so uniformly high in ash as to make it unsaleable, as there are at least some areas where the average analyses show a lower ash content than in the average coal mined in the Province.

A combination of unfortunate factors has made the areas contiguous to the transcontinental railway of slight economic value, but there are other areas at some distance from the railway where such particular disadvantages do not exist. With these, however, the transportation question is the difficulty, as it is necessary that a coal-mine should ship its product by rail. The market question comes in here, as an assured market for a large tonnage of coal must be available before the expense of building branch railways to these far-removed areas can be considered. When the Grand Trunk Pacific Railway Company was unable to secure a coalfield in the immediate vicinity of its railway-line, the company was more or less forced to equip the line with locomotives using crude oil as a fuel. This oil comes from California and Peruvian oilfields, and the company hauls it from Prince Rupert as far east as Alberta. While this policy was more or less forced on the railway company, a more vigorous effort to de-

velop other known coalfields might have been successful, and the opening of a productive coalfield would have quickened the general development of the country.

Another possible market for coal from this district is the coastwise and ocean-going ships which make Prince Rupert a port of call. Some years ago, however, the cheapness and desirability of crude oil as a fuel became evident, with the result that nearly all of the boats plying on the Coast were converted to oil-burners. Another possible market was therefore shut off and the local market in northern British Columbia is small. The owners of undeveloped coalfields had perforce, therefore, to adopt the wait-and-see policy.

During the last two years the economic changes wrought by the war have again brought coal back to its rightful place in the economic life and development of the nation. Coal on the Pacific Coast, and it may be said the world generally, is in great demand, as the high and ever-increasing cost of fuel-oil and its derivatives has caused the users of oil to consider the advisability of reverting coal as a source of energy. At the present time the balance is very much in favour of coal as compared with oil in point of cost per horsepower developed.

The coal area owned by the Prince Rupert Coalfields is situated on the low divide between the Morice River and the South fork of the Telkwa River. It has been partially prospected and tested by two diamond drill-holes, and an estimate by a competent engineer gave a tonnage of 50 million tons of good grade bituminous coal in the field.

The area held by the Copper River Coal Company (for which the Yorkshire Guarantee and Loan Company are liquidators) is another promising field. It has not been diamond-drilled but a drill was taken in in 1914.

Both these areas are distant about 40 miles from Telkwa (in different directions) and therefore considerable expenditure would be necessary for branch railways before they could be opened up.

Another coalfield in the North-eastern District which attracted attention a few years ago is the Bowron River area about 20 miles easterly from Prince George, a divisional point on the G. T. P. Ry.

In considering the sections of the North-eastern District which are promising for prospecting due regard must be paid to the question of transportation. Many areas at the present time are so remote from transportation that it is inadvisable to prospect them as nothing could be done with mineral showings after discovery. But there are many areas within easy reach of the Grand Trunk Pacific Railway that offer promising possibilities to the prospector.

Some of these may be enumerated as follows:—The whole Babine range which as yet has only been prospected in a few places. This range is bounded on one side by the Bulkley valley down which the G. T. P. Ry runs and on the north-easterly side by the aBbine Lake. Silver-lead showings have been staked in several parts of the range, the most important property being the Cronin mine on which a considerable amount of development work has been done. On Dome mountain, one of the mountains of the range, a number of quartz veins carrying gold values have been staked but only slightly developed. These different claims show the possibilities of the area and much of the range is as yet virtually unprospected.

Prospecting outfits can be obtained at Hazelton, Telkwa and Smithers and from the main Hazelton-Telkwa wagon road, branch trails go into the Babine range.

The strip of country lying along the eastern flank of the Coast mountains and between the Telkwa river and Eutsuk Lake is perhaps the most promising portion of the whole North-eastern District for prospecting for lode minerals. In more detail, the headwaters of the Morice Rivers, and the territory contiguous to Loring, McAulay, Tahtsa, Whitesail and Eutsuk Yakes is recommended. At the present time this country is not even supplied with adequate trails, but this condition will soon be changed. Claims have already been staked near Tahtsa Lake, one of which, the **Emerald** group, has a remarkable surface showing of silver-lead ore. This property is under option to Mr. James Cronin and it is expected that important development will be started this summer. Improvement of the present transportation into this section is now under consideration by the Department of Mines.

Another area in which little or no prospecting has been done is north of the Grand Trunk Pacific Railway between the Kitwanga and Kispiox Rivers. This area consists mainly of the old complex of the Kitselas formation, and portions of the Hazelton formation, the whole thoroughly intruded by granitic and dioritic batholith stock and dykes. The older rocks are made up of sedimentary measures and volcanic rocks, most of which have been profoundly altered by regional metamorphism and in many places consist of extensive bands of schists and slates. Undoubtedly this area from its geologic formation is quite possibly the home of deposits of economically valuable minerals; and it is virtually an unknown country — a virgin field for prospecting.

Another section which is reported to be a favorable one for prospecting and in which some claims have already been staked is on the Driftwood River and Tacta Lake. This area is a long way from the railway but the lake and river system can be utilized so as to travel most of the distance by boat.

North of Hazelton the range of mountains drained by the Theguma (Salmon) River is practically unknown country. It is to be hoped that some further prospecting will soon be done in this district.

In concluding my remarks about suitable areas for prospecting, I would like to emphasize that while the mountain ranges drained by all the creeks flowing into the Skeena, Bulkley and Telkwa Rivers have been partially prospected, claims staked and properties developed, that there are still large sections which have never yet been gone over. Taking the map I refer to that country lying between Copper City and Houston.

A Promising Field.

In conclusion it may be said that the North-eastern District at the present time offers a promising field both for mining investment and as a virgin field for prospecting. During the last two years the country has been almost depleted of men with the result that prospecting has almost ceased and also that many promising surface showings have had little or nothing done on them.

It is expected that the return of many men to the country now that the war is ended will result in a general revival of prospecting. Undoubtedly many of the prospectors who enlisted will return to their old occu-

pation, while the free, adventurous life of the prospector, with its promise of possible spectacular returns, will make a strong appeal to many returned soldiers who before the war had led indoor lives. The North-eastern Mineral District should secure a considerable number of these returned men who are desirous of following such a life.

This Chamber of Mines can do useful work in assisting such men who are desirous of engaging in prospecting, by intelligently advising them what districts to go to and generally in assisting them in starting out on what will be, to many of them, a new occupation.

Another useful objective of the Chamber would be to form an intermediary between small syndicates and men desirous of prospecting by making arrangements between them along the lines of the old 'Grub-stake' system, which did so much to develop many of our older mining camps.

As the foregoing are districts which, comparatively speaking, have been little prospected, it has been thought well to reproduce them in full. Both the North-Western and North-Eastern districts of British Columbia are very highly mineralized and, as will be noted, by the observations of the Engineers, they have great possibilities in a mining way. Mr. Clothier's report in particular when it is borne in mind that the author is a responsible Government mining engineer, might almost be termed glowing and therefore to those interested in the future of the industry in the West is highly gratifying.

Mr. R. W. Thomson.

Mr. R. W. Thomson, Engineer of the Central Mining Survey with headquarters at Kamloops referred to his district as one having a very bright future. He said that while it was the smallest in point of output it probably produced the greatest variety of mineral in comparison with any other section of the Province. He referred to the very full geological reports of the late Doctor Drysdale in reference to some particular areas; dwelt on the recent development of quartz bearing properties situated on Cadwallader Creek and gave some information regarding iron bearing areas in the neighborhood. The latter, he said, was very promising. He spoke, too, of the coal bearing areas of the Nicola-Princeton District which was being largely developed and which last year had produced something over 150,000 tons of coal. His information was that another property was to be opened up and would be in operation in the very near future. While he did not care to definitely commit himself as to which particular sections of his district were best suited for prospecting he asserted that there were large areas which had been very little explored and which he thought would, without doubt, repay investigation. There were also areas which contained properties somewhat beyond the prospect stage in development which would warrant the investment of capital.

Mr. P. B. Freeland.

Mr. Phillip B. Freeland, Grand Forks, B.C., Engineer for the Southern Mineral Survey District stated that the territory covered by district No. 4 was made up in part of mountains which are a part of the Cordillera System which, in Mexico and the United States is estimated to have produced minerals to the value of over \$3,500,000 for each mile in length of these mountains. Within British Columbia, he said, the Mountains comprising this system have an approximate length of 800 miles and a breadth of 500 miles. His

district was only a small portion of this expanse, the area being approximately 6,500 square miles, but the production for the past 22 years would give some idea of the mineral possibilities of the whole country. The production, he said, amounted to the following:

Gold	Silver	Copper
1,420,000 ozs.	6,780,000 ozs.	435,309,000 lbs.
Lead	Coal	
503,000 lbs.	209,000 tons.	

Only a few hundred tons of fluorite had been shipped up to the present time, but the size of the outcrop promised a large tonnage of this mineral. The construction of a mill for concentration of the fluorite was under way at the present time. The cromite deposits had not been thoroughly exploited and their size was unknown. After referring to the Grand Forks and Greenwood mining divisions and their production of copper from large grade ore bodies Mr. Freeland stated that these deposits have been greatly diminished in size and in some cases worked out without any further prospects being developed sufficiently to interest the companies now operating in these two divisions. This, however, did not mean that there were no more deposits to be found, but only that no surplus showings had been discovered up to the present time large enough to interest the companies operating in that locality. It was often the case that bodies of ore are entirely covered by debris and very little evidence of their presence indicated except by a small amount of carbonates. This, of course, was widely known in mining circles and a local case in point occurred at the Monarch Mine in the Phoenix Camp. Here a deposit of 100,000 tons of ore missed having an outcrop by only a few feet and was discovered by a tunnel driven to develop an ore body some distance away. This instance was quoted to show that although the copper industry is on the wane in these two divisions there are yet chances, and good ones, of discovering other deposits.

Mr. Freeland continued:

That this will take patience and effort is probable in the already well prospected localities, but there are many outlying districts that have scarcely been scratched and samples brought in from time to time by prospectors show evidence of the same geological condition that occur in the Phoenix and Greenwood Camp, and which have produced such an abundance of copper, gold and silver.

The policy of picking the ripest plums, is, of course, the most paying, but such a condition cannot last forever and the time will come when districts passed over because they had no apparent large outcrop will be again explored systematically and I hope with gratifying results. In a geological survey report on the Franklin Camp, which is situated approximately 45 miles north of Grand Forks and embraces an area of 16 square miles, the writer of which was the late Mr. C. W. Drysdale, it is stated that the Franklin contact metamorphic ores resemble those of the Phoenix most closely in character and belong to the same Chalcopyrite-Magnetite class. The Franklin occurrences has somewhat similar structural relations to that of the Elk Horn Mine in Montana. The ore bodies are in the crushed dolomite which served as a channel for the ascending solution. There are a variety of gold, silver and copper out-crop in this camp which up to the present time have not been developed to any great extent. **It is a locality that I believe is worthy of further**

exploration and development." Mr. Freeland then referred to the country commencing in the vicinity of the north end of Christina Lake and extending north between the Arrow Lakes and the North Fork of the Kettle River as far as Gallopin Mountain. This is a district which has come to the front recently and its property carry a high grade silver and lead. Further exploration, he said, is warranted on both sides of the main Kettle River and also on the west fork of the Kettle River. Here there were great old crown granted claims which would be worth looking over. These claims have lain idle for years and at the time of their exploration there were few facilities for transportation. Conditions, however, have since changed and, for this reason the speaker thought, that it might be found that some would repay development. He also suggested intensive prospecting along the route of the high power electric lines being built from Greenwood to Princeton, B. C. He pointed out also that the largest producer of gold in his district was the Osoyoos Mining Division, the lead gold coming mainly from the Hedley and Similkimeen localities.

In discussing recent developments at Copper Mountain Mr. Freeland said that the highly siliceous alumina content of the Copper Mountain ores, of which there are 12,000,000 tons blocked out made concentration by oil flotation necessary. He said this locality promised to be one of the leading producers of copper in the country.

The sedimentary rocks near Princeton, Coalmont and Tulameen covered an area of approximately 50 square miles, seems of better class lignite varying in thickness were being worked at the present time. Chemical analysis showed that a small area, about 3,300 acres, near Coalmont, contains bituminous coal. This also is being worked.

Brief reference was made by Mr. Freeland to discoveries of Chromite and Platinum in his district during the war. In regard to the platinum he stated that the gravels of the Tulameen River were well known for their production of gold and platinum and that much platinum was thrown away in the early days when the price was low. "In fact," he said, "it was considered a nuisance by the placer miners because its high specific gravity caused it to mix with the gold. A representative of the munition board sampled the rocks of the Franklin Camp and found that the pyroxenites carried some platinum." He added that indications were that Russia's present known supply of platinum would last about twelve years. After that time, unless some other large field was discovered, another supply would have to be found, which might bring British Columbia occurrences under further consideration and result in the arrangement of some system whereby the platinum and copper ores might be analyzed and paid for by the Smelters.

Concluding, Mr. Freeman said. "The encouragement of the prospectors is a subject which I believe is going to be discussed by others of this convention and I am sure it will receive the hearty support of all interested in mining. During the short time I have been resident Engineer of this District it has been a pleasure to see the keen interest taken by a great many of the prospectors in studying the formations likely to contain minerals. It is in this way that a good deal of assistance has been given. A distribution of samples of ore in the various towns has also helped.

Mr. A. G. Langley.

Mr. A. G. Langley, District Engineer of the Eastern Mineral Survey District, which includes the East and West Kootenay, next delivered a very interesting address on Metalliferous Mining in that section. He dealt very exhaustively on the subject explaining conditions thoroughly in each section from the south to the north. After describing the geology of the district he gave an outline of the principle properties producing gold, silver and copper.

The silver-lead-zinc production of the district overshadowed that of all others and was at the present time the mainstay of the metalliferous mining in this particular section of the country. Dealing with the Slocan Districts in this connection it was stated that a great deal of money had been taken out by various properties in that section. The Standard alone having paid \$2,700,000 in dividends, The Rambler Cariboo \$500,000, while it was estimated that the Slocan Star produced over a period of 12 years or having a net value of \$1,875,372. The Payne Mine, which had been one of the largest producers of the Slocan closed down in 1904. Its discovery dated back, he said, to 1892, and it produced over 50,000 tons of silver lead ore, representing a gross value at that time of nearly \$4,000,000. Dividends paid between 1897 and 1904 amounted to \$1,438,000. The mill concentrate during 1903 averaged 124.0 ozs. in silver, 67.29 lead. This was given merely as an illustration of the possibilities of that part of British Columbia. Mr. Langley continued, "Among the properties which have undoubtedly made a large earning during the last year or two are the Surprise and Queen Bess. In 1916 Clarence Cunningham took over the Queen Bess which had been idle for a number of years. Large bodies of ore were soon developed and the mine has recently become one of the most important shippers in the district. The Idaho, Alamo, Sovereign, Wonderful, Van Roy and Hewitt and Wakefield have since been acquired by Mr. Cunningham. A 150 ton concentrator embodying the latest improvements in mill design has been erected recently by Mr. Cunningham at Alamo. Since the rocks of the Slocan series have been found to enclose the largest and most profitable silver lead deposits their appearance in other sections of the country are of interest and well worthy of investigation. Although I do not know of any geological survey records which show co-relation between the rocks of the central mineral belt of the Trout Lake Mining Division and those of other parts of the district it is interesting to note that the richest silver lead deposit in this region also occurred in dark carbonaceous and graphitic slates. Large tonnages of high grade ore have been extracted from the Silver Cup, Netty L. Triune and other properties. The ore is galena, blend and tetrahedrite carrying high silver value. As an example, between the years 1901 and 1905 five hundred and thirty-four tons were shipped from the Triune which ran: gold 0.9 oz.; silver 250 to 400 ozs.; lead 33 to 50 per cent."

The Sullivan Mine.

Mr. Langley dealt in detail with the Arrow Lake Mining Division, the Ainsworth district and the Kaslo district touching upon some of the chief properties of those fields. He then turned to the East Kootenay district, referring at the outset to the Cranbrook area and then taking up Kimberley area in which are the Sullivan, North Star and Stemwinder properties. Of the

year it produced 30,554 tons of lead ore, 97,976 tons of zinc ore and 4,582 tons of iron pyrites. The Sullivan Mine was staked in 1895. In 1902 the Sullivan Sullivan, he says: "This property is the largest producer of lead and zinc in the Province. During last Group Mining Company erected a smelter at Marysville which closed down in 1908. In 1910 the property was acquired by the Consolidated Mining and Smelting Company and is now considered to be one of the greatest mines on the American continent. For a long time the problem of treating the complex zinc ores prevented large tonnages high in metallic content from being considered of commercial value. In 1918 a satisfactory solution of this problem was obtained and thus many millions of tons of ore previously considered of no commercial value was added to the already large reserve. According to the management by mining and treating this ore on a large scale, they will be able to produce zinc and lead at a profit on any market which exist in recent years, providing the price of labor and supplies falls with the price of these metals. The long added tunnel, which now has a length of nearly 8,000 feet is reported to be in ore and preparations are now being contemplated for extensive improvement with a view of increasing the output."

Dealing briefly with some of the properties on the north fork of Toby Creek in carrying high silver and lead value and with other properties of the Fort Steel, Windermere and Golden Mining Divisions which, he stated, had not received nearly as much attention from the prospector as sections of West Kootenay and that there were many opportunities here both for the prospector and capitalist, Mr. Langley, continued, "It is ridiculous to suppose that the East and West Kootenay have been thoroughly prospected, for such is not the case, as is quite apparent to any one who has travelled the mountains and is familiar with the nature of the country. It is still a young mining country and, providing market conditions remain favorable, we should see an increase in production during the next few years. What we need is more capital and more prospectors. There are still many properties which were successfully operated some years ago now lying idle that are no doubt worthy of careful investigation and in which ore might be developed and worked profitably under existing conditions. For such enterprises as these capital is needed and also for development of new prospects. Again, there are a number of small deposits carrying high grade ore which are not suitable for working on a large scale and which can be successfully mined by two or three men. These properties are often worked under lease and bond and in many cases substantial profits have been made.

Mr. W. M. Brewer, of the Western Mineral Survey District, when called upon, explained that the area included in his district totalled approximately 48,000 square miles in which about 3,000 square miles were taken up by the Straits of Georgia and other Straits and Inlets between the mainland and East Coast of Vancouver Island. He drew attention at the outset to the fact that within this district was the Britannia Mine, one of the most important copper mines of the British Empire, and a monument to the late G. D. Schley, of New York. The district possessed a great diversity of mineral resources, including coal, ores carrying copper and gold, iron, silver, lead, manganese and molybdenite, also limestone for cement, quick lime and flux, marble, building stone, clay, talcose, slate suitable for some of the various purposes for which talc is generally used and

an occurrence of graphite reported on Harbledown Island.

The district's production of coal from Vancouver Island during 1918 he put at 1,666,582 long tons, and the estimated production of copper for the district, nearly all of which came from the Britannia and Marble Bay Mines, at 19,470,760 pounds, of which about 18,000,000 pounds was from the Britannia. The quantity of lode gold was estimated at 5,800 ounces and of silver at 115,120 ounces. All of the precious metals were derived from the smelting of copper ores carrying low values in gold and silver.

He said that the district presented an excellent opportunity for the prospector, but asserted that the prospector must be prepared to tackle a few difficulties. He would have to be accustomed to the water, a fair boatman and know how to handle a canoe and be able to use an axe, cross-cut saw, a rifle and fishing rod. The various lakes, sounds and inlets where the several small bays afford protection and shelter in case of storm provided unsurpassed transportation facilities, as well as excellent fish food. He added: "There is an old saying amongst the coast prospectors that when the tide is out the table is spread. In other words all a man need do is to go out when the tide is low and dig clams and he will never be hungry."

He said that the most attractive sections for prospecting in his judgment were the Coast Range of mountains on the mainland and sections of the west coast of Vancouver Island. After going into the geology of the Coast Range, he referred to some first-class property in that section, dealing particularly with what he describes as the Britannia Belt. As to the rewards obtainable by prospectors, it was interesting to note that, since the original Britannia group was located in 1897 or 1898, the mining company had purchased about 350 claims, nearly all of which were staked by prospectors some years ago. The cost to the company for these purchases was about \$1,000,000. The westerly side of Howe Sound, he thought, would be a favorable one for a prospector to explore. The section in the vicinity of Lough Boro Inlet, Phillips Arm, Butte Inlet, Knights Inlet and Seymour Inlet he said, was prospected to some extent about twenty years ago, and a part of the section was then one of the most active portions of the Coast district, but had been neglected since the Dorothy Morton Mine closed down. The fact that occurrences of bornite and chalcopyrite were discovered not very long ago in the mountains adjacent to Wnight's Inlet, suggested the entire section was entitled to further consideration from prospectors, especially when it was considered that an ore which was practically valueless ten years ago is today a commercial asset. "Only recently," he continued, "a prominent operator informed me that he expected to see the day when he could successfully mine and treat a copper ore carrying not to exceed 1 per cent in copper provided the extent of the deposit was sufficiently great."

