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E. JACOBS.....Managing Editor

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NOTES AND COMMENTS.

The annual meeting of the American Mining Congress is to be opened at Denver, Colorado, on October 16.

Nelson is sending to the New Zealand Exhibition a collection of minerals representative of the mineral resources of the district of which it is the commercial centre.

"The operations at the Last Chance Mine," says the *Nelson Canadian*. "are giving new life to Sandon, and the Slocan district generally is the scene of more real mining work than at any other time since 1900."

It has been announced that Mr. Arthur Harold W. Cleve, superintendent of the Royal Mint, England, is coming to Canada to superintend the installation of the machinery at the Canadian Mint, Ottawa, Ontario.

Mr. T. A. Rickard and his brother have announced that they have retired from professional mining engineering work and intend to devote their entire time to the *Mining and Scientific Press* of San Francisco, California.

In its comments on mining stocks the *London Mining Journal* remarked on 15th inst. Le Roi have put on 1/8, and Le Roi No. 2 1/4. The latter have been quietly absorbed, but the position of each is better than for some time past.

Mr. Edward Dedolph, superintendent of the Sullivan Co.'s smelter at Marysville, East Kootenay, is reported by the *Kaslo Kootenaiian* to have stated that there are 100 men employed at the mines and reduction works of that company.

A payday for August, with a total wages disbursement of about \$33,000, is stated by the *Moyie Leader* to have been the largest in the history of the St. Eugene mine, which, during that month, had an average of about 320 men on its payroll.

During September the *Mining Journal* of London, England, published the greater part of Professor R. W. Brock's "Preliminary Report on the Rossland, B. C., Mining District," issued in pamphlet form last June by the Geological Survey of Canada.

It, as reported, is a fact that the Guggenheim Exploration Co. intends to shortly do extensive prospecting work on mineral claims in the northern part of the Nicola country, its operation there should do much towards advancing the interests of that section.

Some interesting information concerning the Telqua country obtained from Mr. G. R. Naden of Greenwood, who spent between two and three months of the summer and autumn in examining the surface showings of mineral throughout that district, is unavoidably held over until next month.

Mr. H. H. Jessman, a marble polisher, is reported to have discovered in a gulch at Sechelt some excellent marble. Mr. Jessman says there is plenty of good marble in British Columbia, if it were only developed. He and Mr. H. J. Pelkey of Vancouver are applying for title to a marble quarry near Lund, where there is a deposit about 100 ft. wide.

Early in September His Excellency the Governor-General of Canada and party, while en route to Nelson, made a short stay at Fernie, Southeast Kootenay, and were shown, by resident officials of the Crow's Nest Pass Coal Co., the coke ovens in operation. The company has 420 beehive ovens at Fernie.

Early this month the McKee Amalgamated Hydraulic Co., operating on McKee Creek, Atlin, had a clean-up of 533 oz. of gold valued at between \$9,000 and \$10,000, which, the Atlin Claim states was the result of 23 days' pipping. Another clean-up, possibly two more, will, it is expected by the manager, Mr. S. H. Plumb, be practicable before the season shall close.

It is understood that the owners of the Enterprise mine, situated at the head of Ten-Mile Creek, in the Slocan City mining division, contemplate joining forces with those of the Iron Horse, an adjoining property on the north, so that the two may be worked jointly. Some of the directors of the Enterprise (B. C.) Mines, Ltd., are expected to shortly arrive from England to look into the situation.

Early in the month tenders were invited for sinking the Lake Shore shaft of the St. Eugene mine, in East Kootenay, 300 ft. deeper. It is evident the Consolidated Mining and Smelting Co. of Canada intends to continue an active policy of development at this,

the largest silver-lead mine in Canada, as well as at its Centre Star-War Eagle gold-copper mines at Rossland and its big copper and lead reduction works at Trail.

Regarding the continued delay in the operation on a commercial basis of the zinc smelter erected at Frank, Southwest Alberta, by the Canadian Metal Co., we understand that the works are closed down pending the making of certain changes in the plant found by experience to be desirable. It is expected that these changes will be completed by next spring and that the company will thereafter be prepared to enter the market as a purchaser of zinc ore and concentrate.

The Dominion Copper Co. has given practical evidence of its confidence that Franklin camp, on the north Fork of Kettle River, Boundary district, merits its continued attention, by paying the first money due under its working bond on the Gloucester group, the work of prospecting which property is being proceeded with. This camp has some big showings of mineral and gives much promise of becoming a large producer of ore after completion to it of the railway now in course of construction.

In connection with the important development work in progress at the Rambler-Cariboo mine at McGuigan, Slocan, it may be mentioned that in looking over a newspaper file the other day we happened on some information concerning this property, published in June, 1904, as follows: At the 800-ft. level there is a paystreak of solid ore ranging from 6 to 30 in. in width. The average metal contents of the ore in the south drift at this level are 74.6 per cent lead and 170.1 oz. silver per ton, and in the north drift 63.8 per cent lead and 136.3 oz. silver per ton. It is to reach this shoot of high-grade ore that the raise is being made from the deep-level tunnel.

Since the Canadian Metal Co.'s Blue Bell mine, on the east side of Kootenay Lake was visited in July, and described in that month's issue of the B. C. MINING RECORD, the north ore body has been opened up with the result that on the adit level the "chimney" of ore is shown to have a diameter of about 100 ft. An inclined raise in this ore body will be about 130 ft. to the surface, while the shaft sunk in the middle of the same big shoot of ore is down 120 ft., also on the incline. The latter gives a vertical depth of about 100 ft. below the floor of the adit level. Raising and sinking are both being continued. Above ground lines are being run and levels made for bringing in water for the concentrating mill it is intended to erect. Work on the mill plans is also being proceeded with.

When in Rossland the other day the editor of the B. C. MINING RECORD called at the office of the Consolidated Mining and Smelting Co. of Canada and

asked whether the published report of the discovery at the 1,600 ft. level of the Centre Star of a new ore shoot 40 ft. in width and assaying \$48 per ton could be relied on. He was assured it was true and, further, that the mine underground is looking very well indeed, with plenty of ore in sight. This assurance, added to those previously received from officials of the Le Roi and Le Roi No. 2 that their respective mines were in excellent condition as regards available ore of good grade, was indeed gratifying and appeared to amply warrant confidence that Rossland camp is now in a more satisfactory position from an ore-producing point of view than at any previous time in its history.

Deep drift mining in the Cariboo gives promise of soon proving a success at the mine of the Cariboo Consolidated, if not at other district mines. This company has followed the prudent policy of leaving the direction of its operations in the hands of a mine manager with a full knowledge and long experience of local conditions, and as a result appears to have at last come within measurable distance of overcoming the very considerable difficulties that have heretofore seriously impeded its operations. In contrast to this there is the present experience of another company which is trying the experiment of management at long range under conditions that appear to make continued failure a foregone conclusion. Some day it may be forced home upon English directors that something more than the engagement at comparatively large expense of an engineer with a big general reputation and little local experience is not always conducive to success; that is, the success of the company immediately concerned.