Referring to the best places for the investment of capital in mining, Mr. Brewer mentioned Quadra Island, Texada Island, Lucky Four Group in the Cheam Range, the Big Eye Group near the head of Great Central Lake and the Alberni Mining Division and the Tarmigan Group adjoining the Big Eye. The three last mentioned groups of Mineral Claims, he said, required very large expenditures of capital to develop them, but they all had the ear-mark of promising to develop into such extensive properties as are in favor with the big operators.

Texada Island, he referred to as a promising field for investment. He spoke of the type of deposits on this Island as having been proven to maintain continuity to a considerable depth and stated that other conditions, such as transportation facilities, are as nearly ideal as it could be expected to find anywhere. Intelligent prospecting and the investment of capital also promised good rewards in several other Vancouver Island localities. He said that but little real prospecting had been done on the Island during the past fifteen years. Previous to that time there were about 200 prospectors exploring the mountains on the west coast, but many of these men about the year 1903 abandoned prospecting to stake timber claims and a large number became fairly rich by selling out. Capital was easier to secure for purchasing timber than to develop mining properties, although many of the pioneer prospectors cleaned up good stakes.

Mr. Brewer's address concluded the Monday afternoon proceedings, and in the evening Mr. T. A. Rickard delivered the paper to which reference has already been made, his subject being "Mining as an Investment."

(Continued on Page 242)

Employees at Trail May Buy Company's Bonds.

With reference to the recent announcement that the directors of the Consolidated Mining & Smelting Company of Canada has authorized an issue of ten-year convertible gold debenture bonds, which action has been endorsed by the shareholders, an interesting statement has been made by Mr. S. G. Blaylock, assistant general manager of the Company which is indicative of the company's attitude towards its employees. He says: "It has been decided to allow employees of two or more year standing to subscribe for these bonds without insisting on the stockholding qualifications. They may have their payments extended over a period of 10 months. The interest charged on back payments will be at the same rate as is paid on the bonds, namely, 7 per cent." It is further explained that when the list of subscriptions was closed at Toronto on February 3rd it was found that shareholders had agreed to take up the entire issue of \$3,000,000, but it was decided by the management to accept subscriptions from such employees as desired to take advantage of the offer. Accordingly the list is now open at Trail for that purpose for a limited time. The bonds are issued at par in denominations of \$100, \$500, and \$1,000, and are dated January 1st, 1919, carrying 7 per cent.

Kaslo.

An assay office is being constructed at the Rosebery-Surprise Mill, Rosebery, the old building having been destroyed by fire a few days ago, most of the contents being saved.

Charles Hendrickson, of Howser, has disposed of all his interest in the Red Cloud Mineral Claim, situated on the west slope of Lavina Mountain, one mile from Duncan River, to A. Le Blanc.

E. W. Senff and A. Le Blanc have taken over from W. F. Clarke, of Howser, all interest in the Jumbo Mineral Claim, situated on Lavina Mountain.

P. J. Sheridan, of Nelson, B.C., has given an option to the Nelson Mining and Development Company in respect of the following properties all situated in the Lardo Water Valley; Comstock, Noonday, Silver Hill, White Water, Barker, Rambler, Markwell, Spokane, March, Six Friends, and Volunteer. The ultimate consideration is fixed at \$60,000, to be paid in installments covering a period of four years.

Mining: An Investment, a Speculation, or a Gamble

By T. A. Rickard.

The Chairman of your Programme Committee told me that the subject allotted to me was "Mining as an Investment." I assumed that he meant the gainful use of money in mining, that is, the making of money through the exploitation of mineral deposits, not other people's pockets. However, I deem it well to start by defining the terms to be used in the present discussion, because definitions are essential to a correct understanding of any subject.

Money can be employed profitably in three ways: Investment, Speculation, Gambling. An "investment" looks to income; the use of the word assumes the comparative safety and stability of the principal. A "Speculation" looks to an increase of the principal; the use of this word suggests the minor importance of interest, income, or return on capital; it assumes not the stability, but the comparatively rapid appreciation of the principal. A "Gamble" involves a risk so large as to require the aid of luck; it ignores interest or income, it anticipates the alternative of a big winning or a total loss.

Obviously, the definition is subjective; it is based upon the expectation of the individual making the purchase. To one man the use of money for a certain purpose is an investment; to another man the same use appears to be a speculation. Similarly, one man's speculation is another man's gamble. Six years ago, Mr. Lloyd George and Lord Reading, then Sir Rufus Isaacs, were persuaded by Mr. Godfrey Isaacs, a brother of the present British Ambassador and Lord Chief Justice, to buy a block of American Marconi shares as an investment, that is, as a steady dividend payer. Three days after, Mr. Lloyd George had bought his shares, they rose so rapidly that he sold them, on the urgent advice of his broker, to whom he was disinclined to listen, because his intention was to hold the stock "as an investment." He was then Chancellor of the Exchequer, therefore he was hauled over the coals for "speculating"; he was charged with a levity of conduct unbecoming the chief of the British Treasury. He replied by saying that when he bought the shares it was his intention to hold them indefinitely, and that the sudden and surprising rise justified him in selling. In short, his "investment" had proved a "speculation." The distinction is in the mind of the purchaser. Similarly, a Boston school-teacher may buy the shares of the Great Wildcat Extended as an "investment," whereas a Wall Street broker recognizes that it is highly "speculative," and a Nevadan mining engineer knows that it is a rank "gamble." These terms are relative; they connect a crescendo of risk; even an investment has a slight element of risk; a speculation has more; a gamble, most. Sometimes a stock is bought on the expectation of a rise; it remains steady for years; it proves to be what is called a "forced" investment. The idea of expectation is implicit; human factor is never absent; we are dealing not with lexicons, but with human affairs.

The other significant word is in "Mines." A mine is an excavation in the earth's surface, from which mineral is extracted. It is not a company, nor the shares of a company owning that excavation. A flippant definition says that a mine is a hole in the ground with a liar sitting on top. A promoter is said to be a man who

sells something he has not got, to somebody who does not want it or, if you prefer, a promotor tries to sell nothing for something to a man who expects something for nothing. However, these perversions of honest business do not concern us for the moment; my subject is the reasonable speculation that is based upon the legitimate exploitation of mines. Permit me to remind you that the word "Mine" was used in the language of warfare before it entered that of peaceful industry. It comes to us through the Latin "Mina," signifying an excavation to be used for killing the enemy. The original sense of the word survives in "minatory," meaning threatening. During the war we have heard more of mines in the North Sea than of Mines in Mexico, for example, and you will allow that those who have sailed the seven seas had to deal much with speculation concerning mines, and the floating of mines on water, reminding us of minatory performances on the stock exchanges during times of peace. Now, however, we hope soon to forget the derivation of the word, and to interpret it, not in terms of maleficent activity, but of beneficent industry.

You will note that I have chosen "speculation" in preference either to "investment" or "gambling" as being more appropriate to mining. The use of money in mining is seldom an "investment; usually what is meant to be so, affords an example of the triumph of hope over experience. I admit that certain forms of iron and coal mining on a large scale are characterized by such security, continuity, and steadiness of income as to be "investments," but the mining of the so-called base metals or of the precious metals, in which most of you are engaged, does not come within the category. In metal mining the chance of a considerable risk and of a correspondingly large gain is inherent. Some of you will demur, you will point at the Homestead, the Bunker Hill and Sullivan, or the Utah Copper as examples of an investment, as representing a type of security so safe as to be gilt edge, but I venture to say that your opinion is *ex post facto*. You are writing last year's almanac, you are wise after the event. The history of such persistently profitable mines causes you to regard them as safe, because you can retrace their history for 10, 20 or 30 years. You imagine yourself buying into such mines soon after they had undergone preliminary development, and you know that if you had done so at an early date your purchase would have proved extremely remunerative; but I submit that in the early stages of development these splendid enterprises were speculative as is suggested by the fact that these successful ones are a few survivors from the much larger number that were started at about the same time and proved disappointing. I may remind you, to make my point quite clear, that many of the famous mines of the world "broke" those who first attempted to bring them to financial success. If today you were to advise a widow to put her savings in any one of the three magnificent mines that I have instanced, you would, in my opinion, be an unwise councillor, because looking forward, not backward, for 10 or 20 years, they would represent a speculative use of the widow's savings. You might be sagacious in using your own money for such a purchase, because you could take the relatively small risk for the sake of the probably large gain, but the widow would be better advised to buy Liberty Bonds.

At this stage of my argument, I beg you not to be annoyed at my apparently over-cautious attitude; you will find that my conclusions will not depreciate the industry in which you and I alike are so deeply interested. I shall hammer my point home by one further suggestion. You would not be willing to lock up your mining stock in a safe for 5 or 10 years, as you might do with first-class bonds; you know that in the course of five years the fluctuations in market value are likely to be so wide as to compel you, in your judgment, either to cut a loss or take advantage of market profit. On the other hand, a mine is not a "gamble," because the risk it involves is not unreasonable; it is diminished by knowledge and experience, it is lessened by the skill you can apply both to the finding and to the treatment of the ore. A miner always needs some luck, of course, but his luck is a friendly sprite, not the grinning devil that sits by the roulette-wheel. Every business involves one or more indeterminate factors, and therefore contains an element of risk. Without risk there is no gain; but a large gain usually involves a large risk. There are people in mining, of course, that take big odds, that like a reckless bet; they are real gamblers, even if they are unaware of it; but the risks taken in legitimate mining are under some measure of control, they are met by scientific knowledge and by trained intelligence. A blend of pluck and judgment is required. You will recall a line in Bipling's poem, "The Merry Gloster": "And I took the chances they wouldn't and now they are calling it luck." That is why I insist that mining, properly conducted, is not a gamble. On the other hand, no man of experience in these matters would expect to escape all the risk. The idea of eliminating risk from mining is both contrary to the spirit of the business and false to the history of it. To understand mining—to appreciate the principles guiding legitimate and successful speculation in mines—which is my subject—you must revert to the old Cornish word for shareholders; they were called "adventurers," that is, men willing to make a venture.

Indeed, the idea of avoiding the risk in mining is a pathetic fallacy; a puerile endeavour to escape the inevitable. The attempt to find mines that would involve no risk to the capital sunk in them has tended to cripple the industry; the refusal of sundry so-called exploration companies to incur risk has stultified their operations and paralyzed development. And I may add that this policy has warped the judgment of some otherwise brilliant engineers. The story is told that Marcus Daly sent a mining engineer on a scouting expedition; he examined many prospects, without finding anything worth while. Daly became impatient; he slapped the engineer on the shoulder and exclaimed: "For God's sake, man, go out and spend some money." There is too much of a desire to play safe by buying mines of large blocks of proved ore, and to make money by means of an enlarged scale of operations, increased skill, or improved methods of metallurgy. The finding of ore, which is the real adventure, is relegated to the background; it is not only the chief attraction of mining, but the one that wins the greatest reward. When the ore reserves of a mine are at a low ebb, it may be the most speculatively attractive time to buy the property. There are those who say that the mining of the future will be the economic harvesting of known ore deposits of low grade, the beneficiation of masses of mineral already discovered, but heretofore regarded as too refractory for successful metallurgic treatment, that is, the utilization of the visible supply of skimmed milk instead of the

finding of the metallic cream concentrated by the patient operations of nature. I doubt that; the world is still young, and but half explored, as is suggested by such discoveries as those of Nome, Cobalt, Porcupine, Tonopah, Goldfield, the United Verde Extension, the Baldwin Mines in Burma, and a host of other bonanzas during the last 20 years.

One does not need to be venerable in order to recall great changes in the philosophy in mining economics. In 1905 I published a book on this subject, in which was included a discussion upon various aspects of mining finance. Among those contributing, besides myself, were H. C. Hoover, J. H. Curle, and W. R. Ingalls. Mr. Curle, at that time the leading London authority on such matters, a man of wide travel and stalwart independence of mind, advised his countrymen to stick to gold mining as being the safest, because gold had a "fixed value." We know to-day, by unpleasant experience, that gold can so depreciate in terms of other commodities that the gold miner is placed at a decided disadvantage. Mr. Curle insisted that the only correct kind of gold mining was based upon a careful estimate of the ore in reserve, and that at least 60 per cent of the price of the mine ought to be represented by a net profit from the developed ore. He even went so far as to lay down the rule that gold mines should yield 10 per cent on their market valuation. Later he put the interest at 15 per cent. We have travelled far since then. Most of these *obiter dicta* served a purpose in their day, 15 years ago, as a means of educating the British shareholder, who is a simple-minded person, because Mr. Curle accompanied them with much straight information and trenchant criticism, but all such attempts to compress mining into a formula are a failure. They were based largely on the experience—then incomplete—of the Rand, in South Africa, where continuous beds of gold-bearing conglomerate were being exploited on the largest scale known to the modern world. These beds of "banket," as they were called, after the Boer name for almond-cake, were comparatively uniform in their gold contents, and were mined and milled so cheaply as to yield handsome profits. Their uniformity of grade and persistence in depth caused them to be regarded as a basis for "investments" of the safest kind, suitable for widows and orphans. Later experience has shown that they were neither so uniformly nor persistently rich as had been expected, the result being to turn the "investments" into "speculations" out of which a comparatively few made a great deal of money and comparatively many lost more than they could afford. The Rand proved to be the greatest gold field in the world, in extent and in yield, but I am making the point that it did not escape the vicissitudes latent in mining, and the successful effort to persuade the public that it would escape those vicissitudes led, in the end, to a tremendous and widespread loss of money, which passed from the pockets of the public to those of the promoters. Money made honestly on the Rand during the development stage, when adventurous spirits risked a total loss of their stake in order to make a big gain; but when the operators and promoters turned to this man of small means and persuaded him that the latent risks were eliminated, and that a gilt-edge investment was available to him in the stock of over-capitalized mines, they deceived him. Some of the operators and promoters knew no better; others were advised by good engineers, and simply victimized the unsuspecting by unloading their holdings upon them at a handsome premium. To illustrate how the public was victimized, I can state that the market value of the shares

in the principal companies representing consolidations of groups of mines declined \$203,931,610 between 1911 and 1918. That huge loss was due to ignoring the common experience, that mines become impoverished in depth, just as surely as men grow old, and also to the assumption that a 60 per cent ore reserve, that is, having 80 per cent of the market value "in sight," furnished ample security. In the attempt to introduce one or two academic factors of safety, the public was led to ignore the very essentials of the business, namely, that it involved no small risk, under the best conditions, and that the risk must be compensated by large dividends. Instead, the public accepted 8 per cent, or 7 per cent as an added freight return and failed to recognize that they held a wasting asset. During the speculative—the frankly adventurous—stage of Rand mining made money for nearly everybody engaged in it, but when the chicanery of the few was combined with the ignorance of the many into creating a false notice that the speculative phase had been transferred into one of secure investment, then it was that share-dealing on the Rand became a cause of great loss to the public and a blot on honest industry. From the moment when the change in sentiment was effected, and the fallacy was established, the mining of the gold became less profitable than the mining of the pockets of the public.

This investment idea, of minimizing risks and limiting possibilities, would soon cause mining to die for want of breath. Before a profitable outcome is assured every mining enterprise must pass through several stages of speculativeness, as surely as a child must take the chance of bumps and bruises, or measles and mumps. The biggest fortunes are made during the early stages of development; on the whole, more money is made by selling than by buying mines, simply because the final, or so-called investment, stage of a first-class mine is likely to represent an over-valuation, caused by an erroneous supposition that the essential hazard is precluded. I would even say that more money has been lost by the over-valuation of the great rich mines of the world, like the Con. Virginia, Mount Morgan, Broken Hill, and Nipissing, than in a multitude of worthless prospects. Shall men lose their money in big mines, and big men in small mines. The inference, therefore, is not to try to get rid of the essential risk—because it cannot be done—but to require a rate of profit proportionate to it. A much more intelligent policy is to engage in such mining as allows a liberal margin both ways, taking a larger risk for the sake of the larger gain, that is, to speculate with eyes wide open and not to invest with eyes half shut.

Fifteen years ago the careful sampling of ore as a means of valuing mines was becoming advanced to an art and the tendency was to place great reliance upon it, with the consequence that capitalists began to think themselves safe in buying ore. They thought to escape the essential risk by assuring themselves a return of their money, diminishing the speculative features of the business as much as possible. Exploration companies were organized in London, New York, and Boston to scout for promising mines on which to apply the newly developed methods of valuation. Most of these seekers after bonanzas were disappointed; they failed to repeat the successes of the pioneers in this type of mining finance—such as the exploration company of the Hamilton & Smith era—because they were too timid; they expected to have their money in sight when they bought a mine; they were looking for a bet on the sure thing, with all the profits of a speculation. They lacked the

temperament needed for adventure and should have placed their money in a bank where at 4 per cent it would double itself in fifteen years. Many directors of these exploration companies bluffed themselves into the idea that they were bold navigators when, as a matter of fact, they were only fair weather sailors.

As I remarked at the time, "ore-reserves are not everything; expansion and development are the essence of successful mining." The big successes have been made by developing prospects into mines, not by buying blocks of ore that had been exhaustively sampled by meticulous young men. The profit to be made must depend upon the further extension of the ore; the larger the proportion of ore already proved the smaller the possibilities beyond. As Mr. Hoover pointed out, the probable depth of extension is more critical than the proportion of profit in sight. He worked out a rough rule for the Gold Mine of Western Australia, namely, the minimum extension of an ore body in depth should be not less than one half its length. He called it a "yardstick" for use in forming a judgment, but he laid stress on the need for investigating the characteristics of the individual ore body, more particularly its geologic structure and that of the district in which it lies. Such a rough and ready formula, however, would fit only the mines that are dependent on one or two large shoots; it would be of little service in the valuation of mines, depending on a series of recurring ore-shoots, as, for example, the Goldfield Consolidated, in Nevada, the Nipissing, at Cobalt, the Yoquivo in Mexico. Mr. Hoover made the shrewd observation that "the quantity of ore in reserve is a matter of management, not necessarily dependent on the size of the mine."

In 1912 Morton Webber protested against the use of formulas in mine valuation and showed that "the relative magnitude of ore reserve in any particular mine is largely a matter of administrative policy." I myself remember, when practising as a mining engineer, advising a client not to extract the ore in his mine if he hoped to sell it to advantage, as he wished to do. The extension of the ore-body was menaced by a fault. He listened to a saw-mill engineer, enlarged his mill from 20 to 40 stamps, extracted all the ore, and barely made enough profit to pay for the enlargement of the plant, leaving a hole in the ground in which several later operators have buried their good money. This was a gold mine in Idaho. Another example occurs to me: a small silver mine in Colorado; ore was only 5 ins. wide, but high grade. A careful sampling showed \$150,000 worth of ore assured, which would yield a net profit of \$110,000. The owners were willing to sell for that sum, half cash, and half in six months. I advised my clients not to buy, because the winzes below the adit-level showed that the vein was poor and much faulted. The history of neighboring mines was not promising as to prospects in depth. I considered the business unattractive because the risk of the known ore yielding less than the amount of profit estimated seemed to outweigh the chances of finding more ore, the subsequent story of the mine justified my opinion. On the other hand, I advised the purchase of the Camp Bird, in Colorado, for \$6,000,000, when the bottom workings looked poor, and gave no promise of the ore persisting, because I believe that horizontal exploration would lead to the uncovering of more ore bodies, especially Westwood, where the rising surface gave virgin ground increasing to a height of 1,200 ft. above the adit. The mine had reserves equal to \$6,118,000 gross, but the value of it lay largely in the good prospects of the further finding of rich ore.

without sinking, as the sequel proved, for the Camp Bird has produced \$20,000,000 since then, although poor in depth. Please pardon these reminiscences of a time, 20 years ago, when I was a mining engineer, not a journalist; I give them because personal experience is direct evidence.

In 1911 M. H. Burnham contributed a series of articles on sundry principles underlying the finance of mining enterprises, more especially the "risk rate." He insisted rightly that the buyer of mines or of shares in mines should expect not only a bank-rate of interest on his capital, but as much more as will cover the additional risk inherent in the business of mining. If, as I suggested at that time, he bought into the Goldfields Consolidated, in Nevada, then the most productive gold mine in the world, but with a reserve of ore so small as compared with its annual production as to insure the return of only a small part of the market value, he, the sane speculator, ought to expect a dividend of 35 per cent per annum, or 31 per cent more than the four per cent bank rate, that is, the mine should be valued on the basis of a three-years' purchase. This famous mine is now in the hands of lessees; its story has been told, and you can ascertain how nearly right was my diagnosis of the position. However, it is only mentioned as an example. On the other hand, a mine like the New Modderfontein in South Africa or the Homestake in South Dakota might show a life and a standard of production justifying a low estimate of risk, thus warranting a much smaller return, say, six per cent more than the bank rate. It amounts to this, that after an engineer has examined a mine and measured its ore-reserves, he must determine the risk-rate at which his clients' capital may be used in the purchase of that particular property. This risk-rate will be based upon the past history, the present condition, and the future prospects of the mine.

The sampling of mines has been allowed to obscure the need for good judgment. It is also another phase of the attempt to make an investment out of a speculation. The ore in reserve in a mine should be regarded chiefly as an indicator of the probability of being able to find and develop more ore of the same grade. The expectation of a profitable venture should be based not upon the attraction of the known ore, but upon the chances of further intelligent search.

A so-called five per cent investment in a metal mine is an unwise use of money, because the interest is too small for the risk, whereas a 20 to 25 per cent speculation in a metal mine is sagacious, if the probable risk is compensated by the probable gain. As Mr. Hoover says, "there is an inherent speculation in mining, and it is this speculation that attracts." It attracts those that understand. It is the spirit of adventure that stimulates the best kind of mining. For instance, the controllers of the Homestake mine have spent 15 million dollars in 15 years on the Corro de Pasco; they have received their money back and 100 per cent additional thereto, equal to about seven per cent in the 15 years, and now they have proved ore sufficient to last for 20 years. This is what I call a fine adventure!

The speculative side of mining has an attractiveness that is at the bottom of the energy with which it is followed, and when you bring it to the dead level of a steady investment you will find that the man of ordinary shrewdness saves time by going straight to his broker and buying bonds or consols. This does

not mean that one is justified in playing the fool and expecting miracles to happen. The risk of mining should not be increased needlessly by human abhorrence. Mining enterprises come to grief often not so much on account of the failure to attain an investment basis, but because they are not put on a business basis. Even if the occurrence of ore in nature be erratic, and mining as a consequence be hazardous, there is no justification for piling human foolishness on top of nature's vagaries.

A large part of public participation in mining is done by means of share-buying; this is a secondary and less desirable form of speculation, as compared with the ownership or part-ownership of mines by individuals, partnerships, or small syndicates. It is a legitimate means, however, of distributing risk and of applying collective capital to undertakings too burdensome for an individual or a syndicate. It produces a fluctuating ownership. In practice, whatever may be his theory, the American "investor" does not buy mining stocks to keep. Whatever he calls such holdings, he treats them as "speculations" he does not put them away for the sake of their dividend yield; he is always ready to realize upon them at an enhanced price; he buys them to sell. It has been said that the ownership in an American mining company changes, on an average, every five years. Hence the mysteries of amortization do not interest most of the people. They are looking for a quick turn-over, not a long-time investment. The individual owner of a mine rarely keeps it when it grows to a size involving a large amount of capital; he spreads the risk and gathers his winnings by disposing of the mine in a public company. Long continued private ownership of a profitable mine is rare. W. B. Bourn and his father before him have controlled the Empire mine in Grass Valley, California, for 50 years, and I may add that this mine has been worked uninterruptedly for 66 years. It has proved a real investment, although started, of course, as a speculation. I venture to say, however, that if anybody were to buy it to-day on Mr. Bourn's valuation, or on that of an equally competent appraiser, he would be compelled to take it as a "speculation," for the simple reason that the odds are largely against the Empire mine continuing to be worked profitably in the future for any such length of time as in the past.

Of well conducted mining ventures it can be said that they meet with a measure of success as large as, if not larger than, an ordinary manufacturing enterprise. I make no apology for mining, it has been—and still is—a glorious adventure for the youth of the world, for those young in spirit as well as in body. To mining we owe the exploration of the far corners of the earth and the development of its waste places. From the days of the Argonauts to that of the beach-diggers of Nome the call of adventure has caused men to go forth into the wilderness and prepare the way for the establishment of industry, for the extension of civilization, for the making of homes, which is the best fruit of human toil. If we stifle that spirit of adventure between formule, if we suppress it by maxims of an unreasoning caution, we shall shrivel a great industry into a picayune trading that will commit suicide in due course.

No; risk is the very essence of mining; it is its life, and the true miner faces the risk with the cheerful confidence of the men that make the world more spacious "in the time of great Elizabeth," of the Ar-

gonauts of the Golden Age in California, of the trappers and *coureurs du bois*, who opened up the great northwest.

Mr. H. N. Lawrie.

On reassembling on Tuesday morning Mr. S. S. Fowler, of Nelson, B.C., took the chair and called upon Mr. H. N. Lawrie, Chairman of the Oregon Bureau of Mines, Portland, Oregon, who spoke on the subject "Gold." His address was exceedingly interesting and the information he gave, coming from a man who knows what he is talking about, was very attentively followed. In view of its importance it is reproduced in full as follows:

Government Control of Smelters.

The program next provided for an address by Mr. Sydney Norman, Editor of the Northwest Mining Truth, Spokane, on the subject "Government control of Smelters." Mr. Norman introduced his remarks by explaining that he did not wish it to be taken that he was attempting to impose his views upon any of the delegates present. He pointed out that he had addressed the International Convention at Revelstoke last year on the same subject and his remarks had been characterized as insidious and lurid. It had been added, too, that British Columbia did not need the advice of Americans to conduct their business properly. "I do not blame them I am sure," said Mr. Norman, "still I believe that it is only by the experience of others that any nation or any people can select that which is best for its own interests."

Continuing, he said, that he could not give any definite information regarding the commercial advisability of establishing any kind of a smelter on the southern coast. That would have to be decided by a thorough canvass of the ore situation. He would assume, therefore, that the necessary supply of ore is readily available and that location of a smelter and refinery upon the coast where British Commerce can be maintained economically with the Orient would insure a market of the first magnitude in extent and monetary returns. If that assumption is correct, he emphatically declared, that such a smelter should be subsidized by the Government. Such a subsidy should not, however, be given to bolster up a more or less problematical venture, but as a return for Government Supervision of rates so that the producer of ores might be for all time assured of a fair return for his labor and his capital. He declared that he was not in favor of Government ownership which, in his opinion, was merely another expression for wanton waste. Government regulation, however, was a different thing, "but again," he said, "I wish to qualify by saying that a regulation must be as unrestricted as possible, always keeping in mind that the smelter is as important to the mining industry as the producer and that, until both are satisfied by a spirit of mutual confidence, neither can prosper to the limit warranted for instance by the great mineral wealth of this Province."

"Speaking still emphatically I cannot see any argument," he continued, "against proper Government regulation that will guarantee to the producer a fair share for his labors and the smelter a fair return upon the great capital necessary to the success of any such venture. If a smelting company be honest in its methods and its settlements and for the purpose of this discussion we may assume that smelters in Brit-

ish Columbia are unlike some prototypes on the other side of the line, then there surely can be no objection on their part to a fair impartial regulation that will forever remove the most prolific cause of dissention and distrust. If, on other hand, there should be smelters that do not conduct business with due regard to the broad interests of this Province — and that means full encouragement of the producer — it is time the conditions were changed that the Province may come fully into its own in the mineral producing way."

Mr. Norman asserted that British Columbia possessed the best mining laws under the sun and he thought it was logical that its Government should take the lead in settling the smelting question in such a way that would lead to a much better understanding between shipper and smelter and thus increase the volume of its mineral production. He went on to deal with the Trail Smelter saying that the former spirit of co-operation and mutual trust between that Company and its patrons had given away to distrust and bickering. Smelter officials contended that the rates now in force were as low as could be granted under the rules of good business while the shipper asserted that he was not getting a fair share of the proceeds of his work and his capital. This, the speaker said, clearly proved the necessity for some regulating force that would remove the cause of friction that militated against full development of interior mining districts and would continue to do so until the shippers felt that there was some final court to which they might appeal in cases where injustice had occurred.

Mr. Norman proceeded to deal with general conditions on the American side and in Canada in respect to the smelting industry. He asserted that it was folly to suggest that Canada could disassociate itself with what was occurring in the United States in regard to this matter. The interests of the two were closely co-related and there was no escaping the fact that, as smelting corporations, whether on the American or Canadian side, work closely together, what might be done south of the imaginary line was bound to make its influence felt to the north. Touching upon a few of the arguments which he had heard advanced against the proposed proposal of Government regulation smelters Mr. Norman said that they amounted to nothing and that in point of fact there was no logical reason why the present unsatisfactory condition should not be improved in the manner indicated.

Concluding Mr. Norman said, "The world is on the eve of great changes and I submit that smelting corporations will be untrue to the best interests of the people and remain contributors to a condition of unrest that has hindered development in the past if they refuse to give these arguments consideration. We are at the parting of the ways on the threshold of a new and better era."

"The corporation that refuses to sense these changes and fall in with march of progress might easily find itself engulfed in a wave of Government ownership that will sweep it out of individual existence forever. The leaders of industry who realize the situation and go forward to meet it with the single purpose of advancing the best interest of all the people will erect greater monuments than those who refuse to be swerved from their sole purpose of wringing money from the public. I honestly believe that Government regulation must come sooner or later and that wisdom dictates adjustment to changed conditions without delay.

The Better Preparation and Utilization of Coal.

"The Better Preparation and Utilization of Coal" was the next paper presented. It was given by Mr. G. W. Evans, Coal Mining Engineer, North West Experiment Station, U. S. Bureau of Mines, Seattle. He stated at the outset that his remarks would not be specifically with regard to the bituminous coal of British Columbia. As, however, the coal of this character in the State of Washington was similar to that of this Province the problems confronting the people of the two countries in this respect also were similar. His plea was for the greater use of the smaller sizes of coal, largely disregarded by both producer and consumer. Coal operators in both British Columbia and Washington knew that the percentage of large sizes is decreasing and the quantity of small size coal is increasing. This change, he said, had been brought about partly by the inferior class of coal miners of to-day compared with former years. To-day some of the coal miners particularly in the State of Washington knew only how to drill a hole and fire a shot, some did not know even how much powder should be used. The result was that the coal is shot into small pieces and in steeply pitching coal beds the coal is further broken up by falling down the chutes. It was therefore necessary to face the inevitable fact that the percentage of lump coal will decrease and the small sizes are going to increase as time goes on unless new coal fields are discovered. It behooved us for these reasons to make preparations to save more of these smaller sizes and offer them to the public in the cleanest possible condition. To separate impurities from the coal in the smaller sizes was a more difficult matter than to clean the coal of larger size. In the anthracite coal fields of Pennsylvania dry cleaners were used for the smaller sizes and, at one bituminous mine on the Strait of Washington, a spiral separator was tried with only partial success. It has been found, the speaker asserted, after years of experimenting that treating the coal in a liquid thus taking advantage of the difference in specific gravities between the coal and its associated impurities is the only practical way of making a proper separation. Experience, he said, has taught that, in order to get the best results in the washing of coal, the washer should be of proper design properly adjusted and operated. He had seen plants where tubs appeared to do pretty good work, but for a new plant would not recommend the tub except in an emergency. Mr. Evans proceeded then to describe some of the coal washing plants that are now being built and after describing the various methods of their operation declared that to get the best results a thorough study should be made of the coal to be washed and the type of jig installed that would best suit the purpose. Such studies and designs should be studied by someone competent to make such investigations. He did not advise ordering from a catalogue, suggesting that the operator should take his coal washing problem to a specialist and ask for a guarantee so that the resultant product would measure up to certain specifications. In this connection he said, "Our coal washing plants are being built with more refinements each year in order to successfully meet the requirements exacted by more complex coal and an effort to practice true conservation."

Mr. Evans recommended that operators should pay

more attention to the efficient operation of their jigs. Very few could tell what results they were getting, and little did many of them realize that the amount of good coal going to waste or the percentage of absolute waste in the wash product can be determined by a proper study with a "float-and-sink" machine, and the necessary corrections made in the jig. Briefly outlining the manner in which this work is done, he said: "Samples are taken every thirty minutes for a period of eight hours at different parts of the plant. Careful head samples are taken of the material going into the washery; also samples are taken at each of the refuse discharge gates of the machine, and as the washed product passes over the conveyor from the jig, it too, is carefully sampled. Next day each of these samples should be treated about as follows: The original samples should be coned and quartered—care being taken not to break the particles in the sample—until a representative sample of about 40 or 50 pounds is obtained. This smaller sample is further quartered until the required size sample is secured, which is to be used in the "float-and-sink" machine. The machine is then filled to the required height with a solution of zinc chloride of the proper density. This particular density is called the permissible bath for the coal under consideration, and might range from 1.35 to 1.65 specific gravity, depending on the amount of adherent ash in the coal and the amount of ash the coal market will assimilate. The head sample is then run through the machine. The marketable product will float, and the refuse will sink. Each part is weighed and in this manner the percentages of each are determined. The results obtained on the head sample indicate what the washers should produce if they are working at an efficiency of 100 per cent. The "float-and-sink" machine, by the way, is assumed to be a 100 per cent efficient separating machine. The refuse is treated in the same bath, and if the washer is doing perfect work, there will be no float, and in treating the product there should be no sink. This seldom happens. The percentage of float in the refuse and the percentage of sink in the product are used as factors in determining the efficiency of the coal washer. By making these determinations adjustments of the length of stroke of the jigs and experiments with the sizes to be treated to get the desired results can be made. The man who operates the jigs will more clearly understand what is required of him and the machine he is paid to operate.

Quoting from a bulletin published by the Commission of the Conservation of Canada on the Conservation of Coal in 1914 Mr. Evans enumerated the equipment of which the principle collieries of British Columbia were provided in respective washers at that time. He pointed out that the same authority estimated that the cleaning losses are as follows: Hosmer Mine, no loss because small size is coked; Nicola Valley Coal and Coke Company, no estimate; at the Western Fuel Company's Mine, the sludge and other unmarketable coal is used under the Company's boilers and in the Northfield Mine of the same Company, it is estimated that the sludge loss is 2%; at the Vancouver Nanaimo Company's plant the coal less than one quarter inch was wasted, no estimate was made as to the amount. There is fifteen per cent. of the output of the Fiddich Mine of the Pacific Coal Mines, Limited, that is wasted; at the Extension Colliery of the Canadian

Colliery Company it is estimated that about 34% is wasted in bone and slack and at the Union Washery of the same Company there is a waste of 24%. "Of course these percentages," Mr. Evans said, "do not all represent clean coal, but it is safe to assume that between 5 and 10% greater recovery could be made in treating the Nicola Valley and Vancouver Island coal if crushers were used on the larger impurities such as bone and coal and shale from the picking tables and the middlings from the jigs and the crushed material either treated on tables or in jigs; and if the bird's-eye or sludge now being wasted were treated on properly designed tables these are features well worth considering very carefully. A seven per cent. saving on the coals for these two fields would probably equal 140,000 tons, which in itself is worthy of an effort.

"At one plant in the State of Washington using a well known jig I personally saw 80 lbs. of white rock picked from seven tons of coal that was supposed to have been cleaned by that jig, yet the Company, which was paying a man good wages to attend to the jig, wonders why the people of Seattle complain at the amount of impurities in the coal. Let us have more study and education along this line."

"Until recently we were satisfied to let the refuse from the jigs go to the waste dump without further thought; to-day many of the progressible Companies are crushing some of the refuse and all the middlings and treating them either in another jig or on properly designed tables.

"Also until within the past few years little thought was given to the waste water and smaller sizes usually called bird's-eye or sludge, but at present in some plants the waste water along with its load of small coal and associated impurities are conveyed to a settling tank and from the settling tank are fed to properly designed concentrating tables. The tables generally used are what might be called nephews of the old Wilfley table, familiar to ore dressing engineers. As a rule the riffles used are higher and the surface of the table is differently arranged.

"A coal cleaning plant operating along most modern lines does not waste very much except the color in the water. Probably some enterprising engineer will attempt to recover the color by means of an Oliver filter."

Mr. Evans stated that coal operators might ask what was the use of all this refinement in coal preparation and saving of small sizes when they were unable to dispose of one-half the small coal on hand. This led him to the second part of his paper under the heading, "The Better Utilization of the Small Products from the Washers." He said that the product of such a field as that of the Crows' Nest gave rise to no problem because the smaller size can readily be used in making coke. It was different, however, with non-coking, bituminous and sub-bituminous coals.

Continuing he said, "In many of the large steam plants mechanical stokers of some form are in successful operation. They burn the small sizes efficiently with little or no smoke given off. The ash formed is disposed of mechanically. In fact, everything goes along pretty well in a very large plant, but only the larger plants can afford to install mechanical stokers. In the smaller plants where the installation of large stokers is not justified because of the expense the boilers usually are fired by hand. In plants where the

expense of installing large mechanical stokers is not justified or even where justified in some instances powdered coal equipment is now being installed. To-day we find that pulverized coal is being used in many steam and heating plants of some cities. Several large buildings in Seattle have recently replaced California fuel oil with powdered coal and, according to the statements of the engineers in charge of those plants they like the powdered coal best.

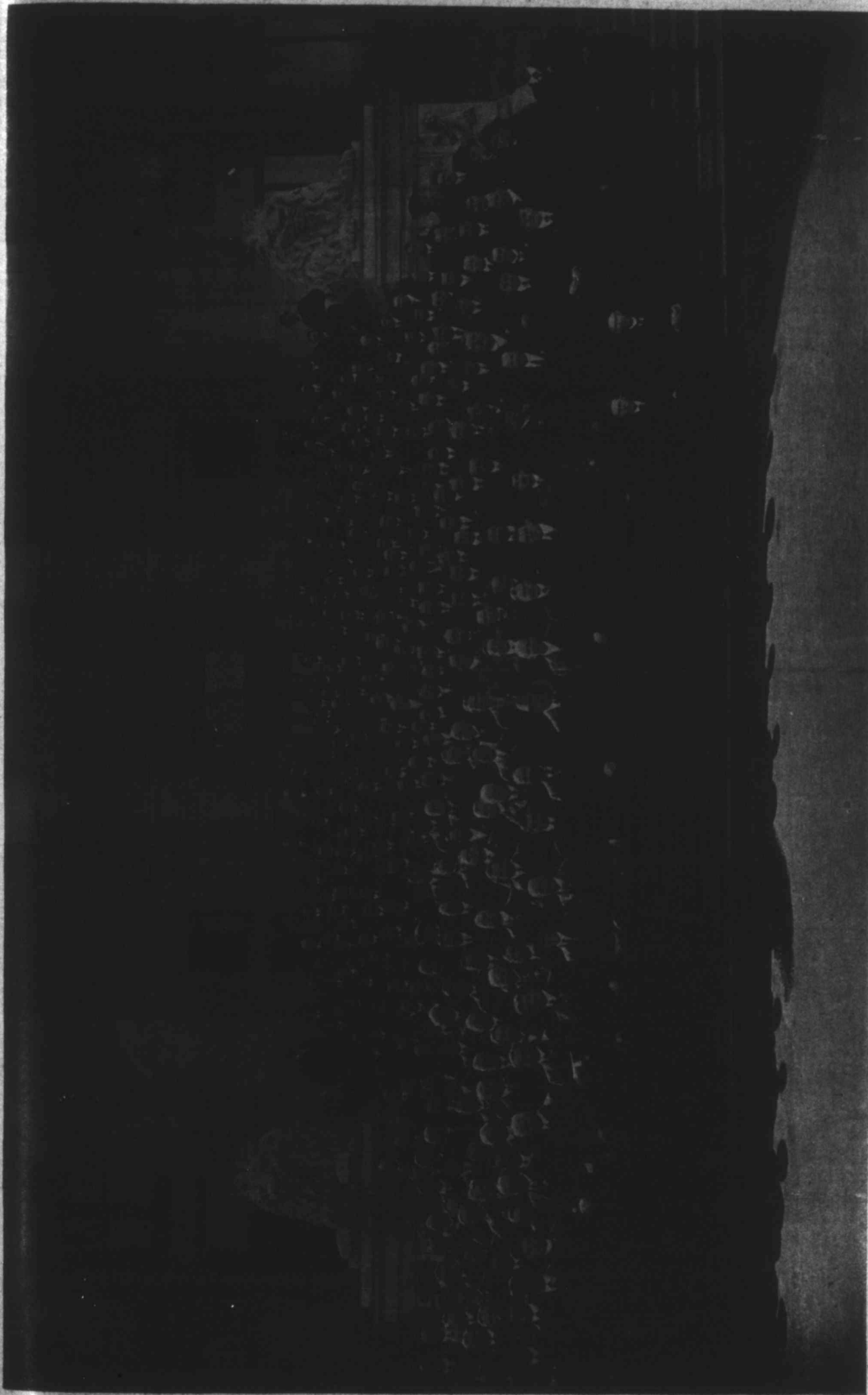
The speaker proceeded to enumerate some of the powdered coal installations in the State of Washington, mentioning the Western Avenue plant at Seattle, the Puget Sound Traction Light and Power Company and describing equipment. The coal was ground so that 95% of it will pass a 100 mesh screen renton buckwheat and bird's eye or sludge is used. "In this connection," Mr. Evans stated, "it might be well to mention the fact that at the Renton coal mine the Company years ago was forced to dike their bird's-eye and not allow it to go into the streams with the waste water because of protest from the neighboring farmers. To-day they are loading coal from the pile of 160,000 tons saved by means of a drag scraper and utilizing it in their Seattle Powdered Coal plant. This is a plan that others might follow to their advantage." Other installations mentioned were the Superior Portland Cement Company's plant at Concrete, Washington, that at Briquettville, Washington, where the powdered coal used in some of Seattle's largest buildings is pulverized; that of the Pacific Coal Company at the Black Diamond Coal Mine. At Black Diamond, he said, the smallest sizes of the black diamond coal are used which is non-coking bituminous; at the Coal Creek plant of the same firm they were using the smallest sizes of the sub-bituminous coal of the Coal Creek mine; at Briquettville they were using a mixture of Black Diamond-Coal Creek and the coking bituminous coal of the Burnett Mine.