One of the largest shareholders in the Kootenay Air Supply Co. came to British Columbia from Montreal, Quebec, this month, for the purpose of looking over the Taylor Hydraulic Air Compressor plant installed near Ainsworth six or seven years ago and to endeavour to make arrangements with some "live" man to advocate the more general use, at local mines, of the compressed air power the company is in a position to supply. The B. C. MINING RECORD published in May, 1898, an account of what was then described as "A new system of compression of air by falling water," and in the July, 1900, number of this journal there appeared an illustrated description of the installation. The latter is reproduced this month, for the double reason that the system at the present time is receiving attention in mining camps in the United States, and that there is a gradually increasing revival of interest in mining in Ainsworth camp, so that the time seems opportune for again directing public attention to this economical and effective method for compressing air.

The first of the three 600-ton blast furnaces the British Columbia Copper Co. is installing at its smelting works at Greenwood, Boundary district, is ready for operation and is to be blown in during the first week in October. The hearth area of each of these furnaces is given as 48 by 240 in., and charging is from side-dumping cars hauled by trolley locomotives. The 25-ton slag cars for dumping the molten slag are also ready for use. The manager, Mr. J. E. McAllister, is to be congratulated on the successful installation of the big and modern copper smelting plant his company has on his expert advice substituted for the smaller plant formerly in use at these works. As the B. C. Copper Co. obtains its supply of coke from the Belgian ovens of the West Canadian Collieries Co. at Lille, Southwest Alberta, it is probable the present labour troubles at the more westerly collieries of the Crow's Nest Pass will not in any way interfere with its smelting operations, about to be resumed after the suspension unavoidable during the period of reconstruction.

"There has been more trouble at the Ymir," remarks the *London Critic*. "This time the melting snow and scarcity of labour have combined to make the July and August crushings disappointing, but an official circular explains that the mine is now well drained, and a cablegram from the manager states that 'September output promises exceedingly well.' It also appears that American capitalists are desirous of becoming interested in the Ymir gold mine, which is a good sign, as the American capitalist is a cute person. The directors have intimated that they are prepared to discuss terms for introducing this capital, and arrangements are being made for a meeting of the interested parties in New York early next month. If the provision of funds can be arranged, Mr. Gilman Brown advises that diamond drills should be employed to locate the other large vein which he is still confident exists, and from which the rich float has been shed over a long line of country on the company's property." We earnestly hope Mr. Gilman Brown's confident expectations will soon be realized. Meanwhile it might be well for the local manager to check his seeming too ready disposition to talk to local newspaper representatives in so over-sanguine a strain. Our personal experience of the present manager on three separate occasions has been that while free enough in promise to supply us with information as to the actual condition of affairs at the mine, he has not once kept his promise. Fortunately there are very few men in charge of important mines in the Province with whom we have had a similar experience. Mine managers usually either say frankly that they are not at liberty to disclose information, or they give a reliable outline of the position, recognizing that a journal of the good reputation and standing of the B. C. MINING RECORD should not be trifled with.

The Diamond Vale Coal and Iron Mines, Ltd., a company having its head office in Vancouver, has again shown that its management is enterprising and energetic. After having during three seasons prospected its coal lands in the Quilchena basin of Nicola district by means of diamond drills and in other ways and proved the occurrence on its property of workable seams of coal, the directors realized that owing to the fact that the recently constructed railway from Spence's Bridge to Nicola did not tap the Diamond Vale property the company could not take advantage of the opportunity afforded by the incoming of the railway to find a profitable market for its coal. Accordingly other coal lands, at present afforded transportation advantages not yet possessed by the Quilchena basin lands, have been acquired, and a vigorous policy of development is being undertaken, with the object of supplying the demand for coal that has arisen with the incoming of the railway, which will, it is stated, require up to 1,000 tons of coal daily. It is to be hoped that this further enterprise of the management of the Diamond Vale Coal and Iron Mines, Ltd., which, unlike some of the "paper" coal companies of the Similkameen and Nicola districts, appears to be a *bona fide* coal-mining undertaking, will be rewarded by abundant success and that a permanent coal producing industry will result therefrom.

It is sometimes interesting to compare the opinions of men of great pretensions and only small achievements with those of others of high professional standing and a long and excellent record of successful work. For instance, Mr. Wm. Blakemore, who has made claim to have "been engaged in coal mining for the past 30 years," opened a contribution published under his name in the *Engineering and Mining Journal* of New York with the following words: "The impending exhaustion of the coal mines operated for more than 30 years on Vancouver Island by the Dunsmuir family and the New Vancouver Coal Co." In that article he attempted to show that the coal on Vancouver Island was nearly exhausted. Dr. H. S. Poole of Halifax, Nova Scotia, an acknowledged authority on coal, who was engaged by the Geological Survey of Canada last year to gather information relative to the coal fields of this Island, and who had no personal ends to serve, at the close of his report, which is printed elsewhere in this issue, said:

"If it be desired that a conjecture be hazarded of the quantity of coal exceeding a thickness of two feet, and within a vertical depth of 4,000 ft. an estimate of 600,000,000 tons, though based on most incomplete data, would seem conservative and yet at the same time sufficiently large to allay apprehensions of any immediate shortage in the output." In language not as classic as would be used by the above-mentioned man of 30 years' experience, "You pays your money and you takes your choice."

The recent visit to Cariboo of Mr. Donald G. Forbes, the well known mining engineer, for the pur-

pose of examining the quartz veins in the Barkerville district exploited in the seasons of 1903-4 by Messrs. C. J. Seymour Baker and Austin J. R. Aitkin, recalls the fact that a brief account of the operations of those gentlemen, supplied to the provincial mineralogist by the latter, was published in the "Annual Report of the Minister of Mines for 1904," (p. 49). The first paragraph of Mr. Aitkin's communication reads as follows: "The season was spent in still further checking the information gathered in the previous two summers, and the least promising properties were temporarily thrown up. Although there are many ledges which will repay thorough and systematic prospecting, as soon as a railway lowers mining cost, it is unfortunate that none but the very richest veins in the country can be opened up under present conditions. The most important find of the season, and one which may prove of great commercial value, was made on Hardscrabble Creek." This "important find" appears to have been of scheelite and a quantity of the mineral was sent to Chicago for test purposes. In response a communication was received stating, "The scheelite was of good quality and there is at present a considerable demand for it, at prices varying from \$360 to \$460 per ton, according to quality." This discovery awaits the provision of railway transportation to admit of its being turned to profitable account on a commercial scale.