The following well known buildings of Seattle, it was stated, are using powdered coal; the Seattle Natatorium or Crystal Pool; New Richmond Hotel; Broadway High School and the forty-two story L. C. Smith Building. The air pressures used at these plants ranged from two to three pounds and the pulverized coal was hauled to Seattle in five ton air-tight tanks from Briquettville, a distance of twelve miles.

Mr. Evans followed with some notes taken from a detailed report of a twenty-four hour test made during February, 1919, on a Babcock and Wilcox boiler of 600 H.P., which during the test had a rating of 125%. Without going into the details he quoted a few of the economic and efficiency results obtained:

Water fed per pound of coal fired.....	8.50lb
Water evaporated per pound of dry coal.	8.35
Equivalent evaporation from and at	
212°E per pound of combustible.....	11.30
Calorific value of one pound of dry coal.	11,660 B. t. u.
Calorific value of one pound of dry com-	
bustible coal	13,700 B. t. u.
Efficiency based on coal fired.....	78.95%
Efficiency based on combustible.....	60.05%

Continuing Mr. Evans said that there was quite an accumulation of slag on the sloping sides of the furnace which is removed at intervals of one to two months when it has accumulated to a thickness of six to twelve inches. The ash also accumulated in the boiler tube was removed by the aid of a soot blower.



International Mining Convention, Vancouver, B.C., March 17-19, 1919.

The condition of smoke was very light; there was no back lash; the best effect on the brick works was not noticeable; there was no pulsation and it was the opinion of the engineer who made the test that the results were very satisfactory. The coal used was screenings from the Issaquah Mine of the Pacific Coast Coal Company which is sub-bituminous.

Dealing with comparative costs of fuel oil operation with powdered coal, Mr. Evans quoted some observations from a book written by Mr. C. F. Harrington, mechanical engineer, on the use of powdered coal. After giving statistics the speaker pointed out that the conclusion was that, with fuel oil at \$2.00 per barrel and washed bird's-eye coal at \$2.50 per ton there is a marked saving in favor of powdered coal.

"For the smaller apartment houses, hotels and small steam plants that cannot afford to install either the large mechanical stoker or the powdered coal equipment some other provision must be made. This field of fuel consumption appears to be well taken care of by a mechanical stoker invented in Seattle within the past few years which is known as the American Smokeless Stoker or Burner. This stoker works automatically. It is of the under-fed type and is designed to be used where the amount of coal consumed is not as large as in a large steam plant. A coal bin connected with the screw feed of the stoker is filled with coal and after a fire is started in the bowl of the stoker the apparatus is started. This stoker or burner is constructed so that it can be controlled first by hand for plants that have the constant attention of an engineer who regulated the rate of feed by means of a three-speed belted pulley; second by steam pressure control in which case an electric switch is thrown on or off and can be adjusted at will; third by thermostatic control whereby the switch is operated by a rise or fall of temperature beyond fixed positions. These positions are also changeable.

The following data were furnished by the manager of the American Smokeless Burner Company. In two houses in Seattle the fires have run for two winters without being relighted and in the case of the smaller of the two stokers it ran all of last winter and kept the house at a constant temperature of 75 degrees. All the owner did was to fill the hopper which holds 140 pounds of coal every day or two and remove the ashes every four or five days. The fuel used from October to the following June cost \$20.00, the price per ton being \$3.15. The building is a two story wooden building of eight rooms. At another plant before the stoker was installed the coal used cost \$4.50 per ton, and it was impossible to keep the house warm. Since the stoker has been installed coal costing \$2.75 per ton has been used and the apartments have been thoroughly heated. It takes only one hour of a man's time per day to fill the hopper and remove the ashes, hence one fireman could take care of several apartment houses equipped with this form of stoker.

Comparing powdered coal with fuel oil Mr. Evans pointed to the analyses of some western coals. These show that they average ten thousand B. T. U. per pound, that is, figuring conservatively, 20,000,000 B. T. U. per ton. If California fuel oil averages 18,500 B. T. U. per pound and 7.8 pounds to the gallon, 42 gallons to the barrel, we would have 6,000,000 and 60,600 B. T. U. to the barrel. It takes, therefore, approximately 3 and 1/3 barrels of oil to the ton of coal. The oil would have to be sold at 80c per barrel to be on a parity with coal at \$3.00 per ton. With fuel oil at \$2.00 per barrel you could afford to pay \$6.66

per ton for the coal except the cost of handling the ash which is not great. There is no smoke given out by the stacks of these smokers when they are operated properly.

Mr. Evans added that a smaller stoker has been invented, but has not yet been placed on the market. Some of its features resemble the operation of the American Smokeless Stoker. It is designed to burn as small an amount as one pound of coal per hour and to be used in residences and the smaller homes. This stoker can be controlled with a thermostat or an electric push button in any part of the house.

Concluding the speaker said, "By definite team work on the part of the coal producers, the coal salesmen, the fuel engineers and the public a large percentage of the small coal now being wasted can be saved to the coal company and the State or Province. Such team work will be a factor in successfully overcoming the inroads made into fuel markets of the Northwest by California fuel oil and cause this same oil to be utilized along lines where it will do the greatest amount of good. The oil supply of the world is very limited and should be conserved. The supply of coal in the Province of British Columbia and State of Washington not to consider the coals of Oregon and California are sufficient to last the needs of the Pacific Coast States for hundreds of years and why not utilize these coals to the best advantage? By practicing true conservation we will make the supply last longer and the consumer will be able to buy a better grade of coal at a cheaper price.

Mr. Francis Glover, of the Princeton Coal and Land Company, of Princeton, B.C., in dealing with the better Utilization of British Columbia Coal, suggested that the Government should introduce legislation preventing the coal lands falling into the hands of speculators whose one idea was to hold them in order to sell at a profit. Engineers, he said, should be appointed by the Government to see that coal was not extracted by wasteful methods. As to operators, he declared that they should realize that all conditions relative to the human element should be of the best. By this he meant safety condition, living condition and working condition. They ought to have the most up-to-date machinery and tackle and should be ready at all times to work in harmony with labor, referring disputes to the Government Board of Control and abiding by the decisions. On their part, the laborer should realize that production is imperative to the success of the coal industry, and it was his duty to handle idlers and malingerers. He spoke of the necessity of the railways providing the best transportation facilities possible and expressed the opinion that in the past one of the great drawbacks to the profitable mining of coal in British Columbia has been the intermittent tonnage. By this he meant periods of slackness and periods of great activity. This lead, during the slack period, to the deterioration of workings and roadways, and had the effect also during the periods of great activity of tempting operators to attain a fictitiously high output by following the line of least resistance and neglecting development work. In speaking of the present methods of burning coal he termed them a disgrace, and thought that there should be some effort at an educational campaign that would result in the practice of economy by the general public. Mr. Glover also dealt in a general way with the problem of utilization of the many valuable by-products of coal.

The Prospector.

Mr. John McConnell spoke on the "Prospector; What He should Be and How to Encourage Him." He spoke

of the absolute necessity of prospectors and the prospector's work in a mining country, especially a mining country in the early stages of development. Because of the pioneer work which he did, it was his opinion that every encouragement and assistance should be accorded these men. He said that the prospector's problem was his grub stake, and the speaker recommended citizens of Vancouver might give more attention to prospectors looking for such backing. It was a gamble, of course, but a gamble of the most fascinating nature. The odds were against the return, but if reward was obtained, it was likely that it would be of a very generous nature in proportion to the investment. Mr. McConnell thought that the prospectors might be given more aid in the work of developing their prospect to the end that they might become operators. He recommended too, that because of the complex nature of British Columbia ores such representation should be made as would bring about the establishment in the Province of ore testing mills in different mining centres. Plants of this nature, he said, would be a very great help to those engaged in mining in a small way. He thought that plants might well be established, one as an adjunct to the Scientific Department of the University of British Columbia, another in Nelson to supply the needs of the interior mining districts of British Columbia and a third at a point in the northern interior. These plants he recommended should be under the direction of skilled metallurgists who would in turn be under the jurisdiction of the Provincial minerologist.

In the judgment of Mr. McConnell, the Government also should construct at least two concentrating plants, one at Hazelton or some suitable point in the Northern silver lead district and one in Kootenay preferably at Nelson to take care of the southern galena belt. Referring again directly to the prospector and his welfare, Mr. McConnell recommended that a course in mining should be given at the University of British Columbia for his benefit and also that the Government might consider in dealing with the returned soldier problem the possibility of grub-staking those returned men who would prefer to prospect unexplored areas of the Province for mineral. This support, he suggested, might be limited to one or two years but he thought that such a measure would be largely taken advantage of and very much appreciated besides materially assisting development of the mining industry of the Province.

Taxation of Mines.

"Taxation of Mines" was the subject of an address by Mr. Valentine Quinn of the Granby Consolidated Mining and Smelting Company, Vancouver, B. C., and he was followed by Mr. T. W. Bingay of the Consolidated Mining and Smelting Company and Mr. Nicol Thomson, Chairman of the Mining Committee, Board of Trade, on the same subject. Mr. Quinn's address dealt with the principals which should be followed in his opinion in the taxing of mining properties. He said there were three cardinal features governing the employment of capital namely, its ultimate return to the proprietors, its safety during use, the interest or rent to be paid by the borrower. He observed that if capital is to be obtained its return to the proprietor when no longer employed must be assured and said that income might briefly be epitomized as the difference between the amount of money you take in less the amount of money you have to pay out incident to the operation. After some further amplification he laid down these principles:

(1) Capital must be assured protection during em-

ployment and ultimate return when its loan term is ended.

(2) Capital must receive a reasonable percentage of the earnings derived from its use.

(3) Income is only truly defined as the difference between earnings and the cost of their production and included in such cost must be the necessary provision for the first two items enumerated.

Further explanation of his position was given with the result that the conclusion was reached that interest on capital employed is a fair and equitable charge on the income its employment produces and therefore it should not be taxed.

He spoke of the possibility of considerable difficulty arising in the obtaining of outside money or capital for an investment in British Columbia mining enterprises if the course were pursued of making no allowance for interest on bonds in connection with taxation. He referred also to other proper exemptions, and concluded by saying that if a refinement of the Income Tax Act could be secured eliminating the indeterminate basis "on which it is presently proposed to assess the mining industry and taking into account the necessity of not only inducing new capital to come into the province, but permitting the repayment of capital already invested to be periodically provided for as well as to receive a reasonable return on its use, say 7 per cent, before determining the taxable income it would go far towards developing the financial end of British Columbia's mining industry.

Addressing himself to the same question, Mr. Bingay arrived at practically the same conclusion. He thought that the Government should in its taxation policy exempt interest on borrowed capital in its estimation of what was termed taxable income. His opinion was that it would be more just and equitable to follow the lines laid down by the Dominion Income Tax Act, which applied equally to all individuals and to all corporations, regardless of the size of the income. "If an individual derives income from investments in a company, the normal tax is collected at its source, and he does not have to pay the normal tax again on the same income." Mr. Bingay said that this was not the case in the province, but that the individual paid income-tax first on earnings of the company in which he was interested, then again on the same money which came to him as income from the company. He also criticized the two per cent mineral tax as being inequitable, and felt that a deduction should be made for salaries of non-resident directors and managers. In regard to the allowance for mine depreciations, he did not agree with the limit of 15 per cent set by the Government, thinking it illogical for the Government to take the stand that in no case could a greater depreciation be suffered.

Mr. Nicol Thomson followed along the lines of the previous speaker endorsing in unqualified terms their arguments and their conclusions. He thought that any taxation should be based on the net income and not on the gross income, and that proper allowances for exemptions should be made for depreciation, development charges and so forth. This, he thought, was only right, inasmuch as the mining industry was one of very great importance to British Columbia, that it was at a point necessitating the acquirement of considerable sums of outside capital and that any undue burden in the shape of taxation could not but have the effect of discouraging investment.

The resolutions to which reference already has been made then were dealt with, as indicated, after which the Convention adjourned.

In the evening, the delegates assembled around the banquet table in the magnificent ballroom of the Vancouver Hotel. After the offerings of an excellent which was duly appreciated, Mr. Fred T. Congton, K.C., former representative of the Yukon Territory in the Dominion House of Commons was called on for a short address. He congratulated the British Columbia Chamber of Mines on the splendid convention held under its auspices, expressed the opinion that it could not but be of very great benefit to the mining industry of the province and was of the opinion that such assembly should be repeated annually. In touching upon the Yukon, he said that it was a fallacy to suppose the Yukon Territory or Alaska had been in any way depleted in their mineral possibilities. Both these vast territories offered splendid opportunity to the prospector and explorer. He spoke of the fine type of men which the Yukon had turned out, referring to the whole country as a university which taught the traits of true manhood and developed in its people courage, enterprise and intellect. The climate, too, was grievously misunderstood. To talk to people in Eastern Canada and even in the West one would imagine, he said, that Alaska and Yukon were horrible places to live, the climatic hardships almost unendurable. This was absolutely untrue. It was true that there were occasional cold snaps. It was true also that if the people of Vancouver had to endure a temperature of 30 deg. below zero living in houses such as theirs were they would probably wake up in the morning to find themselves frozen stiff. (Laughter.) But in Dawson these trifling cold snaps were scarcely felt, in fact, they were considered desirable, as providing the necessary pep and stimulation for work. Seriously though, he wanted to put

himself on record as stating that the climate of Dawson all the year round could not be beaten, and that for six months in the year it was much finer than anything that could be found in so-called sunny California.

The mineral and industrial possibilities of Prince Rupert and adjacent districts were the subject of a short address by Mr. A. C. Garde, the delegate from the City of Prince Rupert. Mr. Garde was very enthusiastic; pointed to the resources of the section from which he comes, and declared with unreserved enthusiasm that Prince Rupert was destined to become one of the most important communities or centres of the Pacific Northwest.

The importance of developing the iron ore deposits of British Columbia was the theme of an address by Mr. M. J. Carrigan, of Seattle. The substance of his remarks already has been dealt with. Briefly he declared with all the emphasis at his command that this province has the iron ore in sufficient quantity and of the required quality to make the establishment of a modest-sized smelting plant absolutely practicable. He commended the Minister of Mines for so stating in a public manner and with equal emphasis urged the people of the Northwest to be up and doing in this matter in order that the shipbuilding industry may be maintained.

On Wednesday, the Convention was brought to a close with a trip to the mine and plant of the Britannia Mining Company, which is situated within a day's return journey from the City of Vancouver. A special invitation was given the visiting delegates and every opportunity afforded them to become acquainted, at least to some extent, with one of the largest and best managed mining enterprises of America.



General View, Consolidated M. & S. Co. Smelter, Trail, B.C.

British Columbia's Mineral Production in 1918

The value of the mineral production of British Columbia for 1918 is estimated at \$41,083,093. This is an increase of about 11 per cent. over that of the previous year.

year, an increase of about 7.4 per cent. over the previous year.

The Hidden Creek mines and the smelter at Anyox of the Granby Consolidated Mining and Smelting Com-

Mineral Production For Two Years, 1917-18.

	—Production, 1917—		—Estimated Production, 1918—			
	Quantity.	Value.	Quantity.	Value.	Increase.	Dec'se.
Gold, placeroz.	24,800	\$ 496,000	15,400	\$ 308,000	.....	\$188,000
Gold, lodeoz.	114,523	2,367,190	157,276	3,250,895	\$ 883,705	.....
Total gold . . . . .	.....	\$2,863,190	.....	\$3,558,895	695,705	.....
Silveroz.	2,929,216	2,265,749	2,886,861	\$2,601,120	335,371	.....
Leadlb.	37,307,465	2,951,020	43,949,661	2,944,627	.....	6,393
Copperlb.	59,007,565	16,038,256	63,387,010	15,681,946	.....	356,310
Zinclb.	41,848,513	3,166,259	36,149,894	2,501,573	.....	664,686
Total metalliferous . . . . .	.....	\$27,284,474	.....	\$27,288,161	3,687	.....
Coaltons	2,149,975	\$7,524,913	2,292,068	\$11,460,340	3,935,427	.....
Coketons	159,905	959,430	190,656	1,334,592	375,162	.....
Total collieries . . . . .	.....	\$8,484,343	.....	\$12,794,932	4,310,589	.....
Miscellaneous and building materials.	.....	\$1,241,575	.....	\$1,000,000	.....	241,575
Total production . . . . .	.....	\$37,010,392	.....	\$41,083,093	\$4,072,701	.....

It will be noted that the coal and gold companies are responsible for the satisfactory increase, there being a decrease in value of zinc, copper and building materials.

In the case of coal there was an increase in selling price as well as output. The increase in value of gold is, of course, an exact indication of increased production.

The increase in value of silver output is directly attributable to the higher selling price, there being actually a small decrease in output.

The increase in gold production is to be credited chiefly to a new mine, the Surf Inlet property of Canadian Belmont Mines, which made an output of about 43,000 oz. The Rossland mines have usually contributed about one-half of the province's gold, but during the past two years only about one-quarter the normal output has been made. Only very small shipments were made during the latter part of 1918. With the improved conditions for gold mining, it may be expected that production in 1919 will be much larger.

Most of British Columbia's silver comes from the Slocan district. In 1918 47 per cent. was credited to the Slocan. The Surprise, Queen Bess and Standard mines are large producers.

British Columbia is Canada's chief producer of lead. The total amount of lead produced in 1918 is estimated to have been 43,949,661 lbs., valued at \$2,944,627. This represents, as compared with the previous year, an increase in quantity of 6,642,196 lbs., but owing to the lower market price of lead a decrease in value of \$6,393.

The Sullivan mine, in the Fort Steele division is responsible for much of the lead output. The North Star, Queen Bess, Surprise, Standard, Blue Bell, Florence, Hyland and Cork-Provinces mines were among the large shippers in 1918.

The decrease in copper was in value, not in quantity. The production is estimated at 63,387,010 lb. for the

pany were operated practically continuously throughout the year, although closed for a short time by a strike, which was soon settled. A larger tonnage was treated than in 1917, amounting to approximately 828,000 tons, together with quartz and limestone flux to the extent of some 80,000 tons. With the increased tonnage handled there was a corresponding increase in the output of copper, approximately 30,400,000 lb. being produced, as compared with 27,661,301 lb. in 1917.

In the Boundary District the Granby Company's mines at Phoenix were unable to supply the smelter at Grank Forks with sufficient ore to run the smelter at capacity. The ores reserves of these mines are approaching exhaustion, so that the large-scale production of former years cannot be maintained. Also the high operating costs during 1918 left but little margin of profit in working the low-grade ores at Phoenix.

The Canada Copper Corporation, operating the Mother Lode mine and smelter at Greenwood, treated a slightly smaller tonnage than in 1917. About 165,000 tons were handled, from which approximately 2,200,000 lb. of copper was recovered, together with low gold and silver contents. Towards the end of the year the smelter was closed, the ore-reserves at the Mother Lode mine being exhausted.

The Britannia mine had a very successful year, approximately 750,000 tons of ore being milled, the production of copper from which is estimated at 18,250,000 lb. This is nearly 2,500,000 lb. greater than the 1917 production.

The Marble Bay mine, on Texada island, made about the same production as in 1917; the output is estimated at 740,000 lb.