The Monitor and Ajax Fraction, Ltd., an English company operating in the Slocan district and owning the Monitor mine near Three Forks, the Bosun mine near New Denver, and a recently completed concentrating mill at Rosebery, is planning to develop the mines named on a systematic scale. Both contain large quantities of zinc, which, under present conditions, is not favourable to active operations, so the company is not mining just now. Certain improvements, found advisable, have been made to the concentrating plant, which is stated to be now working smoothly and making an average recovery of 95 per cent of the lead, 89 per cent of the silver, and 81 per cent of the zinc content of the ore treated. During the two months it had been running when the district was visited lately, about 1,900 tons of ore had been put through the mill. Ore bins have been built on the water front of the Bosun property, Slocan Lake, and a gravity tramway to the mine constructed. This provision for shipping admits of the old dumps of ore being sent to the mill at Rosebery, for scows carrying four railway cars can be quickly loaded and the ore be thus cheaply conveyed to the mill. These shipping bins have a total capacity of about 400 tons and the cars can be filled from them in less than half an hour. Some development work was done last summer at the Bosun, this consisting of the extension of three adit tunnels, in each of which ore was encountered. At the Monitor there is plenty of ore—when last at work in that mine it was found that there was from 6 to 42 in. of solid ore in the lowest level. It

is stated to be only a question of unfavourable marketing conditions, or this mine would be steadily producing today.

It is generally understood at Rossland that the directors of the Le Roi Mining Co. have a decidedly satisfactory report for the company's last fiscal year to present to the shareholders at the annual meeting to be held in London, England, in November. It is known that the mine is in a very promising condition underground, with more ore of a smelting grade in sight on several levels below the 700-ft. than at any previous time in its history. During the current year much exploration has been going on at the 700-, 800-, and 900-ft. levels on the company's Black Bear claim, and this has resulted in the discovery of ore bodies of considerable value and extent. Other developments of importance are the discovery on the 1,050-ft. level of the downward continuation of the Black Bear ore shoot, and of a shoot of pay ore at the 1,200-ft. level. Particulars of these and other greatly improved conditions underground will, doubtless, be given the shareholders shortly. Meanwhile the sinking of the main shaft below the 1,350-ft. level, to reach ore bodies the occurrence of which has been disclosed by cross-cuts from the winze already sunk to a depth of 1,750 ft., is in progress, so that the outlook for the future is assuring and the promise of continued excellent returns may be therefore regarded with confidence. It is to be regretted that labour troubles at the Crow's Nest Pass Co.'s coal mines and coke ovens will delay the resumption of smelting operations at the company's smelter at Northport, but this difficulty may be overcome before the ensuing meeting of the shareholders shall take place, so the directors may be in a position to give the shareholders assurance that there is good reason to expect the current year will see a resumption of dividend paying by the company.

MINERAL PRODUCTION OF BRITISH COLUMBIA IN 1906.

INTERVIEWED in Nelson recently, the editor of the B. C. MINING RECORD said: British Columbia's mineral production this year promises to considerably exceed that of any previous year in the history of mining in the province.

The mining statistics published weekly by provincial newspapers give particulars of production in the chief lode mining districts of the province, the aggregate tonnage of which is now nearly 1,200,000 tons. Add to this the production of the coast districts and Hedley camp, Similkameen, and a grand total of between 1,300,000 and 1,400,000 tons for the eight expired months of the year will be obtained. Further, there is the increase in the average prices of silver, lead and copper for 1906, as compared with 1905, to take into account when estimating the value of the year's production. Taking the quantity of these several metals produced last year and calculating the enhanced value at this year's average prices it will be found that

even if the production for the current year were to show no increase in quantity the value would be fully \$1,800,000 greater than that of 1905.

When it is remembered that the quantity of the ore produced this year by the lode mines of the province has already exceeded that of the whole of last year it will be evident that if production be not greatly interrupted during the unexpired portion of the year it will be quite reasonable to look for a considerable increase in quantity and a larger increase in total value, the latter as the result of the higher average prices for the year above referred to.

While no statistics of the current year's production of placer gold are as yet available, there is good reason to also look for an increase in this direction, conditions having been generally favourable to a larger recovery of gold in the placer mining districts during the season now drawing to a close than in 1905. It is probable that both Atlin and Cariboo will be found to have made a larger total recovery, while the outlying districts of Cassiar will add an appreciably large amount to the year's total.

Coal and coke, too, should exhibit a substantial advance, notwithstanding that conditions have not been favourable to the ordinary average output of the Vancouver Island collieries being maintained. The Crow's Nest Pass Coal Co.'s mines have already produced more coal this year than during the whole of 1905, so that if no serious interruption of production takes place to prevent the last quarter of 1906 from contributing a proportionately large output, a considerable increase in total tonnage should be the result of the year's coal mining operations.

Building materials, as well, will show a larger total value than in past years, for there has been an active demand for brick, stone, cement, etc., and these are included under the head of non-metallic minerals, when making up the statistics of mineral production.

But it is not the largely increased production of the year that will most impress capitalists with the progress and prosperity of British Columbia's mineral industry; it is rather the convincing evidence afforded by the payment of a comparatively large sum of money in dividends that will most strongly appeal to them. When it shall become widely known that a number of British Columbia's mines are at last in a position to distribute profits periodically capital will not be difficult to obtain for promising mining enterprises, and since it is capital for development that is most needed to bring about the utilisation of the enormous mineral resources of the province on a much larger scale, it is certainly gratifying to at last find conditions becoming favourable to the encouragement of capitalists to put money into mining in the province.

While a total distribution of between \$2,000,000 and \$3,000,000 of *bona fide* earned profits this year may not be a very large showing, it is an earnest that the corner has at length been turned and that mining and smelting in British Columbia are now offering considerable inducements to capitalists to engage in these industries in the Province.

THE LEASING SYSTEM OF MINING IN THE SLOCAN.

L EASING MINES, with or without option of purchase, has been gradually growing in favour in British Columbia, particularly in the Slocan district, in which there are many properties to which mining under such a condition may be applied with advantage to both lessor and lessee. Last July the B. C. MINING RECORD (see p. 264), published a communication on this subject from Mr. Geo. Huston, for some time editor of the Sardon *Mining Standard*, in which newspaper he for months earnestly and persistently advocated the leasing system. Recently the *Nelson Canadian* published the following views of Mr. S. S. Fowler, consulting engineer and mine manager, who has for years been actively associated with mining in West Kootenay. As reported by the *Canadian*, Mr. Fowler said:

"The greatest and also the most obvious advantage of the leasing system is the great saving of expenditure. The mining operations of a big company necessarily involve an office staff of fair salaried men, accountant, clerks, manager and engineer. Where the authority of the manager is limited it also involves frequently costly delays in obtaining consent and approval for projected operations.

"The system has been in vogue for some years in Colorado and has been successful there. The returns of printed contracts show that the lessees pay a much higher royalty in Colorado than has so far been paid in British Columbia. There the companies usually do a certain amount of development work, sink a shaft and equip it, and start drifts. Then they lease parts of the drifts, making it a condition of the lease that the lessee shall do a certain amount of development work before he begins to stope ore.

"As to the royalties paid, the figures I have apply to two years ago, but I think there has been no material change since. The royalty is on a sliding scale, from 10 per cent on the gross returns in the case of \$25 ore to 70 per cent for \$200 ore, with the average of 45 per cent on \$100 ore. In British Columbia the rate is usually only 25 per cent on \$100 ore and calculated on the smelter returns.

"The first leases in British Columbia were generally taken on developed mines by former employees, who knew the location of small ore bodies and got leases merely to take them out, paying a small percentage on the returns. Such lessees were usually, though not always, working miners.

"That condition, however, is rapidly passing. It had many defects. Such lessees seldom had any capital. They had to work on credit, with a merchant sharing the risk, and they did no development work. The mine owners derived no benefit.

"The new condition is creating a class of lessees with small capital and usually with enough mining and business experience to satisfy the owners that the work undertaken will be well done.

"A recent contribution to the subject has advocated the formation of small syndicates, of 25 miners, each

contributing \$10 a month for development. Well, \$250 a month will not go far to develop a mine.

"Few working miners have enough capital to really accomplish anything worth while. The lessees of the future will be men who can afford a few thousand dollars. They may then sub-lease special parts of the properties.

"It has been found that employees of a lessee do better work than men working for a big company. There is a definite object in view. They know that unless the work is successful it will stop and their occupation will be gone. In many cases, of course, where they are sub-lessees, they have a direct financial interest in the success of the work.

"Now, of course, the system cannot be followed with success in all fields. A big low-grade property—in which operation on a very large scale is necessary for profits, can only be handled by a company or individual with large capital. Even a high-grade property requiring big and costly development work, such as the long tunnel of the Rambler-Cariboo, will never, I think, be done by lessees.

"But it seems to me that the Slocan is peculiarly fitted now for successful application of the leasing system. There are many small high-grade properties already opened up, with ore bodies definitely located if not actually in sight, and many of them are equipped with mills, or are near to concentrating plans of some kind. Such properties will probably never be able to pay expenses of company operation with its costly incidentals, and pay interest on investment too, but they may give excellent returns to working lessees. If it be granted that a company manager and a working lessee are equal in efficiency, the latter has an immense advantage in economy.

"With the close supervision that is only possible with a small force, many other economies besides the saving of superfluous salaries may be effected. It is possible to see that all ore taken to the mill is clean ore, and there is every incentive to do so, as the returns depend entirely upon what is mined.

"One difficulty in the way at present is the scarcity of miners. The general prosperity of the West on both sides of the line has created a big demand for labour, and good miners are hard to get even at the highest wages.

"So far, mining lessees in British Columbia have enjoyed very favourable terms. They have paid a low royalty as compared with that paid in other districts, and little in the way of development work has been required of them. There are no indications of any increase in the royalties, but the mine owners are now becoming keener as to the financial ability of the lessee to fulfill his contract, and do work that will benefit the property as well as himself and give the owner a substantial return in development as well as the small royalty, which amounts to little more, in some cases, than interest on capital already expended.

"With its limitations clearly understood and the need of economy and efficiency thoroughly appreciated, there is a splendid field in the Slocan for mining on the leasing system."

A LABOUR DISPUTE AT THE CROW'S NEST
PASS COAL CO.'S COLLIERIES.

PRESS DESPATCHES from Fernie, East Kootenay, where are situated the chief executive offices of the Crow's Nest Pass Coal Co., Ltd., sent out on September 14, inst., contained the gratifying information that on the following day there would be paid out in wages at the collieries of the company a sum of \$155,799.85, being the total of the payrolls of the company's mines, coke ovens, etc., for the month of August, the Fernie and Coal Creek portion of this amount totalling \$101,802.10, and the Michel \$53,997.75. It was mentioned that this was the largest amount of any month's payments on similar account in the history of the company's operations, and that it exceeded the previous record total by about \$5,000. Eight days later by far the greater number of the men employed at the company's Coal Creek mines refused to continue working, and later the men employed at the company's coke ovens at Fernie and at its mines and coke ovens at Michel also ceased work. The B. C. MINING RECORD has not space at its disposal for the text of the published correspondence in connection with this unfortunate labour trouble, but some of the despatches to the *Nelson Daily News*, published late in September, are reprinted below. It is to be hoped that there will be no considerable delay in arriving at a settlement of the matters in dispute, since a long-continued suspension of work at these collieries and coke ovens must necessarily have a far-reaching disastrous effect, since the larger smelters of the Kootenay and Boundary districts obtain from the Crow's Nest Pass Coal Co. their supply of coke, and failing receipt of the fuel necessary for smelting purposes, these reduction works must be closed down. The larger producing mines of Rossland and the Boundary may also be disadvantageously affected by the stoppage of smelting operations, so that the trouble will not be restricted to the Crow's Nest Pass. The despatches referred to follow:

Fernie, Sept. 22.—The mines of the C. N. P. Coal Co. at Coal Creek are idle today owing to the refusal of the members of the local union, U. M. W. of A., to work any longer with non-union miners.

On September 14 the following notice was issued: "Acting under instructions from President Mitchell, we hereby give all non-union miners notice that seven days after this date we will cease to work with non-union miners. (Sgd.) U. M. W. of A."

At a meeting of the union held last night it was decided to cease work this morning until ordered to return to work by the district officers.

The officials of the coal company claim such action is deliberate violation of the agreement instituted between the company and the union in May, 1905.

Mr. G. G. S. Lindsey, the general manager of the company, has issued a circular letter to the workmen at Coal Creek, in which he clearly defines the position

of his company, and draws the attention of the members of the union to the following facts:

"At the conferences between the company and the officers of the union immediately preceding the signing of the agreement the question of discriminating against non-union men was thoroughly discussed and the national board representatives, Mr. Jones and Mr. Sherman, both agreed that President Mitchell would not allow a strike because there were non-union men in the mines; that the local union could not take such a step without the consent of the national president of the Mine Workers and that they would have to conduct such a strike on their own resources, that they could not deal with a question which would result in closing down the mines without instructions from and consent of the national president and that they could not get his consent; that under the agreement where a difference arises between the company and the union, all cases where the United Mine Workers have not been fairly treated are to be referred to a series of tribunals, ending with the president of the company and the president of the United Mine Workers of America for settlement, and as long as such negotiations are in progress and until a final decision is reached, mine labourers and all other parties must remain at work; that if President Mitchell gave the instructions to cease work on the grounds stated and authorized their publication then the contract with the United Mine Workers of America is not worth the paper it is written on, for he has violated every pledge given by him through representatives at the conference in May, 1905, and by his district officers, and has failed to himself discuss the matter with the president of the coal company before acting, as provided under the agreement and until that is done the men must continue work."

Mr. Lindsey's letter concludes thus:

"This notice is sent you for the purpose of presenting the facts to you as they exist and to give you the opportunity of considering them and governing yourselves accordingly. It is further to give notice that every workman who does not report for work on Monday morning, September 24, 1906, will, having absented himself for two days without permission, be liable to be discharged, and will for this and other reasons be discharged from the employment of the company."

Fernie, Sept. 25.—The miners employed at Coal Creek collieries, not having complied with the order issued by the C. N. P. Coal Co. yesterday to remove their tools from the mines this morning, the following notice has been posted at the collieries:

"The men at Coal Creek having failed to comply with the company's order to remove their tools are hereby notified the tools will be removed by the general superintendent and may be had by application at the company's offices at Coal Creek.

(Sgd.) "R. G. DRINNAN,
"General Superintendent."