Copper mining is now firmly established as the most important form of mining in the Province, and from all indications it should maintain this place for years to come. In 1918 the value of the copper mined

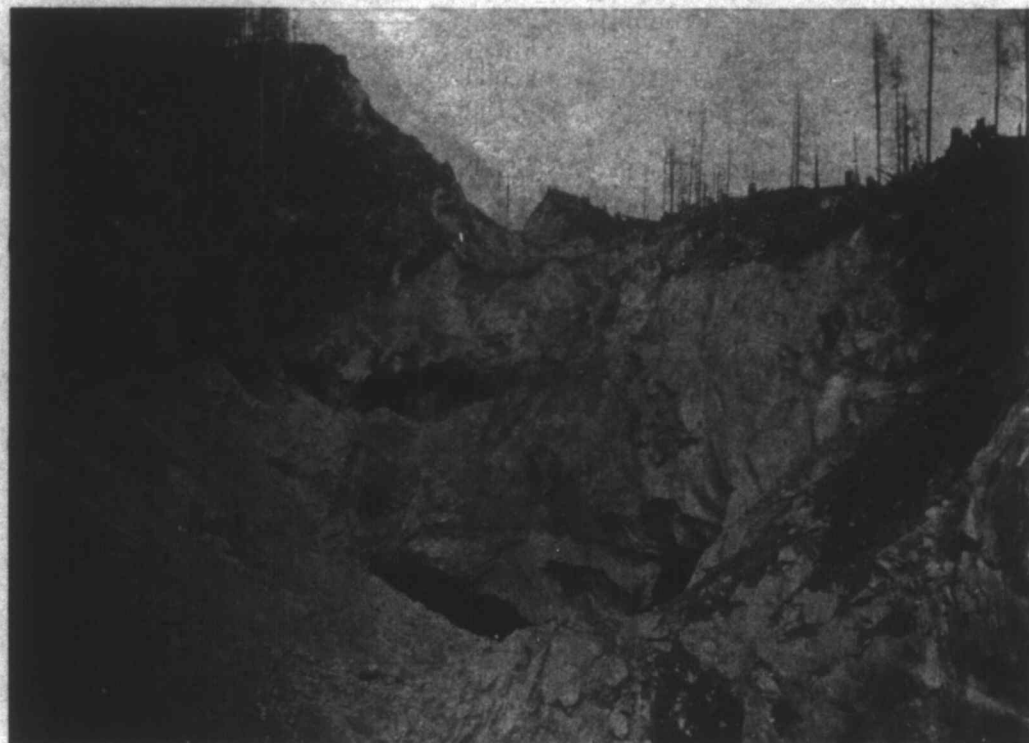
exceeded by over \$4,000,000 the combined values of all other metals mined, and it formed 38 per cent. of the total value of the mineral production for the year.

It is also to be noted that 80 per cent. of the copper output is produced on the Coast, which has become

information regarding shipments to the United States. This production is valued at \$2,501,573, which shows a still further proportionate decrease, as compared with the 1917 value of \$3,166,259, due to the decreased market price of the metal.

It is estimated that the gross production of coal

COPPER MINING IN BRITISH COLUMBIA.



Glory-Hole, Granby Co.'s Mine, Anyox.



Stoping, Granby Co.'s Mine, Anyox.

the centre of the copper-mining industry, thus replacing the Boundary District, the old centre.

The quantity of zinc estimated to have been produced in 1918 amounted to 36,149,894 lb., which, compared with 41,848,513 lb. produced in 1917, shows a decrease of 5,698,619 lb. The estimate on zinc-output, however, may be low, as it has been difficult to get

was 2,572,811 long tons, of which 280,743 tons was made into coke, leaving the net production at 2,292,068 tons. These figures show an increase, as compared with 1917, of 174,096 tons gross and an increase of 142,093 tons net. The quantity of coke made was about 190,656 tons, which is an increase of about 30,751 tons as compared with 1917.

New Marcus Tipple at Granby Co.'s Coal Mine

There has been published from time to time in these columns information concerning the new mining plant of the Granby Consolidated Mining, Smelting and Power Company, Ltd., at Cassidy Siding, near Nanaimo, on Vancouver Island. It is not our purpose here to go into the detail of mine development or the surface plant, as a comprehensive article will later be published by the engineers for the company, the Taylor Engineering Co., Ltd., of Vancouver, B.C. It is sufficient to state at this time that the arrangement of camp, housing facilities for the comfort of the employees, shops, bath house and boiler equipment is second to none in the West, the entire arrangement lending itself readily to the ultimate development of this property.

The engineers entrusted to Roberts and Schaefer company of Chicago the development of the tipple, and in view of the agitation against anything other than a solid body car, and consequently the use of rotary dumps, and also the careful consideration that must be given now that the war is over, to the better preparation of coal by picking or washing, it is opportune that the readers of this journal should have called to their attention the general arrangement of this plant.

ably no where has it operated using a car of such large capacity as at Cassidy Siding.

Another feature of interest in connection with this dump is that it is provided with Mining Safety Device Company's feeders, so that the feed of cars to the dump is automatically controlled, thereby avoiding delay and liability of wrecks which might happen if the cars were not regulated into the dump. All parts of the car feeders and revolving dump are of very substantial construction and are easily accessible in case repairs are necessary.

The empty cars standing in the revolving dump are started forward by the load entering, the arrangement of tipple tracks being such that empty cars run by gravity from the rotary dump to the kick-back and thence to the empty track, from which they are lowered by means of a car-haul to the ground level; whence they can drift on to either of the empty storage tracks for making up trips preparatory to lowering into slope.

Provision has been made for handling mine cars loaded with rock by taking off the rock cars at the head of the loaded car-haul, passing them over a rock track, which leads to a rock bin—this, however, for future requirements, at which time a duplicate revolving dump will be placed over the rock bin. The empty rock cars will drift by gravity back to the empty mine



The Tipple at Granby's New Coal Mine, Cassidy, Vancouver Island.

In locating mine car tracks, tipple and proposed washery, sufficient room has been provided for the storage of loaded cars pulled out of the slope, the loads being permitted, after passing over the knuckle to drift on and down grade at ground level to the loaded trip feeders, which feed the cars, one at a time on to the loaded car-haul.

After the cars have reached the top of the loaded car-haul, they drift over a platform scale and then on towards the rotary dump. This rotary dump is of the Head-Wrightson type, the Canadian rights of which, together with the Canadian rights of the Marcus patent picking table screen, have been entrusted to the care of Roberts and Schaefer company since the outbreak of the war. This type of rotary dump is not new to coal operators of Western Canada as it has been in successful use at a number of mines, but prob-

ably no where has it operated using a car of such large capacity as at Cassidy Siding.

For the early development of the mine the rock will be handled over the rotary coal dump, a by-pass being provided in the chutes leading from the dump so that the rock can be diverted into a temporary rock bin from which it is disposed of by means of wagons. Provision is also made in connection with the rotary dump and chutes leading therefrom to handle local trade or house coal.

The coal from the rotary dump is delivered into a receiving hopper from which it is mechanically fed on to a 5' wide Marcus horizontal screen, the upper deck of which is provided with perforated plate for producing lump, nut and slack coals on three tracks as shown, or combinations of these sizes as might be desired.

Britannia Mine

As you leave the boat at Britannia Beach you notice the powerful little electric locomotive hauling some heavy machinery direct from the boat, and upon enquiry, you will find that this machinery will be delivered with the least possible handling direct to that part of the works for which it is destined. They even have a track to the basement of the store to deliver merchandise.

Going up from the boat, after landing at Britannia you come to a neat, trim office building, where you always find the latch-string out, and Mr. J. W. D. Moodie, Vice-President and General Manager, or Mr. E. J. Donahue, Secretary-Treasurer. The very businesslike and, at the same time, genial greeting with which they greet you, will impress you. It is the same all over Britannia, that genial courtesy is everywhere.

The hotel has a comfortable dining room and the very best of food. At the store employees may purchase the best of everything at city prices. Everything is of the best. The store is exceptionally large, light and airy. It is fitted with a freight elevator, refrigerator system and special storage, for all kinds of foods, barber shop and even a shoe repair shop. Nearby are the steam laundry, blacksmith and machine shop.

Looking to the right as you leave the wharf you will see the bunkers from which the ore is landed on the steamers to be taken to the smelter. At the top of the mill, which is the 4100 ft. level, one first sees the skips used on the incline, and which is operated by a gravity system. Here also you get the first near view of the aerial tram, as the buckets dump their 900 lb. each of ore into the ore dump. This dumping is automatic, then the buckets continue on and are righted automatically and return to the upper terminal, a distance of 13,000 feet at the 27 ft. level. This aerial tram can handle 1,000 tons of ore per day and works 24 hours.

The skips carry ore from the ore bins at the top of the incline to the dump at the mill. They are operated on the gravity system, the hauling being done by a 1½ inch cable over an 8 ft. drum. Safety devices and brakes are operated by compressed air, and electric motor. The entire operation being carried on by one operator in a tower at the head of the incline. Each skip has a capacity of 15 tons and weighs, itself, 13 tons. The top of the incline is at the 2,700 ft. level, and is 5,400 feet long on a grade of 30 per cent.



The Rotary Dump, Granby Coal Mine.

Provision is also made in connection with the Marcus Screen for diverting the nut and slack coals to a conveyor which delivers this nut and slack mixed to the elevator of a washery which is now being installed by the Roberts and Schaefer Company, or the slack from tipples can be diverted to the conveyor leading to boiler-house.

Ample facilities are provided in connection with the Marcus screen for thoroughly picking the lump coal, and after passing over the lump perforations it is delivered without breakage on to an apron conveyor type of loading boom which lowers it into railroad cars.

Pickings from the Marcus table are carried forward in a pickings trough which shakes with and is part of the Marcus screen proper, these pickings being delivered to a refuse bin built in conjunction with the rock bin. Provision is also made in the tipples for delivering bone coal (with some good coal attached), to a crusher from which it is conveyed into the boiler house.

With the arrangements provided for handling mine cars and the facilities provided for preparing and handling the finished coal products, this preparation should prove one that will permit of low cost production, and when the washery is built, will load a product on railroad cars that will be among the best of the Island coals.



A part of Beach Townsite, showing electric tram-road winding around mountain.



Incline to Mill—Note 1½ inch wire cable used to haul skips. Incline is 1,500 ft. from top of mill and is 5,400 ft. long.

Britannia Mine Entertains Delegates

When the committee in charge of the proposed trip to some important mine came back with word that Mr. J. W. D. Moodie, Vice-President and General Manager of the Britannia Mining and Smelting Company, Limited, said he would be only too glad to welcome the delegates of the International Mining Convention at Britannia Beach, the opinion of the Executive Committee was that, if the weather was good, this would be a trip of inspection worth while.

When Wednesday morning, March 19, the day of the trip, arrived, the delegates surely had Mr. Weatherman with them. The day was ideally bright and sunny. Everyone arrived at the boat with a smile and the feeling of good-fellowship was everywhere. The fact that the Convention so far had been a decided success from every point of view was responsible for a great deal of this.

After boarding the S.S. Ballena, the delegates had a good two and a half hours to get-together and talk over old times or business. This was one of the best chances the delegates had for getting acquainted. The orchestra provided music, which did a great deal to enliven the trip.

On arrival of the steamer at Britannia Beach, Mr. Moody was on the dock to welcome the delegates. That arrangements had been made to handle the delegation was amply exemplified when the committee immediately began loading up the cars which were ready on the dock waiting for those who were going direct to the mine. These cars were arranged with seats and hauled by an electric locomotive up to the foot of the incline. Here the delegates boarded the ore skips which took them up the incline 1,500 feet higher up to where the electric railway took them up to the mine tunnel.

From the time the members of the delegation boarded the electric tram at the dock until they were back and on board the boat, the employees in every department of the works put themselves out to explain and describe the different departments and each tram load had on board some one of the men in charge to explain the different locations and answer the many questions fired at them by the delegates at the different points. This was especially noted by all of those who made a tour of the mill. Every phase of the workings in this up-to-date plant was explained—from heads to tails.

The majority of the delegates ate their dinner at the company hotel instead of on the boat and found that the meal service here was like everything else at the Britannia Mines—first class.

On the return trip the boat left Britannia Beach soon after 7 o'clock in the evening. After giving three cheers for Mr. Moody and the different men who had showed them such great courtesy on the trip, the start for the return to Vancouver was made.

Pass Resolution of Thanks.

Between songs a few moments were spent in passing resolutions of thanks and commendation by the visiting delegations. There were short speeches by some of the committee. This episode was started by Mr. Buck, correspondent of the "Chronicle" of Spokane, who called upon Mr. Sidney Norman of the Spokane delegation to say a few words. Mr. Norman, after commending the work done by the committee done in connection with the Convention proposed a resolution as from the City of Spokane that the delegates from south of the line extend their sincere thanks to the citizens of Vancouver

and the members of the British Columbia Chamber of Mines for the entertainment and courtesy shown the visiting delegates. Mr. Norman stated that, during the past ten years he had attended Conventions all over the States and Canada, and that there never had been one so successfully managed and attaining so much commendation as the present Convention. Mr. Carrigan, who, by the way, has earned the soubriquette of "Pig-Iron" Carrigan, through his memorable address at the banquet, seconded the resolution as coming from the Seattle delegation. In his remarks, Mr. Carrigan said, "At the end not of one perfect day, but of three perfect days, the delegations will return homes after enjoying the hospitality of the British Columbia Chamber of Mines." They came to Vancouver strangers and were going home friends. In fact, he believed that he knew almost everyone present by their first names. Mr. Carrigan stated that he had attended conventions for the past twenty-five years, and that this was the most perfectly managed convention he had ever had the pleasure of attending. The generous sense of business as well as the entertainment had appealed to all. The members of the committee consisting of Mr. J. D. Kearns, Dr. Hodge, Mr. A. M. Whiteside and others were deserving of the greatest credit for their hard and continuous work in carrying through the first International Mining Convention without a hitch. As a virgin effort it was remarkable. The interest developed at the beginning had kept up to the finish. The universal courtesy extended had resulted in sending home the most satisfied delegation ever attending any convention. It gave him the greatest pleasure to second the resolution for the delegates from Seattle.

An Idea of the Late A. B. Clabon.

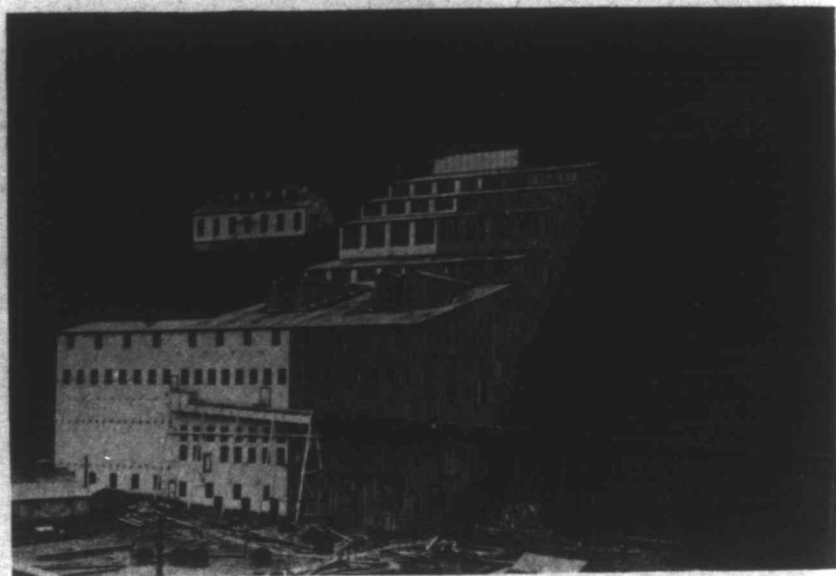
Mr. Kearns was called upon for a speech and insisted on not being given so much credit for the success of the Convention, stating that everyone of the committee deserved equal commendation as they had all given up a great deal of their time to help make this Convention a success. Mr. Kearns stated that the late Mr. A. B. Clabon, who was formerly President of the Chamber of Mines, originally conceived the idea of the International Convention and Mr. Kearns gave Mr. Clabon his promise two days before Mr. Clabon's death that he would see that this Convention was carried on. He believed in making these remarks that he was doing credit to the memory of a man who had done much for the mining industry of British Columbia.

Dr. Hodge was next called upon and made a few remarks suitable to the occasion.

Acting Mayor Woodside expressed his satisfaction at the success of the Convention and extended the thanks of the City Council and City to the members of the Chamber of Mines for making the Convention such a success.

Mr. Norman made a few remarks, speaking of the losses experienced on both sides of the line in the death of many brave boys during the great conflict. He spoke very strongly along the line of these losses, bringing both countries much closer together with the lessons that can be learned from these losses.

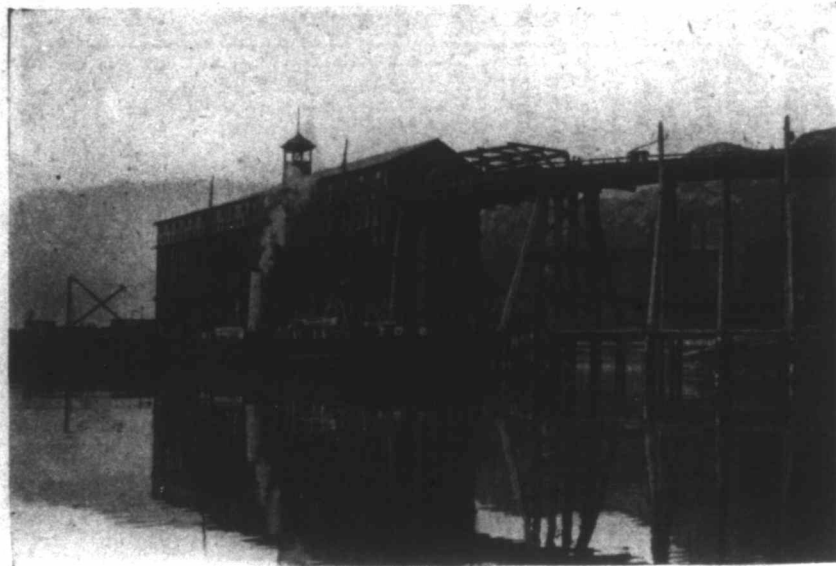
Mr. Kearns moved that the thanks of the entire delegation be conveyed to the management of the Britannia Mining and Smelting Company for their hospitality during the trip and that a letter be sent to that effect. This was seconded by Acting Mayor Woodside and carried by unanimous vote.



The Mill.—Produces about 1,500,000 lbs. of copper per month. Runs 24 hours daily.



Beach Townsite, showing employees' houses and department store, where everything may be purchased from a pin to a piano, and at city prices.



Ore Bunker Company steamer "Quadra" loading.



Beach Townsite, showing mill, bunkers and store.

Gold

Address by Nt. H. N. Lawrie, Chairman of the Bureau of Mines, Oregon.

He said:—

We all know that the economic situation has been changed very rapidly from time to time and it is very hard to keep track of these changes which are very momentous and very serious bearing upon our present and immediate future. To start with I have prepared some charts and data. The year 1915 is the high point in the production of the world's gold which was 469 millions. The decline has been very rapid since. I propose to give you the percentages of decline in the past three years with respect to the production of 1915.

The total decline for the world's production represents 20 per cent. The decline for South Africa was only six and four-tenths per cent. The fact that the decline was no much less than the decline of the world is evidence of the fact that South Africa happened to be more remote from the centre of economic pressure. They had probably laid in their supplies in advance. Another factor is the improvement in the recovery of returns in the South African ores and that has tended to compensate for the economic conditions that have been so universal in the gold mining industry.

In Australia a country which was no less remote but on account of the fact that probably the resources of the Australian gold mines were diminishing we have a continuous decline from 1912, but the decline from 1915 represents 45 and a half per cent. The decline in Canada is 6 per cent. covering a period of three years. British India, the decline is 13 per cent., Rhodesia is 15 and eight-tenths per cent. and other colonies the total decline amounted to 46 millions and represents 15 and four-tenths per cent.

In the U. S. we find the decline to be 32 and two-tenths per cent. Of the total decline of 92 millions of the world's gold production, the production of the U. S. may be accounted a decline of a little better than one-third or approximately 35 per cent. while the U. S. gold mines produce one-fifth of the gold output. That denotes the extreme economic pressure and reflects the volume of the financial responsibility of the development of the natural resources and the responsibility of the U. S. when it entered the war. It was much more acute than it was in some other countries that had felt the pressure before that time.

In Russia we naturally expect that country would show the effect of disorganised government and so it does. The Russian decline is 62 per cent. for the three years and I suppose that spells more eloquently than anything else the effects of Bolshevism. The south and central American states showed an increase of five and three-tenths per cent. and I assume some of that increase has been made up from the by-products of gold. The Mexican crisis in gold production took place in 1915. It happened to coincide with the year in which the high point took place and speaks for the chaos in which the Mexican government found itself at the initiation of their difficulties. The production was a little over six millions and in three years it has increased to ten millions so that we have an increase in Mexico of 52 per cent.

All the other countries combined indicate a decline of 4 and two-tenths per cent. To analyse the situation in the U. S. a little more carefully, I have prepared a

chart on exactly the same principle and covering the same years from 1912 to 1918. We find that California has just about maintained its production in a somewhat similar manner that South Africa maintained its production with respect to the world notwithstanding the fact that the economic pressure was so severe and showed such a decline in the other states. It is probably for the reason that a considerable part of the output in California is placer mining where labor is not so much a point in the cost of production. Then the interior states had difficulty in holding the seaboard. The decline in California is 23.7 per cent.