Fernie, Sept. 26.—There is little change in the strike situation today. General Manager Lindsey has issued a circular in reply to the one published yesterday by Secretary Biggs, of Gladstone Local Union, and in it draws attention to the fact that, instead of being a reply to his accusations, it deals with a lot of minor matters which have been disposed of already and to which, if explanations were desired, they could be readily given; that Mr. Biggs was very careful not to touch on two points raised by him: first, that the company had the most solemn assurances from the highest officials of the U. M. W. of A., that is from National Board Representative Jones, District President Sherman and Secretary Biggs, that there would be no discrimination by the union against non-union men and that the last thing they would think of doing would be to go out on such an issue; second, that the men have violated their agreement in not remaining at work under article 2 of the agreement until such time as any dispute has been disposed of by the different tribunals therein provided.

He further states that both Mr. Sherman and Mr. Biggs were present at all the meetings of the conference at which the agreement was made and know that what he says as having taken place there is true. That they both have had in their possession ever since the conference a copy of the report from which the extracts in his circular letter were taken, and he challenges them to produce this copy and to deny this statement, and if they deny it he challenges them to meet him with the other members of the conference in the presence of the miners of Coal Creek and say so. He concludes as follows:

"The issue is simple. If I be accurate in what I state, then not only is the present strike entirely unauthorized, but the honour of the U. M. W. of A. is at stake, and the question of the value of a contract with them and the assurance of their highest officials put directly in issue."

Fernie, Sept. 27.—At a meeting of the members of the local miners' union held in their hall this afternoon, it was decided to remain out on strike until the coal company guaranteed to give them their old places again, and until the company agreed to their demands respecting the signing of the books and the check off.

(At the end of September the dispute was still unsettled. It appears that other matters than the question of the employment of non-union men have influenced the men in their decision to remain on strike. These we shall summarize next month.—Editor B. C. MINING RECORD.)

A published report from Dawson is to the effect that the Guggenheims have just bought the lower eight miles of Hunker Creek for a consideration that will, it is stated, run into millions, involving the heaviest aggregate ever paid on a single deal in the Klondike and covering the largest area sold at one time. It is probably the heaviest wholesale placer transaction ever made in the history of the world. The

ground bought extends from the mouth of the Hunker to within ten claims of Gold Bottom town and includes the famous Anderson concession two and a half miles long; also the extensive holdings of Max Kellar, Redmond Bros., Mitchell and Milvain, and about 150 rich individual creek claims. Paradise Hill and other rich hills are also included. The dredging ground above and below the mouth of the Hunker, on the Klondike River is likely to be taken over soon as well.

Prof. W. O. Crosby, of the Boston School of Technology, who recently spent ten days visiting various places in the Ketchikan mining district, Southeast Alaska, having gone there to examine several mining properties in the district, is reported by the Ketchikan *Mining Journal* to have expressed the following opinion relative to the permanence of the ore bodies in the district: "There seems to be a considerable variety of occurrences. For instance, the Omar and Cymru properties, which I have just visited, are entirely different deposits, and statements that would apply to one would not necessarily apply to the other. To make a general statement, there is no reason in geology why the ore deposits in the Ketchikan mining district should not be continuous in depth, but we may expect better copper values on the surface than lower down, in some cases there has been secondary enrichment. There is little reason, though, why values near the surface should not hold in depth. Ketchikan mining district compares very favourably with other parts of Alaska I have visited."

"Canada is emphatically the country of the twentieth century, the land of promise in every line of development, from mining to agriculture, and the 70 members of the Canadian Society of Civil Engineers who have just returned from a tour of the Far West have come back most enthusiastic believers in the future of this country," said Prof. C. H. McLeod, of McGill University, on his return from the trans-continental trip of the society. While in British Columbia the party spent some time studying the mining industry in the Boundary and Kootenay districts. In Rossland, Phoenix and Greenwood camps they found the main activity centred upon the introduction of methods for the economical handling of low grade copper, silver and lead ores. This problem had already been solved, and Prof. McLeod ventured the prediction that it would mean a great increase in the mineral wealth of the West, and the taking of the business out of the speculative field and reducing it to a regular dividend-paying industry. There were practically inexhaustible deposits of these low grade ores, which were formerly regarded as useless, and the solving of the problem of how to reduce them with profit meant a very bright future for the country. "It practically means," said Prof. McLeod, "that the mining business there has passed the excitement of stock speculation, and has at last got down to a rock-bottom common-sense basis."—*Canadian Trade Review*, Montreal, Québec.

THE EVA GOLD MINE AT CAMBORNE, FISH RIVER CAMP, NORTHERN LARDEAU.

By E. Jacobs.

CAMBORNE'S mainstay, among the several mines situated in the vicinity of that town, which is on Fish River, Northern Lardeau, has, for some time, largely been the Eva gold mine. In an article contributed by Mr. J. F. Musselman and published in the B. C. MINING RECORD in September, 1902, it was stated that "mining activity in that part of the Lardeau mining division now known as the Fish River camp, properly commenced with the discovery of gold and the subsequent location on July 8, 1899, of the Eva and adjoining claims, although more or less desultory prospecting had been done prior to that

installation of a reduction plant to qualify as a profitable producer.

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

In the summer of 1901 the property was under bond to the London & British Columbia Goldfields, Ltd., for \$250,000, but this bond was not taken up.



Eva Gold Mine near Camborne, Fish River Camp, Northern Lardeau.—Section of Highland Mary "Glory Hole," showing gold quartz ore, now being mined to a width of 75 ft.

date, a considerable number of claims having been located, and to some extent worked." After dealing with general conditions in the camp, Mr. Musselman continued: "In point of location and amount of work done, the Eva is the premier free-milling gold property of the camp and district. Other properties there may be, and undoubtedly are, that have as good showings as had the Eva at the same stage of development, but the Eva, with 2,000 ft. of underground work done; with one ore shoot 200 ft. long and from 1 to 6 ft. wide, of generally higher grade ore, developed to a depth of nearly 300 ft.; another ore shoot 200 ft. long and from 10 to 15 ft. wide of \$6 to \$8 ore, developed to depth of more than 100 ft.; with immense bodies of lower grade ore developed to greater or lesser depth by other underground workings, and with several fine surface showings exposed by open cuts and stripping but not yet undercut, needs only the

Later, the Calumet & B. C. Gold Mines, Ltd., took a bond on the group.

Mr. R. W. Brock of the Geological Survey of Canada, accompanied by Mr. W. H. Boyd in the capacity of topographer, spent the greater part of the field-work season of 1903 in the Lardeau. Of Fish River camp generally he reported:* "This camp, situated on the lower part of Fish River; was located as a silver-lead camp, but at present the principal development is confined to gold leads. The ores occur in two zones. Camborne is situated on the southwestern edge of one of those which extends northwestward up Menhinick Creek and southeastward across Pool and Mohawk Creeks, over Great Northern Mountain to Ferguson camp.

*"Summary Report of the Geological Survey Department of Canada for 1903," page 58.