In Colorado we find a decline of 45 per cent. This is due to the labor situation and the complexity of the treatment of ores where the chemicals advanced so rapidly. In Alaska we have a decline of 45 and a half per cent. which corresponds exactly with the decline of Australia and it can be accounted for, not altogether by the economic pressure because you will recall the closing down of the Treadwell which was an important factor in the contributing to the Alaska production. Nevertheless the decline since 1917 shows the tremendous effect the war had on the Alaska production.

In Nevada we have a decline of 44 per cent. due largely to the treatment of their complex ores and the fact that they are located away from the coast. In South Dakota we have the Homestake mine which is so well developed and is such a homogeneous ore that they were able without difficulty to maintain their output in fairly good shape. Their decline is only eight and three-tenths per cent. In Arizona the copper production extended very rapidly in the last three years and that expansion gave an expansion in their gold output of 26 and four-tenths per cent. In Montana we have a decline of 36 per cent. and in all the south states and dependencies combined of the U. S. we have a loss of 33.4 per cent. That corresponds with the general loss for the entire U. S.

This third chart is an attempt to show a combination of factors which enters into the stress of the decline in the gold production throughout the world. In 1912 the Hypothetical gold mine yielded \$12 per ton and the total cost of production was \$7. You get the cost per ounce of production of \$11.70 with a profit of \$8.30 per ounce. I have assumed the price of gold at £20. Here is a condition and that is the depreciating value of the ore at depth and the increased cost of production and these two factors would give, regardless of any economic pressure that would be brought to bear. So that in this year of 1913 we have a recovery of \$11 per ton at a cost of \$7.50 per ton. In this case we had a production cost of per ounce of \$13.60 while the net saving was \$6.40 per ounce. These two factors combined gave a return of \$10 per ton and a cost of recovery of 8 and a half dollars combined to produce the cost at \$16 per ounce with a profit of \$4 per ounce.

It was apparent at this time the management prior to 1915 decided that they were creating very rapidly an economic limit and while they had been operating on a 3,000 ton basis per month they estimated that they should be able to reduce their cost by multiplying their output. They did that and we have a decline which shows a result from that policy. 1915 with a double output we have a recovery of \$9 per ton at a cost of \$7 per ton for the total cost of recovery which make the cost per ounce \$15.60 with a profit of \$4.40.

From that time we have this other component to deal with this economic pressure this decline in the purchasing power of the dollar which was due to the fact that we were pressed to obtain war materials at a very rapid rate and the consequent currency inflation in the open market and the credit expansion that was bound to take place which it did and, according to the best economic theory when they increased the currency and expanded the credit we were bound to come to a reaction in the commodity prices. From here on the economic pressure is rapid and in 1916 we find the gold ounce was \$17.60 with a profit of \$2.40. In that year the recovery was eight and a half dollars and the cost increased fifty cents to \$7 and a half dollars.

In 1917 we find a continuation of that. We recovered the same amount per ton and the total cost had risen fifty cents making it eight dollars per ton and the total cost per ounce was \$18.80 with a profit of \$1.20. In June 1918 the total cost of recovery was eight dollars per ton and the total cost of recovery was \$10 provided the mine continued operations. Many properties did shut down which was wise business policy. Here we get a total cost of \$25 per ounce which would have made a net loss of \$5 per ounce and when in 1918 we have \$30 per ounce cost of production which would have made a loss of \$10.

This last chart shows the ebb and flow of the gold imports and exports from and to the U.S. from the fiscal years 1913-14. They always end on June 30. In 1914-15 we came out of the negative conditions, we were in in 1913-14 and 1914-15. This would have been considerably greater in favor of our balance of gold in favor of the U.S. had it not been for the fact that all our foreign securities were liquidated against the trade balance; that was in our favor at the time and this probably continued somewhere between 1915 and 1916 and after they were liquidated. Of course the gold rapidly flowed into the treasury and it may be said that much of this gold represented, belonged to neutrals who remained neutral during the entire period. Of course this enabled the U.S. to enter on a financial offensive regardless whether the neutrals were willing or not.

In 1916-17 this gold import amounted to nearly one billion dollars. Of course our exports of gold in the same year brings the amount down considerably. I want to particularly point to the fact that from June 30, 1917, you will note the very rapid decline that took place in the movement of gold. In fact we developed a balance against us in actual gold of 66 millions in 1917-18 and since that time the gold movement has been practically negligible. It has been marking time.

It can be readily seen that the U.S. by liquidating its obligations in foreign countries by having this gold reserve in custody, has become more or less a creditor of nation. And it is very important that the world be informed as to what attitude the U.S. may be expected to assume because of this tremendous responsibility that has been thrust upon her by the war. But before going into the matter of international trade and commerce I would like to call attention to a condition which now exists which is based altogether upon a league of nations as to what we may expect to have in the way of commodity prices in the next two years.

Some persons have it figured out that those prices are bound to drop, and they are waiting to see what the trend of those prices will be before they expand and go into production. The aggregate of this when

translated into terms of production was that it has created a condition of stagnation which is just as artificial in its conception as the tremendous gains that has been made in commodity prices due their action of economic barriers. Had we at this moment concluded our period of readjustment and new construction, we might expect to be able to contract the currency but we have not yet reached that period and we have got to expand our currency in order to meet that exigency.

Temporally while we are marking time waiting for the peace treaty to be adopted the door of international commerce has been closed. Commodity prices in this country have dropped slightly but they are bound to increase because of the fact that we have to expand our currency and extend our credit and it is good policy that that extension should take place because we have very many vital problems to deal with in this period.

In response to those gentlemen who are waiting, in response to the municipalities which are waiting, in response to the provinces and states that are waiting, to them it seems conservative to wait, but let us see what will result from that watchful waiting policy.

With the signing of the peace treaty there will be a tremendous demand for the delivery of a great variety of commodities to the Europtan countries and those gentlemen who have waited will find themselves in the same market with this great demand to obtain delivery of their equipment. Aside from the delay they will have passed through the period of two years in which we are going to have these high commodity prices which will enable them to recoup what little excess of prices now exists by a period of production for those two years and they will be in the market to obtain delivery of this material and I doubt very much whether the domestic demand will be delivered first. Why should it be. These countries are entering upon a period of reconstruction that is altogether vital to their existence and they should have the first command of this material and we should certainly be prepared to place our order during this period when the demand may be made.

This condition reminds me of the fact that generally speaking industrially we are marking time at a time when we should be going over the top. The boys in France were not called upon to mark time. They were called upon to go over the top and they are returning better citizens and more capable men to assume the responsibilities of our new constructive industrial life. They do not want to take part in this marking time at home. They are not looking for charity. They are not looking for anything but an opportunity to enter upon a most progressive programme and why not. They have seen too much of activity to settle down and and keep settling down.

Among the various developments that could be made, the mining industry is one of the best for these men to participate in. In times of peace the mining wage has always been the top notch wage. There is not a cleaner business and there is not a business in which they can change with more enjoyment because of its outdoor life in the mining industry, and I believe this convention is well timed and that it will have a most marked effect in accomplishing this result and to the people of B. C. is due the credit for having seen the necessity for allocating the mining industry in the general progressive development of our industrial programme.

Now I should be very frank in stating this, because I believe this is no time to withhold the truth. This is no time to camouflage the situation. Our future depends largely on our conception of the truth and our actions in accordance with it. In the matter of international trade I have said the U. S. has become a creditor nation. The U. S. has always been a nation which has seemed full of self interest. I do not wish to convey the idea that there is anything philanthropic that the economists and financiers have in the U. S. concerning the future because that would be camouflage.

But I want to call your attention to the breadth of vision these gentlemen have. We have our goods bought and we are enabled to get them home and we have got to do certain things. We have to educate our people and you in Canada have to educate yours for the necessity of absorbing foreign investment in Canada and the U. S. Why. Because the foreign countries with whom we desire to trade have not the gold to deliver. They have not the goods to deliver because their industries are paralysed and the trade balance is against them.

To draw on their currency would cripple them internally. With what will they pay. They have nothing with which to pay until a broad policy has been developed to absorb the securities of these countries in order to offset that balance. The great variation in commodity prices in the U. S. has been largely due to the erection of economic barriers. Price taxation by government is always an artifice. It met the requirements of the war but it does not meet the requirements of peace. We have to eliminate those artificial barriers. Let the good old immutable law of supply and demand govern the situation. We have been a long time with it and it has never proven false.

During the period the barriers have been erected domestically and in a large measure these barriers have been erected internationally, what has been the result? The U. S. put an embargo on gold and they have been paying a premium of 7 per cent. to get a draft to Buenos Aires. Of course the Canadians know they have been paying 2 per cent. on account of the fact that they put an embargo on gold and it simply represents a physical difficulty in making an exchange. We have got to have more money for development and I am wondering whether it might not be prudent to consider whether the inflow of capital would not greatly offset the advantages of maintaining such an embargo. And this argument applies to every country and it is to the future course of trade. I hesitate to use the word freedom of trade because I might be misunderstood, but I mean that condition of trade which imposes a burden upon the free transportation of products between any two countries in the world.

It is alarming to consider what some of those exchange rate have been and are now. Roberts says it has been necessary to pay as high as 50 per cent in Spain and in Italy it has been necessary to pay a premium of 100 per cent. In Paris it goes to 5 per cent. to get a draft to New York and sometimes as high as 10 per cent. In London a New York draft costs 2 per cent. but it has taken steady lending by this country for the last three years to hold it down to that point. It is also due to the fact that there was 62 per cent of the world's gold output inside the British Empire.

The first condition that is going to assist the gold mining is this freedom of trade which is a most important thing, the resumption of a sound financial bas-

is of trade with foreign countries. We know the demand is there. Those gentlemen who are holding copper at the present time even operating extensive margins in order to hold it but these supplies are necessary.

The effect of putting gold on the open market would be to give the old miner what he justly should have and I may remand you of the fact that while other metals have dropped gold has been keeping at the constant level. That is a very excellent omen. Some people have been so anticipatory of this condition as to say there will not be gold enough. We know that most of the nations are on that basis and the others will be forced to it. They will have to speak in the same language as we have and they will have to adopt the same vocabulary. The British pound sterling has won for Britain the commerce of the world in the past. It has spoken very eloquently of the sound finance that was back of it and the promise to pay is going to be supplanted by no substitute. Why should it be? It has taken us a century and seven years to win for that piece of paper its hundred per cent. value and is based on gold at a fixed price of 23.22 grains per dollar in terms of the currency of the U. S.

So that I find in analysing the various statements that have come from economists that those who believe that our debts are to be repudiated and our standard changed are very far from the fact. We have got to hold the ship to the shore. So far as I can see the extension of Bolshevism is one of the menaces we are confronted with and this marking time on new investments is not putting a backfire on Bolshevism. The best backfire to Bolshevism is to create a condition of employment that is universal, to create a margin of profit which represents a good living for labor and those fellows will have the wind taken out of their sales. They are operating on a draft that is being blown by their own bellows and it does not get anywhere. Even in their ranks the radical of today is the conservative of to-morrow. It is amusing to see the transition when one of them is elevated to be ruler over them. He immediately develops that ultra-conservatism that we perchance would not dare to assume.

MANAGEMENT OF CONVENTION.

The British Columbia Chamber of Mines, through its Executive committee undertook and carried out all arrangements for the entire three day's program and to the executive and committees the entire unqualified success of the Convention is credited. Every man on the executives and committees and others who assisted carried on day and night during the entire three days. The executive committee consisted of the following:

Mr. A. M. Whiteside, Mr. J. M. Lay, Dr. E. D. Hodge, Mr. H. P. McCraney, Mr. Nicol Thompson, Alderman F. E. Woodside, Mr. J. D. Kearns.

Committees.

Manager of Convention, Mr. J. D. Kearns; Program, Dr. E. D. Hodge, Chairman; Machinery Exhibit, Mr. S. J. Crocker, Chairman; Mineral exhibit, Mr. Kenneth S. Robinson, Chairman; Trip, Mr. I. Thomas; Hotel, Mr. A. H. Wallbridge; Resolutions, J. E. Thompson, M. P. P.; Publicity Director, Mr. T. J. McIlveen.

It must not be forgotten that Mrs. A. M. Whiteside and Mr. J. M. Lay did a lot of hard work in entertaining the visiting ladies who were present, and the Chamber of Mines is indebted to these ladies and their assistants for taking care of this part of the programme.

Mineral Exhibit

*International Mining Convention Held at Vancouver,
March 17, 18, 19.*

By EDWIN T. HODGE, M.A., Ph.D., Prof. of Geology and Minerology, University of British Columbia.

A feature which attracted a great deal of attention at the International Mining Convention was the exhibit of minerals. Visitors were deeply impressed with the size of the exhibit, the great range of minerals displayed and the evidence it gave of the mineralization of the entire Province. Many complimentary remarks were made by visitors who agreed that it was the largest and finest display of minerals ever gotten up in Northwest and many went so far as to say that it compared with the exhibit at the San Francisco Fair.

There is much discussion now in the local papers and among business men to the effect that British Columbia should prepare exhibits of this character and send them to all parts of the world. Especially should one be placed in the British Columbia House in London, England, and in New York City. The B.C. Chamber of Mines is in daily receipt of letters from Japan, China and various points of the United States which request exhibits of our minerals for display in Chambers of Commerce and other places. It would seem from this that British Columbia can do much to attract investors by a proper display of her wares in centres of foreign capital.

The display of minerals brought out very forcibly several ideas. One of these is that British Columbia is above everything else, a mineral Province. No part of it is without mineralization of some sort. Prospects abound everywhere. In fact, I do not believe there is any part of the world which contains, for the area explored, so many prospects. Almost every part of the Province that has been examined has shown mineral developed in a greater or less degree. This is in striking contrast to many other mining areas where prospecting has to be continued for a long period of time before even an area of mineralization is found. This prodigality on the part of nature in giving to British Columbia so thorough a mineralization is perhaps the very reason why such prospects of mineral deposits as are found do not receive the intensive development that they receive in other parts of the world.

Most of the minerals displayed in the exhibit were from prospects, few of which have received any thorough developmental work. One cannot help but be reminded of the fact that almost all of the big mines existing in British Columbia at the present time were, at one time, prospects with no better showings than those whose ores were exhibited at the Convention. The only difference, as far as the writer can see, is that the prospects, which developed into big mines, received intensive, persistent and long continued exploration work, frequently in the face of discouraging results until finally results of a substantial character were produced. As stated above, in other parts of the world, where mineralization is not so universal, a prospect, when once found, is at once developed and this development work continues until the prospect is either proven only a prospect or developed into a mine. Here in British Columbia the prospector or the prospect owner rarely proceed to active development work. The percentage of prospects properly developed in a thorough manner, which have developed into mines, is large. Very few failures due to a real lack of ore are recorded. The

difficulty has always been one of getting our prospects thoroughly examined rather than lack of ores of intensive mineralization. This fact should make one look with favor upon many of the mineral occurrences. This is especially true when one considers that the Province, as a mining community, is only a few years old and that of the \$126,000,000 invested in mining enterprises over \$64,000,000 at this early date has been returned.

To the geologist these facts are not at all surprising. In no part of North America are the geological features which favor mineralization so highly developed. British Columbia contains thick series of sedimentary rock which have been penetrated time and time again by large and small intrusive masses of mineral bearing igneous rock. A study of the geological map of North America will show that mining areas are definitely related to areas of sedimentary rock cut by igneous rock and this examination will further show that British Columbia contains this particular feature to a degree greatly surpassing that of any other portion of North America.

That British Columbia is an area of so extensive and intensive mineralization is not generally known. There seems to have been a conspiracy of silence regarding British Columbia's mineral possibilities. This conspiracy of silence has persisted even up until the last few years. Of the large mining companies in British Columbia, all of them, with one or two exceptions, can count their history in the Province for only a few years back. Another striking fact is the very limited number of investors in mining in British Columbia. As the area for prospecting is becoming smaller and smaller with the passing of time and mining investors are beginning to look to the farthest ends of the earth for mineral it is beginning to look to the farthest ends of the earth for is surprising that an area containing such attractive ores as were shown at the mineral exhibit should have lain unnoticed, undeveloped and unadvertised for so long a period of time. Now, however; the mineral wealth hoarded in the mountains of British Columbia is beginning to be recognized. Evidence is at hand that many of the large mining companies in the United States are looking to British Columbia with a great deal of interest, and we may confidently expect to see a real BOOM in mining development during the next ten years.

The ores represented in the exhibit came from areas more or less isolated and in great need of means of transportation. The present policy of the British Columbia Government to build trails, waggon and railroads is highly to be commended. The development of means of communication will perhaps do more to stimulate mining than any other one thing. Another fact brought out by the exhibit is that coal is British Columbia's most important mineral.

Canada contains one million two hundred thousand million tons of coal, or more coal than all the rest of the British Empire put together. Of this large amount of coal, British Columbia contains more than half and, furthermore, the coals of British Columbia are of much higher grade than those of the rest of Canada. The coals of British Columbia, as shown by the exhibit, range from lignites to anthracites. In fact British Columbia contains in the Ground Hog field the only anthracite known in Canada. Lignite coals are rare. Most of the coals in British Columbia are bituminous in character. In these days when coal is looked upon as something more than a fuel, when we are considering ways and means of utilizing all of the by-products of coal, we must look with great favor upon any coal which will

provide a high grade coke and a large percentage of by-products. British Columbia, apparently, judging from the exhibit is rich in such coals. At the present time only two coal-fields in British Columbia are used in the manufacture of coke, the Fernie coals and some of the Vancouver Island coals. This appears to be a very regrettable fact. There seems to be no good reason why many of the coals, if properly handled, could not be used to make a high grade of metallurgical coke. This is particularly true of the Vancouver Island coals. The law that iron ore always goes to coal still holds true. It is desirable, therefore, that the iron go by the shortest and cheapest route.

The Coast area of British Columbia contains abundant iron, and if a good metallurgical coke can be made from the Vancouver Island coals then the movement of these iron ores to the coals would be easily accomplished by water transportation. Coal may be looked upon as the greatest resource in British Columbia and the one upon which our great industrial future must surely depend.

However, British Columbia is not limited to one mineral, as was evidenced by the large display of copper minerals. British Columbia now possesses the three largest copper mines of the British Empire. One only has to go back a few years to the time that the copper output of British Columbia was almost negligible. The present large copper deposits then were only prospects and not extremely attractive ones either. There exists in British Columbia at the present time a great many prospects as attractive as were the prospects of Hidden Creek, Britannia and Copper Mountain a few years back. If capital could only be encouraged to explore some of these more attractive prospects, there is no doubt that many large mines would be developed. The ore exhibited illustrated the fact that chalcopyrite is the fundamental copper mineral of British Columbia. It seems to occur all over the Province. Very attractive specimens show that this mineral occur abundantly at such widely separated places as Princeton, Trout Lake, Hazelton, Kamloops, Lillooet, Queen Charlotte Island, the Skeena, Bear River and many other localities. Much of the chalcopyrite exhibited was associated with pyrrhotite as at Rossland, Kingston, Mammoth Valley and along the Coast and particularly upon Vancouver Island. Chalcopyrite associated with pyrite is a characteristic association at the two largest copper mines, Hidden Creek and Britannia. Much of the chalcopyrite is rich in gold as is illustrated by the specimens from Copper Mountain, Britannia; Voights Claim, Black River, Lillooet; Bear Creek, Tulameen and Calapo Group at Clayquot. Some of the chalcopyrite contains platinum as illustrated by the specimens from Grand Forks. Secondary copper minerals are generally considered to be lacking in this province. In fact a few years back our mining journals were filled with discussion attempting to prove that British Columbia could not be expected to contain copper ores derived by secondary enrichment. Even to-day learned engineers solemnly shake their heads when one mentions prospect of secondarily enriched minerals in British Columbia. The exhibit showed that the dry belt of British Columbia abounds in occurrences of secondary copper mineralization. The dry belt has always been looked upon with disfavor by mining men, chiefly because of this type of mineralization. That all secondary occurrences of copper mineral are not necessarily small and sporadic has been definitely proven by the exploration work carried on at Copper Mountain, Princeton. Why is it not

reasonable to think that many other deposits of secondary copper mineralization may not prove to be as large as the one proven at Copper Mountain?

Many ores were on exhibit containing minerals of the bornite and chalcocite association. The following illustrations of this type of ore may be cited: Drum Lummon, The Grafters, Whitehorse; Emma, Discoverer, and Copper Kid of the Skeena; Silver Kind and Hamilton Fraction in the Slocan; Nesbitt and Archie at Portland Canal; White Rock at Kamloops and other places. No doubt some of these are ores derived by secondary alteration of primary ores, but the writer thinks that a few of these are ores deposited directly from magmatic solutions, and for that reason offer an attractive inducement for exploration. Many ores of the chalcocite and bornite association are rich in silver as those of the Drum Lummon, the Seniorita at Trout Lake and several specimens from the Omineca Mining District. Native copper specimens were on exhibit from two prospects, the Aberdeen and Oregon Group, both of the dry belt.

The statement is commonly made that copper mining in British Columbia is a pursuit open only to very wealthy mining corporations. This is obviously not true. Transportation and smelter facilities permitting, many of these silver and copper rich ores could be mined in a small way and be made to pay.

The mineral exhibit perhaps proved that, of the metallic minerals, copper is going to be the most important one of the Province, but it can never greatly exceed the silver lead minerals in value. Excellent specimens of this type were displayed from the Slocan, Hazelton, Portland Canal, Alice Arm, all along the Grand Trunk Railway, and in the Omineca District. Even parts of British Columbia usually stated not to be highly mineralized sent in very fine specimens of argentic galena from the Ainsworth, Windermere, Couvrapee, Lardau, Ymir and other places of the Rocky Mountain Terrane. Specimens from the Monarch Mine at Field reminded us that some of these deposits could be mined and yield handsome profits. Some of these silver bearing galena ores are associated with sphalerite which, at the present state of our metallurgical skill makes them unattractive. However, metallurgy and ore dressing has in the past made very rapid progress and ores which a few years ago were considered useless to-day command premium prices. Perhaps some of these zinc rich galena ores will not have to wait long before they occupy a similar position of favor. The ores from the Sullivan Mine at Ainsworth teaches what may be expected from some of these sphalerite prospects.

Next to coal, iron is the next mineral of fundamental importance. In fact, a geographical unit devoid of iron ores would be economically helpless if placed beyond the assistance of her iron rich neighbors, as by war, for instance. For this reason the development of the iron industry in any country should be looked upon as one worth a great deal of Governmental assistance. Iron ore deposits, like railroads, should not necessarily be developed with the expectation of dividends, but in order to make possible other industries whose profits will, to the Government, more than compensate the loss incurred through the development of the iron mine. British Columbia stands in a position to furnish to the Orient a large number of iron fabricated mechanical devices providing these devices are manufactured on the Pacific Coast. The manufacture of all of these is dependent

upon the supply of iron. Therefore it behooves our Government to make the most of its iron deposits. British Columbia has no good excuse for not developing a large iron and steel industry. Coal capable of making good coke abounds, and the mineral exhibit shows that iron ores occur in many places. Every few miles along the Coast a deposit of magnetite exists. These deposits are of a type which, under similar conditions in some other places, have been proven to contain large tonnages, and in several cases have been proven to contain many million tons of ore. In fact, there is enough of this magnetite ore in sight on the Coast of British Columbia to keep a blast furnace of several hundred tons capacity in continuous daily operation. Magnetite ores occur not only along the Coast, but specimens were on exhibit from the Arrow Lakes, and from the vicinity of Kamloops. Magnetite practically is the chief iron ore of British Columbia, but hematite ores also occur as at Tatla, Clinton, Bull River, Y.T.; Kitchener of the Chilcotin; the Bear River and Portland Canal. Limonite ores were exhibited from the Standard near Hazelton, from Mons at Alta Lake and the Portland Canal, from Chilliwack Lake and from the Rainbow Claims near Hope. Gossan limonite ores were exhibited from Sheep Creek, the Mother Lode and Bitter Creek near Stewart, B.C. Specular hematite ores from Princeton and Nicola were shown. Not only did the exhibit indicate that British Columbia possesses many iron ore occurrences, but it also proved that those minerals needed to make the important ferro alloys. We may confidently look forward to the time that the Province will be producing along with the iron and steel all of the ferro alloys needed in the steel industry. For example, Tungstein in the form of Wolframite from the deposits in the Atlin district, and Scheelite from the Van Winkle claims in the Cariboo was exhibited. Chromite ores occur in many parts of southern British Columbia, as at Cascade, Olivine Mountain and in the vicinity of Ashcroft. Excellent specimens of molybdenite were on exhibit from Alice Arm Corundum Claims at Skeena; Lost Creek at Nelson; Timothy Mountain, Cariboo; Bald Mountain on the North Thompson and Texas Creek in the Lillooet. Rich manganese minerals were on exhibit from Kaslo and especially from Cowichan Lake, Vancouver Island. Specimens of high grade magnesite were on exhibit from the enormous deposits in the vicinity of Clinton.

Right now, while copper seems to be temporarily without a strong market, gold ores are receiving much attention, as evidenced by the large number in the exhibit. Like the iron ore prospect, the gold prospect deserves a great deal of encouragement, especially now, when our highly inflated credits must sooner or later be liquidated by real gold if we are to preserve the Dominion credit. One of the striking things brought up by the mineral exhibit was the low state to which gold placer mining had fallen in British Columbia. Only a few samples of gold sand and nuggets from the Cariboo were on display.

When one compares the geological similarities existing between the Cariboo and Australia or Tasmania, one cannot help thinking that these placer deposits will sooner or later lead to important lode deposits which will, when developed, far surpass the placer deposits in yield. In other parts of British Columbia lode gold ores are developed as at Surf Inlet, Engineer Mine and the deposits of Bridge River.

One of the most interesting specimens of the exhibit was the specimen of the new ore recently developed at Rossland, which carries as much as \$2,000 per ton. This ore seems to occur in large quantities, and the probabilities are that Rossland will soon again become a very active camp.

The above is a discussion of major minerals, but many of the so called minor minerals were on exhibit. Among these minor minerals may be mentioned some of the following: Arsenopyrite ores at Hedly, muscovite specimens from the Clearwater country and from Tete Jaune Cache; stibnite ore from the Alps Alturas of the Slocan, and rich silver bearing ores from the Mary Reynolds Mine, salt and sodium carbonate minerals from the Clinton district, diatomaceous earth from Atlin and from the vicinity of Nicola; beautiful specimens of fluorite from Grand Forks; specimens of strontianite from the Daffodil Claims in the Lardau, and from claims near Princeton; Gypsum from many parts of the Province; cinnabar from Field and Kamloops; platinum from the Cariboo and from Olivine Mountain. One should not leave this discussion without mentioning the exhibit of oils. Two sets of samples were displayed, one from the Southeast Kootenay and one of seepage oil obtained from the vicinity of Vancouver.

It will be seen from the above that the mineral exhibit of the International Mining Convention stamped British Columbia as a Province containing a large number of mineralized areas. It proved that the mineralization is not only, as is often stated, of low grade disseminated ores, but at places occur very rich concentrated ores, and it further proved that the mineral prospects of the Province are not confined to one or two types of minerals, but contain almost the entire gamut of mineralization.

SLEEPING QUARTERS.

The Alaska B. C. Bedding Co., Ltd., manufacture a most sanitary line of camp springs, camp beds, and camp mattresses. As these are manufactured in the same factory as the celebrated Ostermoor mattress, you may be sure that for strength and durability they are not to be surpassed.

THE B. C. CHAMBER OF MINES.

Every man in any way connected with the mining industry in the Province of British Columbia, whether he is a resident of the Province or not, should become a member of this organization. The executive of this organization planned and carried out the most successful mining convention ever held on the American Continent, and as this was of an International nature, this success is more to the credit of this live organization than if it had not been of the nature of an International gathering of men most prominent in the mining industry.

To make their work more lasting, and to further the interests of the mining industry of British Columbia, the B. C. Chamber of Mines ask all who are interested in advancing the interests of the Province to become a member of this organization. The annual membership fee is \$5.00.

Information and answers to all queries will be gladly furnished, by the Secretary. Address all communications to the B. C. Chamber of Mines, Dominion Bldg., Vancouver, B.C., Canada.

by the various States. This arrangement may seem idealistic and impractical, and it is offered here largely for the purpose of causing reflection and argument, but at the same time, unless the mining industry can put into effect a system that will be fair both to employer and employee, and that will prevent obviously unfit men from working underground, it will be almost useless to make any other effort toward prevention of illness among employees. I believe that the time has come for the American Institute of Mining Engineers to consider seriously the necessity and the means of carrying out physical examinations and to take a definite stand.

The second requisite for the prevention of illness among employees is the maintenance of working conditions underground on a high plane of sanitation and efficiency so that illness arising from working conditions may be held to a decent minimum. The greatest need in the improvement of underground conditions is the elimination of dry drilling in hard-rock mines. The relationship between hard-rock dust and miners' consumption has been so clearly demonstrated that it is not subject to argument; suffice it to say that the efforts made in England and in British colonial possessions to deal with this evil have shown the possibilities of abating it, while in this country little has been attempted. As long as dry drilling is permitted in hard-rock mines, just so long will we have an inordinate amount of pulmonary disease among the miners. That this has worked an economic hardship on the industry, aside from its humanitarian features, and that it has been one of the causes of the better grades of mine labor leaving the industry, is apparent to any one familiar with the conditions, and it is hard to understand why the subject of dry drilling has received so little attention in this country. Dry-drilling apparatus may be as deadly as a machine gun, if somewhat slower, and its continued use in the mining industry is a matter of reproach. While it may be true that the water varieties are not as satisfactory as they might be, at least their improvement should receive serious consideration. It is incredible that American ingenuity, which has produced the telephone, the telegraph, and the flying machine, should be unable to cope with the production of a water drill that would largely make impossible miners' consumption.

Conditions of ventilation and temperature underground are not what they should be, and have never received the attention in metal mines that they have in coal mines. This is also a matter of prime economic importance because a greater amount of work can be done under conditions of proper ventilation and temperature than when there is poor ventilation and high temperature. While the latter may not cause specific illness, certainly they lower the vitality, lessen working ability, and predispose to many illnesses; if we are to have healthy miners we must so arrange it that they can work in places properly ventilated and not excessively hot. Mine ventilation is too complex a subject to be considered here, but the use of small fans with canvas tubing seems to offer a satisfactory and economical means of improving ventilation.

Proper toilet facilities underground are important as a health measure, but vary so much according to the size and locality of the mine that they need not be gone into in detail here; besides, their principles are well understood.

PREVENTION OF ILLNESS AMONG EMPLOYEES IN MINES.

By A. J. LANZA.*

(A paper presented at New York Meeting American Institute of Mining Engineers, February, 1919.)

The prevention of illness among the employees of the mining industry is especially important in view of the importance of the industry, the unsettled conditions of labor, which emphasize the economic necessity for conservation of labor, and for humanitarian reasons. The burden of chronic illness is altogether unwarranted and unnecessary. If the industry is to maintain its labor supply in an efficient manner and keep the standard high, it is essential that it make every effort to keep its labor in good physical condition.

The basic principles underlying health conservation are the same for any industry, but they are here applied, especially to the mining industry, and more particularly, perhaps, to metal mining, as it is with this phase of the industry that the writer is most familiar, and as it is conceded that metal mining presents more health hazards than coal mining.

The first step in the prevention of illness lies in securing employees who are in sound health and free from organic disease. I do not mean that all men who go underground should be physically perfect, but they should be free from organic defects of the heart, lungs, and other organs, or from anatomical defects that would markedly increase their liability to accident. The number of men working underground in mines in this country whose physical condition totally unfits them for such work presents a situation that should not be allowed to continue, and which I believe is not equalled in any other industry in the country. There is but one way to secure men who come up to the required standard, and that is by a thorough physical examination before employment. I am fully aware of the objections felt toward such a procedure by many employers and employees. There is much to be said on both sides, but to any one who is at all familiar with the mining industry as it is today in this country, and who approaches the matter with an unbiased mind, there can be absolutely no doubt as to the necessity for physical examination. As a purely logical proposition this is self-evident, but there remains the further necessity of placing physical examinations on such a basis that they can be administered in a just and equitable manner free from the abuses and suspicions to which they have been subject in the past.

The best way of administering physical examinations in the mining industry would be to have them conducted by properly constituted authorities of the various States. That is, if John Jones wished to work as a miner, when he appeared at the employment office of the Smith Mining Co., he would have in his possession a certificate from the State authorities declaring him to be free from organic or other defects that should, in the natural order of events, bar him from underground work. Such a system would presuppose reciprocity among the mining States and a basic standard of physical fitness. It would be well within the province of the Federal Government to establish such a standard for adoption

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The third requisite consists of adequate provision for medical and surgical service so that minor illnesses and injuries may be promptly treated and not become of major importance. In regard to accidents, "safety first" has become highly specialized and efficient; health service, if I may use this term, has not been developed to the same proportion. While many of the larger mining companies maintain first-class hospitals, the prevention of sickness among miners has not kept pace with the prevention of injury. It is just as feasible to distribute posters and other educational matter dealing with the proper care of common colds, constipation, and other minor troubles, which are forerunners of serious ailments, as it is to impress on the miners the necessity of having the smallest injury promptly attended to by the company doctor. There is need for a closer co-operation between the doctors and the miners in handling the minor ailments when they first appear. In former days the miner was an English-speaking person with all the advantages of a knowledge of the country and its institutions; at present underground workers are largely foreigners, and the employer must provide for their health during working hours, and often in their homes if he desires to keep them on the job.

It is probable that the mining industry will always be hazardous to health and life as compared with other industries, but at present it is needlessly so, because the wastage of human material can be prevented by securing physically fit labor, and by keeping its health unimpaired.

BRITISH COLUMBIA COAL PRODUCTION.

The production of the collieries of Vancouver Island for the month of February totalled 145,750 tons in comparison with 158,327 tons for the month of January. It should be borne in mind, however, that February is the shorter month. Still this does not altogether account for the decline. Nanoose Collieries, for instance, dropped to an output of 500 tons which is explained by the interference with work caused by the work of constructing a wharf. While the generally changed conditions of the past six months have had no very noticeable effect on the Island Collieries as yet, the producing mines being operated steadily and in most cases to capacity with results even better than when the war demand was at its height, there are slight indications that the urgency for output is not as great as it was. The work of opening up the Wakesiah Mine, which is situated near Nanaimo, B. C., and owned by the Canadian Western Fuel Company, has ceased temporarily and a short time ago the coal miners of Nanaimo were off for a Saturday afternoon.

Details of the production of the Island Collieries for February follow:

	Tons.
Canadian Western Fuel Company	59,104
Canadian Collieries (D) Ltd.	19,531
" " " " (Comox)	50,691
" " " " (South Wellington)	5,566
Pacific Coast Coal Mines (Morden)	4,719
B. C. Coal Mining Co. (Jingle Pot)	2,748
Nanoose Collieries	500
Granby Consolidated Mng. & Smelting Co. (Cassidy's)	2,891
	145,750

Of the above the collieries which show increases are

the Pacific Coast Coal Mines, Ltd., and the Granby Consolidated Mining & Smelting Company. The Nanoose Collieries operated for five days only.

Details of the production for February in the Nicola-Princeton District follow:

	Tons.
Middlesboro Collieries Co., Ltd. (Merritt, B. C.)	3,935
Fleming Coal Company	3,729
Coalmont Colliery	800
Princeton Collieries	2,051

Both the Princeton Collieries and the Coalmont Collieries have increased their production in comparison with the results of January. In the case of Princeton the explanation of the improvement is that in the previous month a fire interfered with work.

As for the Crowsnest Pass Coal Field, there are no returns to hand as yet. The collieries, however, are authentically said to have operated only twelve days. A substantial reduction, therefore, is looked for. The reason for this slackness is found in the lack of demand in British Columbia for coke, following the closing down of the smelters at Greenwood and at Anyox, particularly that of the Granby Consolidated Mining & Smelting Company at the latter place where a large quantity of the fuel is used when the plant is working to full capacity.

"By bringing the coal mining companies under the alternative of income tax or mineral tax, in common with other mining companies, we can hope for a revenue of \$200,000 instead of the \$160,000 estimated for the last year."

This statement was made by the Hon. John Hart, Minister of Finance in the British Columbia Government, when making his budget speech before the Provincial Legislature a few days ago. It is of special interest to the coal operators of the Province as it intimates the policy on which the Government has determined relative to the taxation of the coal mining industry. From the sense of the statement it is concluded that the report that a straight increase was to be made in the tax per ton of coal produced is without foundation, which will be a relief to these connected with the coal mining companies.

In explanation it may be said that the tax the companies now pay is 10 cents a ton. Returns of coal produced are made to the Government at regular intervals accompanied by taxation payments on the basis shown. Under the amendment which the budget speech of the Minister of Finance suggests it is understood that this rate will stand, the companies paying as heretofore, but, if at the end of the year, it is found that tax on a Company's income would realize more to the Treasury than has the 10 cents a ton, the Company will be required to pay the difference. In other words the Company will be taxed on whatever basis is found to bring the greater amount to the public exchequer.

It must be understood that there is no definite assurance as yet that this is the Government's policy because the bill amending the taxation Act is not before the House up to the time of writing, but it is the only interpretation that can be placed on Mr. Hart's budget speech and operators are satisfied that nothing further will be done this year. As far as can be gathered there is no particular objection to the proposal though there would have been to any suggestion that the tax on the per ton production be raised. The

argument brought against such a move is that British Columbia coal to a large extent comes into competition with that of the Province of Alberta and the coal of the latter Province is taxed only 5 cents a ton.

The "Sale of Shares" Act.

Yesterday's Canadian Press dispatch from Toronto which intimates the withdrawal of mining concerns from the scope of the "Sale of Shares Act, 1919," has caused a good deal of satisfaction in the north, where it was feared an interference with the sale of stock in mining companies might have a serious effect without achieving the desired results. It is considered as very probable the government will take steps to enforce existing laws with a view to prevent misrepresentation, rather than regulate sale of stock. The suggestion is being put forward that the Ontario Bureau of Mines be given jurisdiction over stock companies engaged in mining, is one that will be brought to the attention of Attorney-General Hon. I. B. Lucas, for consideration. The importance of the silver mining industry of this district is further emphasised to-day in a review of the figures which show the output up to the beginning of the current year. This district has a total precious metal production of \$216,627,283 to its credit, of which \$169,241,387 is credited to the silver mines.

Interests engaged in the gold mining industry of the north have more reason to be pleased over the outcome of the "Blue Sky" bill than even the silver mines. The reason for this is the fact that many new companies are necessary if the many excellent gold mining prospects are to be explored efficiently. In the Porcupine field mining activity is gaining momentum each day. A similar condition prevails in Kirkland Lake, and in the Boston Creek field. Summer should see the majority of the mines in full operation. In the Kirkland Lake field it is officially announced the mill of the Kirkland Lake Gold Mines will be set in operation on Monday, March 1st. It is also officially declared the merger of the Tough-Oakes with the Burnside and the Sylvanite is nearing successful conclusion.

During the last two years a considerable amount of money coming from the Mines Department Fund, has been expended in this District in building and improving roads and trails to mining camps and properties. This policy, by providing transportation to these hitherto inaccessible sections will undoubtedly within a short time give results in the shape of increased production.

At Harpers Camp on the Horsefly river and on Black creek a tributary of that river, there is renewed interest in the placer possibilities. The plant of the International Dredging Company at Harpers Camp was completed last season and a short test-run was made. This Company is using a mechanically operated scraper for digging and elevating the gravel to a flume where it is washed. The system as applied to placer mining being a new one. The work next season will be closely watched, because, if successful, many deposits of lowgrade gravel which cannot be worked hydraulically, could be mined by this method.

Drilling of the deeper ground at Harpers Camp to find the continuation of the rich channel worked out by the old timers may be carried out this summer by the Government.

The present high price of platinum has caused renewed interest in the occurrence of this metal in the black sand of the Quesnel river. It has been known for many years that some of this black sand, which is a concentrate from the panning of the stream gravels, carries variable amounts of platinum.

At Twenty-mile creek, the Quesnel Hydraulic Gold Mining Company has installed a mill in connection with the hydraulic plant to save this black sand. From the old Bullion mine some platinum was always recovered when the pit was in operation.

LOOKING FOR FOREIGN EXPORT TRADE.

The Sullivan Machinery Co. has established a Foreign Trade Department, and plans to increase its export business. The company has well established branch offices at London, Paris, Santiago and Sydney. Engineering agencies handle Sullivan products in Christiania, Amsterdam, Gijon, Turin, Algiers, Tunis, Johannesburg, Durban, Shanghai, Tokio, Lima and Buenos Ayres.

COAL WASHING TABLE.

The Deister Concentrating Company has issued a special bulletin describing "the No. 7 diagonal deck coal washing table."

The company has recently published its general bulletin for 1919, descriptive of the Deister-Overstrom diagonal deck types of ore concentrators.

METAL PRICES ADVANCE.

There has been during the week ending April 5 a stiffening in metal prices.

Prices on car load lots in Toronto on April 5th are: Copper, 17 cents per lb.; lead, 6 $\frac{1}{8}$ cents per lb.; spelter, 7.20 to 7.25 cents per lb.

This spelter price is for April only. A premium is being asked for May and June.

During the week copper advanced $\frac{1}{4}$ to $\frac{3}{8}$ cents per lb. Lead was about the same as last week, but shows more strength. Spelter is stronger than last week.