"This zone consists of a somewhat narrow belt of slate and phyllites cut by greyish-green, yellow weathering diabase-schist lying between somewhat broad bands of green schist. In width and continuance this zone is somewhat irregular, owing to the nature of the green schist, which may divide it into a number of broad bands, but in general it is easily traceable across the country. . . . An inexperienced prospector discovered a quartz vein with some specks of galena on the lower slope of Lexington Mountain, between Pool Creek and Fish River, which he staked as a silver-lead claim. Assays revealed a high gold content, and a number of gold claims were staked on this lead. . . . The main lead has been followed from Fish River southeastward over the shoulder of Lexington Mountain for about a mile, and it probably extends to Pool Creek.

"On the Eva group the greatest amount of work on the lead has been done. The lead here consists of two veins, lying in and along two fault planes, connected by numerous cross veins and stringers. The direction of the lead is about 120°, cutting the formation at a low angle. At the camp level the confining faults are 175 ft. apart, and dip 80° away from one another. Since they are converging upwards, at No. 6 tunnel, 500 ft. above, they are closer together, being 90 ft. apart. Below, the west fault changes its dip eastward. The country rocks are spotted phyllites, cut by the yellow weathering diabase schist. The veins are of quartz, carrying siderite and sulphides, the latter usually in small quantities only, together with free gold. The sulphides consist of pyrite, sometimes crystallised in the form of cubes, and pyritohedra, a little galena and zinc blende. In the Eva shaft the sulphides, especially pyrite, are present in quantity. The veins vary in width from a few inches to many feet. Gouge along the faults has usually confined the ore-bearing solutions within these planes and the crushed country rock between them, so that the veins occur along these lines and in the country rock between them. The southerly vein is called No. 1, the northerly No. 2. Large masses of quartz may be developed, especially where cross veins join Nos. 1 and 2 veins. The cross veins have not been observed to extend through Nos. 1 and 2 out into the country rock. In places the lead is of solid vein matter, sometimes banded, and with divisional planes parallel to the walls or to the stratification of the country rock. Sometimes the veins hold inclusions of the country rock, more or less replaced or mineralized by vein matter; in other places the quartz is deposited in bands between the lines of stratification. The rock between Nos. 1 and 2 veins and the cross veins, is itself somewhat mineralized with quartz and pyrite, assaying perhaps \$2.50 per ton. Slight faults, subsequent to the vein formation, sometimes interrupt the continuity of the vein. Gold may be panned from the quartz almost everywhere, but the values are not evenly distributed. At No. 5 tunnel the vein and the cross vein, which form a small cliff with 50 ft. exposed, are said to run \$20 per ton. The quartz in the winze between Nos. 5 and 3 tunnels is said to sample \$73 and the dump

\$50. Gold occurs, visible to the naked eye, in solid quartz, in seams in the quartz and along the selvage of a vein. Generally it is in small scales and nuggets; sometimes scattered thickly through the quartz in particles as fine as needle points. It is often concentrated along the walls of a vein, or round the inclusions. As the walls and inclusions are often highly carbonaceous, the carbon may be responsible for the enrichment. The veins are usually of higher grade where a cross vein joins. Zinc blende is said to be a good indicator of values. The pyrite in the Highland Mary shaft is said to carry as high as \$2,000 per ton. Galena may or may not carry gold values. About 2,200 ft. of development work has been done on the claim; 500 ft. of this on No. 2 vein, the rest consisting of tunnels, winzes, shafts and cross-cuts to No. 2 vein, has been done on No. 1. The lower tunnel is about 1,000 ft. below the Highland Mary shaft and 1,000 ft. above the river valley, down to which the vein has been followed, proving its continuance in depth."

In August, 1903, I visited Camborne. From the account of my trip "Through the Lardeau," published in the B. C. MINING RECORD in November of that year, I take the following:

"The Eva group, consisting of the Eva, Highland Mary, Iron Dollar, Joker, Highland Mary Fraction and Last Chance mineral claims, is held by the Calumet & B. C. Gold Mines, Ltd. Mr. J. F. Musselman, of Nelson, B. C., is managing director, and Mr. John Knox, Jr., M. E., of Camborne, superintendent. . . . The Calumet & B. C. Gold Mines Co. has further developed the Eva, with results that have induced the management to erect a 10-stamp mill at Camborne. Recent reports from the mine indicate that the quantity of ore of good grade available is now considerably larger and that the outlook is favourable for a lengthy and payable mill run. The mill is a Fraser & Chalmers 10-stamp section of a 40-stamp mill with stamps weighing 1,050 lb. each. The building is of lumber with shingle roof. It stands on a graded site with the foundations of the battery frame resting on solid rock. The main building, including battery and vanner rooms, is 32 ft. and the height from the lowest floor to peak of tower in which is situate the lower terminal of the tramway is 85 ft. The stamp mill is well finished and is equipped with automatic feeders. In the vanner room there are four 6-ft. Fruevanners, one having a corrugated rubber belt. These are fed from a cone sizer. The machinery is driven by three Pelton water motors, one 65 h. p. operating a Comet B. rock crusher, one of 135 h. p. driving the stamps, and one of 20 h. p. the vanners and a dynamo for a 200-light electric plant. A 25 h. p. boiler of locomotive fire-box type heats the mill building. The Peltons are impulse wheels working under a head of 400 ft. The water is brought from Pool Creek about 4,000 ft. to a penstock above the mill in a 24 by 36 in. covered flume. The country over which the flume passes consists of a series of rock bluffs crossed by small snow slides, necessitating the cutting of a bench for the flume the entire distance. A rivetted steel pipe 1.00 ft. long, diameter 18 and 16 in., conveys the water

from the penstock to the Pelton wheels. The Riblet aerial tramway is 4,200 ft. between terminals. It has one span of 1,900 ft. and passes over a high ridge before dropping 200 ft. at a 45° slope to the upper terminal. The fixed cable on the loaded side is 1-in. and on the return side $\frac{7}{8}$ -in., whilst the traction rope is $\frac{3}{4}$ -in. The capacity of the tramway is about 100 tons every 10 hours. The buckets each hold 10 cu. ft."

On May 1, 1904 the Calumet & B. C. Gold Mines, Ltd., relinquished its bond on the property, which then reverted to the Imperial Development Syndicate. After carefully considering the situation, the directors of the syndicate decided to form a subsidiary company to operate the Eva mine and mill. This was done, and the new company, known as the Eva Gold Mines, Ltd., was organized with an authorized capital of \$500,000 in \$1 shares. Of these, 220,000 shares,

syndicate had paid a total of \$10,650 as calls on these 32,000 shares, leaving a liability thereon of \$5,350.