FIDELITY MINING AND DEVELOPMENT CO.

The Fidelity Mining & Development company is developing property which adjoins the La Belle Kirkland, north of Kirkland Lake. In a report to the directors manager R. R. Tough says: "During the month of January very little work was done with the exception of hauling in supplies, cutting roads and performing thirty days' assessment work on the south claim of your company in the Township of Teck, adjoining the Fisher property, where we uncovered a very promising vein. During the month of February the cookery was completed. A bunk house to accommodate eighteen men has been built, also an office, pump house, magazine, powder-thawer, blacksmith shop and a power-house. Machinery consisting of boiler, three-drill compressor and hoist, has been installed. Timber has been cut and framed for head-frame, also for thirty feet of shaft.

"The shaft on the east 'Lavallie' claim has been dewatered and enlarged and some sinking has been done. The vein looks very promising, being heavily mineralized and showing considerable molybdenite. Two hundred feet east of the shaft in the low ground the vein is four feet in width and shows free gold. This gives us reason to anticipate fair values at 100 ft. level, which we expect to reach during the early part of April."

Special Correspondence

NORTHERN ONTARIO.

Gold and Silver Production.

According to official statistics now to hand the total production of gold and silver from the districts of Northern Ontario, up to the beginning of 1919, amounts to \$216,627,282, which has been produced since 1903. The silver mines of Cobalt produced \$169,241,387. The gold mines of Porcupine produced \$44,578,909, while the gold mines of Kirkland Lake show a production of \$2,806,987. This summary of the production of the district up to 1919 does not include a small output from a number of properties in districts not definitely associated with the Cobalt, Porcupine and Kirkland Lake camps. Of the above huge production of the mines it is estimated that approximately forty-two per cent. of the total amount has been returned to shareholders in the various mining companies in the form of dividends, thereby adding to the wealth of the world to the extent of \$91,065,110.04. Very few precious metal mining camps in the world can show a record of such high dividend return on gross production.

Porcupine Crown.

Considerable underground work has been done at the Porcupine Crown Mines at Porcupine, since the recommencement of operations several weeks ago. Mr. Harry Harling, manager of the property has been absent for some time, the work being in charge of the mine captain. Mr. Darling will return to the property in the course of a few days and immediate steps will be taken to place the mill in operation. An unfortunate cave-in occurred at the property some time ago, causing the displacement of a large tonnage of rock and blocking a portion of the underground workings. But for this mishap, it is highly probable the mill would already be in full operation. The tonnage of ore broken in the various stopes of the mine is sufficient to keep the mill in operation at full capacity for a period of six months without drawing on the unbroken ore reserves of the mine. The grade of ore at the Porcupine-Crown is slightly higher than that at either the Hollinger-Consolidated or McIntyre mines averaging between \$10 and \$11 per ton. While the estimated ore reserves now total upwards of half a million dollars, there is also a large tonnage of mineralized rock which may in due course be included in the ore reserves of the mine, providing costs decline to a point on a level with that prevailing before the war, which would allow of a profit on its treatment. In the meantime the main workings of the mine are being continued from a depth of 1,100 feet to 1,400 feet and should add materially to the already large known ore reserves. Diamond drilling in an endeavor to locate commercial ore bodies on other portions of the property are also in progress. Thus, with a cash surplus of upwards of a quarter of a million dollars now on hand and the early commencement of production at full capacity at the property, the company is expected to be in a position to recommence the disbursement of dividends at the rate formerly inaugurated (3 per cent. quarterly or 12 per cent. per annum), in the near future.

Decision of Commissioner Upheld.

The decision of the Mining Commissioner, T. E. Godson, K.C., in the case heard last November, regarding the Howey-Couchenour claims in the Lightning River district, has been upheld by the Appellate Division of the Supreme Court of Ontario. The dispute was one filed by R. N. Austin against W. M. Couchenour, L. B. Howey, M. R. Howey and G. F. Martin, and involved a mining property in the Lightning River district on which two promising gold discoveries have been made, and had to do with an agreement a portion of the conditions of which had been complied with by the claimant Austin. The decision rendered by the Mining Commissioner and upheld by the Appellate Court was in effect that the case be dismissed, Austin paying the costs of the case on the County Court scale, the records of the case to be filed at the recording office at Matheson, Ont.

Hurricanaw.

Revival of interest in the Hurricanaw River district is apparent, and considerable new interest is being evinced in connection with the recent developments. A small mill (the only one in the district for treating gold ore) has been installed on the Martin property. While a good deal of encouragement has been met with, the production from the Martin has been of a more or less erratic nature. The shaft on the property has been driven to a depth of 90 feet and will be continued to a depth of 125 feet, where the lateral work will be enlarged upon. The mill on the property has a battery of ten stamps.

On to Hudson Bay.

Prospectors generally are keenly alive to the tremendous possibilities likely to follow the extension of the T. & N. O. Railway in the movement which has now come to be known as the "On to the Bay" project. If this railroad is built a large area of land will be made accessible to prospectors which offers great inducements to men following the profession to exert their energies in this direction. Very few prospectors have paid any attention to the regions north of the T. C. R. Lignite of an inferior quality has been found on the Mattagami river. Not only will the mineral possibilities of the district attract attention, but also those of lumbering, fishing and power development should also come in for attention.

More Development Work Possible Now.

One of the most conclusive evidences of the improvement in the labor situation in the North Country is to be found in the fact that no difficulty is now experienced in securing men for the performance of development work on mining claims. Already some of the urgent spring work is under way, while parties are leaving for the various districts from day to day and others are making arrangements for the prosecution of extensive explorations and general prospecting during the spring and summer months, and in some cases fairly large parties are being formed to work claims on which extensions have been granted during the past two years, owing to scarcity of men to perform the necessary work required by law. Up until the present time, the majority of prospectors have been going into the Boston Creek area, which is close to the railway and easily accessible.

Alexo Nickel Ore.

The shipments of nickel ore from the Alexo Mine at Porquois Junction during the second week in March amounted to 408,000 pounds, and was contained in four cars. This compared with three cars during the first week having a total weight of 310,000 pounds and makes a total of 718,000 pounds for the first half of the current month. It is therefore evident that the present month's shipments will come close to the record if not establishing a new record for production for any monthly period of the company.

Boston Creek.

Following the announcement of results met with in the diamond drilling of the Cotter property in the Boston Creek district comes the news of increased interest in the immediate district. It is learned that among other deals pending is one where the vendors have under consideration an offer of \$200,000 for a small group of claims on which practically no development work has so far been done. When the high values were first encountered on the Miller-Independence, it was the general opinion that such a rich orebody would not be found to run far. However, at a vertical depth of 492 feet, the drill operating on the Cotter cut a vein more than 28 feet in width, and with an average gold content of \$12.42 to the ton. It then became evident that the great body of ore was consistently continuing to the east, and although not so rich as on the Miller-Independence, it nevertheless indicates a great future for the Cotter. In this connection it is interesting to note that the Hollinger Mine, now conceded to be one of the largest gold mines in the world produced nearly 6,000,000 from ore averaging a little under \$10 per ton in 1918, and according to the last report had \$41,000,000 in ore reserves which average \$9.15 per ton. Thus the indication of the big vein with \$12.42 in gold to the ton on the Cotter stamps this property as one of major importance, which may reasonably give added impetus to the entire Boston Creek camp, which promises to be the scene of extensive and far-reaching developments during the next few months.

Lucky Baldwin.

Work is being resumed on the Lucky Baldwin property, which lies about five miles southwest from the proven mines of the Kirkland Lake Gold camp, near Kenogami Station on the T. & N. O. Ry. About two years ago a small mining plant was installed on the Baldwin and a considerable amount of development work was done with a fair degree of success.

La Rose Report.

The twelfth annual report of the La Rose Mines, Limited, recently issued, showed a surplus as of December 1st, 1918, of \$456,046 after paying a 2 per cent. dividend during the year. Silver production during 1918 amounted to 228,556 ounces, which showed a net profit of \$45,544. What was gained in the price obtained for the silver 99.83 cents per ounce, was largely offset by the increased cost of production, which was 87.17 cents per ounce, due to the increased cost of labor and supplies. As no new ore was discovered in the parent mine, the La Rose, and all the dumps have been milled, this mine may be said to be nearing exhaustion. A limited tonnage remains in the Lawson property dumps. Some ore was located in the Princess Mine. There, ore is being broken with "suf-

ficiently satisfactory results to justify further investigation," and preparations are being made to unwater the second level for this purpose. A new level was opened on the Violet Mine. There, and elsewhere an ore shoot about 60-feet long has been proven. This ore is said to be "erratic," but "there is a certain amount of high grade and the adjoining rock carried milling values." Other work is proceeding on this property. An option has been taken on a silver prospect in the Kamloops District, British Columbia, and this is being developed. The La Rose surplus consists of \$253,533 in cash and call loans, \$100,000 in Victory Bonds, \$9,081 in accounts receivable, accrued interest and supplies, and \$107,544 in ore in transit, at the smelter and at the mine ready for shipment. Since the foregoing report was issued important developments are understood to have taken place at various portions of the company's Cobalt property. At the present time interest in the company's affairs centres around the dispute as to the ownership of a certain piece of land on the boundary line of the La Rose and O'Brien mining properties, on which the shaft from which the La Rose is developing the Violet claim, is situated. The case comes up for hearing early in April, and is attracting a good deal of interest and is of vital importance to the La Rose.

McKinley-Darragh.

The new electric pump for pumping the sands and slimes from the bed of Cobalt Lake to the McKinley-Darragh-Savage Mines new oil flotation mill has been installed and work will be resumed in this portion of the plant during April. The new electrically driven pumps replace the automatic bucket drag used last summer and fall and will keep the mill operating at capacity.

Offered \$1,000,000 for Kirkland Lake Gold Mine?

Unofficial reports are in circulation throughout the north to the effect that the Beaver Consolidated Mining Company has been offered a million dollars for their Kirkland Lake Property, the Kirkland Lake Gold Mines, Limited. The general opinion prevailing in mining circles throughout the district is that with the property at a point where production can be commenced at any time in the new 150-ton mill, and the property developed to a depth of 700-feet there is very little likelihood of the Beaver-Consolidated considering even this tempting offer, which is equal to about fifty cents per share on the stock of the company.

Hollinger.

According to reports from Porcupine, it is probable the Hollinger Consolidated Mining company will be operating at full capacity before the end of the current month. The Hollinger milling plant has a maximum capacity of about twenty-eight hundred tons per day. It is thus apparent that the output of the property from this time forward will show an increase of about fifty per cent. above that of the past year, when the total production amounted to close to six million dollars. The company have over forty million dollars in ore reserves, of an estimated value of \$9.15 per ton, and a large acreage of virgin ground with numerous undeveloped veins.

Lake Shore.

During the month of February the Lake Shore Mines of Kirkland Lake produced \$41,605, as compared with \$45,162 during the preceding month. The slight decrease was due to the shortness of the last month. The January output averaged \$1,456 daily, while that of February amounted to \$1,485 daily. The official report of operations at the mine for the month of February were as follows:—

200-foot level.—The drift on No. 2 vein east was advanced from 380-feet to 482-feet.

400-foot level.—On No. 1 vein West, north branch, a raise was started to connect with the third level workings, the total advance being 15 feet. The drift on No. 1 vein west, north branch, was advanced from 491 feet to 542 feet. At 523 feet a fault was encountered and a drift was run south on same for a distance of 29 feet.

On the No. 1 vein west, south branch, the cross-cut was advanced from 49 feet to 65 feet. The north branch of the No. 2 vein east was advanced from 453 to 463 feet, while the south branch was driven ahead from 452 to 465 feet.

The No. 2 vein west, was advanced from 214 feet to 248 feet.

Milling.—The mill ran 98.8 per cent. of the possible running time, reducing 1,651 tons of ore and recovering therefrom \$41,605.21.

The foregoing report designates that the greater portion of the development work for the month was done at the lower levels of the mine. The general efficiency of the mill is demonstrated by the fact that the plant ran 98.8 per cent. of the possible running time, treating on an average of 59 tons of ore daily, with an average gold content of \$25.20 per ton.

The dividend declared by the company (payable Thursday, March 27th), was the third disbursement since the commencement of milling operations in March of last year. The disbursement was 2½ per cent, and called for a distribution of \$50,000. Although the earnings of the company are greater than 2½ per cent quarterly, the dividends up to the present time have been of an interim nature, permitting of the accumulation of a substantial surplus, such as the importance of the mine warrants. The performance of the property during its first year of operation from a milling standpoint is highly gratifying to the shareholders, who have participated in the distribution of profits to the extent of \$150,000. With an enlargement of operations the earnings of the company could also be increased, permitting of more liberal profits for the shareholders. The future for the Lake Shore looks very bright.

Will Work in Skead Township.

Among companies which are contemplating a resumption of work in Skead township is the Lincoln-Nipissing Mining Company. A number of other companies are making arrangements for extensive development work in the district during the coming spring and summer months, and it is anticipated Skead township will experience its most active days in the near future.

Taking on Miners at Dome Mine.

Announcement has been made that a full force of underground workmen will be working at the Dome mine by the end of the current week, and milling operations will be in full swing about the middle of

April. The ore broken in the mine is sufficient to keep the mill in operation for a considerable time. According to the last report of the company, upwards of 400,000 tons of ore of an average value of \$5.10 per ton was broken in the stopes ready for hoisting to the mill, while the total ore reserves blocked out at the property above the 700-foot level is close to \$10,000,000. The mill at the Dome mine is the second largest in the camp, having a capacity of between 40,000 and 45,000 tons per month. Previous to the war the costs of treatment and mining at the Dome Mine was less than \$2.50 per ton of ore treated, and on the treatment of ore of a general average of less than five dollars per ton the company was able to pay dividends of 20 per cent per annum. Thus, while a large amount of the surplus in the treasury at the time of closing the mill has been spent in developing the lower workings of the mine and installing machinery for the more economical handling of the ore, sufficient funds are still available to carry the company to the producing stage again, and it is confidently expected earnings, with increased efficiency in various branches of the big mill, will be materially increased, permitting of the company resuming dividends again in the near future.

Shipping Ore From Salmon River.

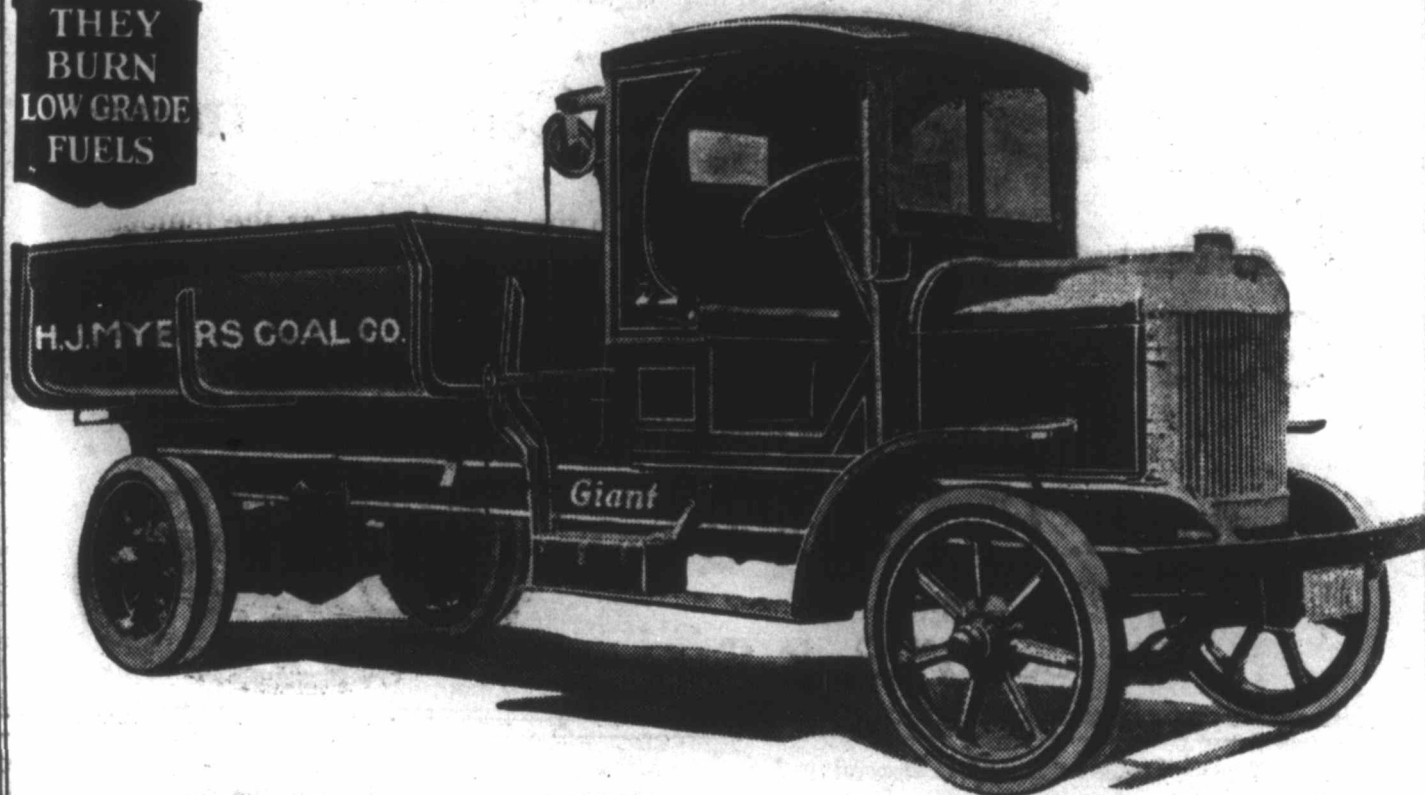
Mr. B. Bush, of Vancouver, who has just returned from the North, states that \$50,000 worth of ore per month is being shipped out of the Salmon River Mining District of British Columbia. The shipments are from the old Salmon-Bear River Mining company's property, now being developed by R. K. Neill, of Spokane, Wn. Mr. Bush, who is the original locator of this property, has great faith in it. He believes that it will make the Salmon River Valley District famous from a mining standpoint. He says: "A large miner from a mining standpoint. He says: "A large mineralized zone 400 feet wide has been traced for more six different claims. These claims are owned by the Premier Gold Mines, Limited, and the Bush Mines, Ltd., of Vancouver. Several ore shoots have been discovered in this zone, one of them being 110 feet wide and 1200 feet long." Mr. Bush states that a tunnel has been driven under his direction for 400 feet on this ore body, and that several crosscuts, one of them 90 feet long, have been driven without encountering the footwall. The ore he states carries high values in gold and silver.

Assembling Plant at Copper Mountain.

It is reported that advantage is being taken of the ready transportation facilities provided by the winter snow to hasten preparations for the opening of the Canada Copper Corporation's large new property and plant at Copper Mountain. Some heavy loads have been taken up the mountain on sleighs, the compressors and other machinery having been so conveyed to the mines for installation in order that the plant may be in shape for operation when the high power line of the West Kootenay Light and Power Co. is complete and the "juice" is ready to be turned on. The load which broke all records was a piece of electrical machinery weighing nine tons, which was hauled by 10 horses most of the time, but required an additional two over the heaviest of the grade. A 12-ton compressor wheel, in two sections, made two other comfortable loads of six tons each.

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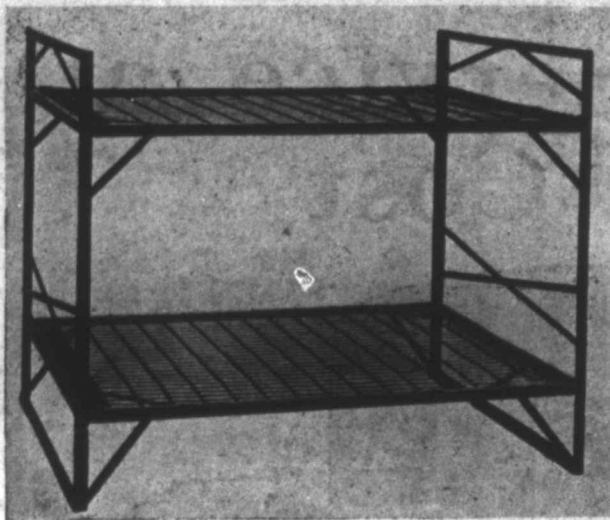
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For the present, the Montreal branch will serve largely as a warehouse, all engineering assistance being rendered by the Canadian Link-Belt Company at Toronto, where Link-Belt is manufactured for the Canadian market.

Although shipments for the Montreal and Quebec territory will be shipped from the Montreal branch, all correspondence should continue to be addressed to the Canadian Link-Belt Company, Toronto.

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The Black Bear Sales Company, 207 Bower Bldg., Vancouver, carry a full line of lubricating oils and greases. They claim it is a "Bear for Wear."

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