The Eva Company has been operating its 10-stamp mill practically continuously since early in 1905, interruptions for repairs, etc., having been of comparatively short duration. The total tonnage treated at the mill since its completion is about 25,300 tons. Of this quantity approximately 6,600 tons were milled during seven months of the company's fiscal year ended July 31, 1905, and 11,130 tons during the year ended July 31, 1906. The remaining 7,570 tons were milled during 1903-4. The average gross value of the ore milled during the first year above mentioned, according to the manager's report for that period, was \$4.25 per ton, of which \$3.45 was recovered—\$3.10 in bullion and 45 cents in concentrate. The report for the last fiscal year, printed elsewhere in this



Eva Mine near Camborne, Fish River Camp, Northern Lardeau.—Outcrop of quartz on No. 1 vein. No. 2 tunnel has been driven in ore about 300 ft. on this vein

fully paid and non-assessable, were allotted to the Imperial Development Syndicate in payment for the property. An opportunity was given the Calumet & B. C. Company to subscribe for 100,000 assessable shares, one-half to be issued as paid up to 50 cents, and the other half to 75 cents per share, these to be liable to calls not to exceed 2½ cents per share per month until fully paid up. Subject to these conditions, more than 102,000 shares were subscribed for by, and allotted to, shareholders in the Calumet & B. C. Company. In order to place the new company in a good position financially, the Imperial Development Syndicate subscribed for 32,000 shares issued as paid up to 50 cents per share and subject to calls for the remaining 50 cents. This gave the syndicate a controlling interest. By the close of 1905 (the latest date up to which a statement of its accounts has been published), the

issue, shows an average gross value of \$5.69 and a recovered value of \$5 per ton. This latter is not an approximation, as the even dollars might suggest, for the actual recovery was just a fraction of a cent over the \$5 shown. The total recovery since the mill was installed has been \$128,338.54—in bullion, \$116,274.19; in concentrates, \$12,064.35—an average of \$5.072 per ton. It is noteworthy that last year's total recovery of values showed a profit over and above operating cost of \$1.573 per ton of ore milled, or a total of \$17,433, which is considered a satisfactory result under the circumstances that the mill contains only 10 stamps instead of the 40 it was originally designed for and to secure the early installation of which efforts are now being made.

The accompanying illustrations will serve to give an idea of the large size of the ore bodies in different

parts of the mine. The Highland Mary "glory hole," or surface quarry, a section of which is shown, is high up the hill, 125 ft. above the level of tunnels 1A and 1B. The letters indicate on which side of the big mineralized mass—the footwall or hanging wall, respectively—the tunnels have been driven. There are in all eight or nine tunnels, the lowest, 7A, being suffi-

terminal of the main tramway up to the portal of 1B tunnel, a raise from which connects with the Highland Mary "glory hole" above. The upper terminal of this subsidiary tramway is being removed lower down the mountain side, to the portal of 2B. A raise from 2B to 1B is about completed. All ore above 2B is now available for stoping and as fast as broken down it



Eva Gold Mine near Camborne, Fish River Camp, Northern Lardeau.—Open Stope, No. 5 A Level.
All Ore showing in View.

ciently high above the upper terminal of the main tramway to allow of another level being opened about 100 ft. below it, and yet leave room for dumping into the ore bin at the tram terminal. From the mouth of 7A a long chute connects with the tramway receiving bin. A subsidiary tramway, of the two-bucket type, 1,350 ft. in length and having a carrying capacity of 100 tons and upwards per day, runs from the up; or

will be sent over the sub-tram to the main tram for conveyance thence to the mill. Ore from all levels below 2B is taken out through 7A. Development work in progress is the driving of an intermediate level, 6A, and cross-cutting thence to 6B adit.

The high pressure half of a Canadian Rand Drill Co.'s compound duplex Corliss valve 15-drill air compressor has been ordered and its early receipt at Cam-

borne is looked for. It is to be installed at the mill, where the cement concrete foundations have been completed and other preparations made for its installation immediately after its arrival there. This engine will be direct-connected to a Pelton wheel of 13-ft. 2 in. diameter. Instead of putting in a separate air pipe-line from the mill up to the mine an arrangement has been made with the owners of the adjoining Oyster-Criterion property for the use of part of its air line and the necessary connections have been made so that as soon as the installation of the air compressor shall have been completed it will be practicable to commence to use machine drills in the mine.

The Eva mine is still managed by Mr. A. H. Gracey, who recently showed the writer over the property and pointed out the decided advantages it possesses, particularly in point of location and size of ore bodies, for economical operation. After a personal examination of the mine the force of the closing paragraph in the manager's last annual report, "Were we operating on a scale commensurate with the size and value of our ore bodies, the results would be of a much more satisfactory nature and I hope this will be a possibility of the near future," is quite evident, and his hope for the early provision of enlarged mining and milling facilities is cordially shared. Notwithstanding the limitations under which it has been working a creditable record has been made for the mine as a profitable enterprise in its comparatively small way, and a much more successful future for it may be expected with confidence.

Mr. D. A. Clements, secretary-treasurer of the Sullivan Group Mining Co. is reported in the press to have made the following statement: "Interest on the bonds of the company is being paid as fast as coupons are presented. The total amount of interest due is about \$48,000, and there is now \$39,000 in the treasury. It will not be necessary to borrow any money to pay off this interest."

Rev. W. E. Collison, clergyman in the charge of the Church of England mission at Massett, Graham Island, of the Queen Charlotte group, when in Victoria lately informed the *Colonist* that at the present time lack of communication with the mainland retards greatly the development of Graham Island. Notwithstanding this, many claims for petroleum have been located on the west coast, Americans being largely interested. "In fact," said he, "our communication is far more frequent with Ketchikan and Southeastern Alaska generally than it is with Port Simpson and neighbouring points of the mainland of British Columbia. It therefore follows that the Massett Indians are more familiar with American ways. Recent investigations have suggested that the natural resources are considerable and with the outlay of a reasonable amount of capital the island would compare very favourably with any other part of British Columbia. Among its natural wealth may be included timber, fish of many varieties, coal and many other minerals. On the west coast, for example, indications favour the existence of petroleum."

THE UNUK RIVER MINING REGION OF BRITISH COLUMBIA.

FROM the Summary Report of the Geological Survey Department of Canada for the year 1905 has been taken the following information relative to mining in the Unuk River district. Dr. Bell, then acting director of the Geological Survey, in his report explained the circumstances under which this had been made available for publication in Canada. He said:

"While investigating the geology of Southeastern Alaska, under instructions from Professor Alfred H. Brooks, geologist in charge, Dr. Fred. Eugene Wright, of the United States Geological Survey, explored the Unuk River, which flows into Behm Canal, opposite Prince of Wales Island. Dr. Wright's work having been principally within British Columbia, the United States Survey has generously placed his results at our disposal, as if he had done this work for our department, and they are published as a short report in the present volume."

Dr. Wright's report follows:

INTRODUCTION.

The occurrence of valuable ore deposits and placer gold near the headwaters of Unuk River, British Columbia, has been known in a vague way for many years, and during the past two seasons definite steps have been taken to develop its resources systematically. Interest has been shown by prospectors and miners, not alone in this locality, but also in the entire mineral belt situated along the eastern flank of the Coast Range granite and not far distant from the International Boundary line. Discoveries of ore bodies, which appear to warrant careful investigation, have been made at several points in this zone recently, notably near the head of Portland Canal, also up Unuk and Stikine Rivers, and farther north near Caribou Crossing. From a geologic and economic standpoint, these regions are practically unknown, and, with the exception of brief notes by Dawson (a) and Brooks (b), have not been described in detail.

In September, 1905, the writer made a hasty reconnaissance trip to one of the localities by way of Behm Canal for the purpose of examining its prospects and collecting data of geologic interest. He is much indebted to Mr. J. W. Daily, manager of the Unuk River Co., for many courtesies extended which aided greatly in furthering the investigation. During the past year the International Boundary line has been permanently established by the Commission and the uncertainty which has heretofore existed as to its exact position, thus removed.

(a) Dawson, G. M. "The Yukon District, N.W.T." Geol. Nat. Hist. Survey, Canada, new series, Vol. III., Pt. I., 1887-1888 B.

"Report on an Exploration from Port Simpson on the Pacific coast to Edmonton on the Saskatchewan, embracing a portion of the northern part of British Columbia and the Peace River country." Geol. Nat. Hist. Survey, Canada, 1879-1880 B.

(b) Brooks, A. H. "Preliminary Report on the Ketchikan Mining District." Prof. Paper No. 1. U.S. Geol. Survey, 1901.

GEOGRAPHY.

Unuk (or "Junuch"—"Dream," in the language of the Tlingit Indians) River is one of the four large transmontane streams which rise in British Columbia either beyond, or well within the Coast Range, and crossing the International Boundary line, enter tide water on the Alaskan coast. Unuk River is about 54 miles in length, and with its tributaries drains the Pacific side of the Coast Range divide between Stikine River on the north, and Portland Canal on the south. At its mouth the river has formed a wide delta deposit which is gradually filling Burroughs Bay, a deep-water indentation adjoining Behm Canal, about 60 miles northeast of Ketchikan, Revillagigedo Island, Southeastern Alaska. The river is swift and too shallow to permit river transportation on a large scale, and is furthermore obstructed by three canyons which can be passed only during periods of low water and then by canoes or small boats alone.

At its source a narrow divide leads over to a branch of Iskoot River along which prospectors can pass and enter the rolling plateau lands of British Columbia. This natural entrance from the coast into British Columbia has long been known and would have been used many years ago had the natural obstacles at the start on Unuk River been less formidable. Within the last three years, however, these conditions have been improved by the construction of a wagon road from the mouth of Unuk River to a prospect 42 miles inland. The road is at present 25 miles in length and when completed will furnish easy access into the mineral belt and thus increase its value materially.

The fiord-like valley of Unuk River is bounded by steep glaciated mountains 4,000 to 10,000 ft. high, frequently rising sheer from its valley floor. It has been shown by Messrs. Spencer and Brooks (a) of the U.S. Geological Survey that the large rivers which traverse the Coast Range are probably antecedent in character and have preserved their original drainage courses during the mountain uplift.

In glacial times the ice streams followed these same lines, scouring them thoroughly and even making deep incisions into the country rock itself, so that at present the land forms are those of an intensely glaciated region. The usual features of glaciation—U-shaped valleys, hanging valleys, glacial terraces, rounded mountain tops, glacial erratics, flutings and grooves—abound and show by their freshness that only a small amount of erosion has been accomplished since the glacial epoch. On several of the mountain slopes the work of ice erosion is still being continued by small ice streams, the last remnants of the huge ice sheets which formerly covered this entire area to a depth of over 6,000 ft.

Along the banks of Unuk River timber of good quality occurs in occasional patches and consists chiefly of spruce, hemlock, cedar, cottonwood, with some

balsam fir trees near its head. Trees of spruce and hemlock, 4 to 6 ft. in diameter, are not uncommon and are reported by lumbermen to be of fair quality. The quantity and supply of timber are sufficient to meet mining needs for many years. The underbrush is dense and, together with the wet climate and the malevolent Devil's Club (*Echinopanax horridum*), add to the difficulties to be overcome by the prospector.

GEOLOGY.

The geologic section exposed by the deep Unuk River cut, affords an unusual opportunity for the study of the Coast Range from many different viewpoints. In a broad way its consideration may be resolved into a study of the intrusive Coast Range granite and the adjoining belts of altered sedimentary rocks on the east and west.

The Coast Range granite belt, which is traversed by Unuk River, is a small part of an immense granite batholite (a) nearly 1,000 miles in length and 30 to 60 miles in width which extends from Fraser River in British Columbia, in a northwesterly direction, parallel to the coast, to the White River basin in the Yukon district. The Coast Range granite is one of the master features of the geology of this entire coastal strip and deserves careful study, not only by the geologist, but also by the prospector, since the major portion of the ore bodies which have been discovered probably have a genetic relation to the intrusive granite (b). From evidence obtained at other points it has been shown that the intrusion of the Coast Range granite took place between Upper Jurassic and Middle Cretaceous times.

Petrographically the field term, granite, applies to only a small part of the intrusive rock types. The prevalent type is less silicious and ranges from granodiorite to diorite and gabbro in composition with hornblende and biotite as coloured constituents and titanite as a frequent accessory component. As a general rule hornblende appears to be more abundant near the coast, while biotite predominates near the inland border of the batholite. Near the coast the granite is also more noticeably gneissoid in aspect and contains abundant inclusions of the intruded schists near its contact. These inclusions become more and more coarsely crystalline as the contact recedes until finally they resemble basic or acid differentiation products and are gradually lost sight of. It is a characteristic feature that while aplitic and particularly pegmatitic dykes are extremely abundant near the western contact of the granite and form an intricate network in the adjoining schist areas, they are rare and practically absent in the central parts of the massif. On its eastern flanks acid dykes occur frequently but are far less abundant than on the coastal side. The absence of minette and similar basic differentiation dyke products

(a) See "Geologic Map of the Dominion of Canada," Western sheet, No. 783. Edition of 1901.

(b) Spencer, A. C., "The magnetic origin of vein forming waters in Southeastern Alaska." Trans. A. I. M. E., Vol. XXXVI, pp. 971-978.

Brooks, A. H., "Ketchikan Mining District." Prof. Paper No. 1, U. S. Geo. Survey, 1901.

(a) Spencer, A. C., "Pacific Mountain System in British Columbia and Alaska." Bull. Geol. Soc. Amer., Vol. 14, pp. 117-132.

Brooks, A. H., "Ketchikan Mining District," Prof. Paper, No. 1, U. S. Geol. Survey.

is noteworthy and may be due to the fact that the acid dykes are pegmatic rather than aplitic in character and therefore are not, strictly speaking, differentiation products.

The importance of the pegmatites becomes apparent when their mode of formation from solutions emanating from the intrusive mass is considered. They represent only a small part of the work accomplished by the pneumatolytic solutions of the granite and are a silent but convincing witness of the great volume of pneumatolytic solutions which accompanied the batholithic intrusion. The intimate connection of ore bodies in southeastern Alaska with the intrusive masses has been proved directly in several instances and is inferred in a number of the remaining deposits.

Considered as a whole, the Coast Range granite has not produced the ordinary type of contact metamorphism in the rocks which it intrudes. On approaching its western contact from the coastal side, as exposed along the shores of Behm Canal, a change in the invaded sedimentary rocks is noted from slates and argillites to phyllites and mica schists and, still nearer, often to gneiss. The many types of contact hornfels are rare and spotted schists do not form an integral part of the complex. The strata are intensely folded and were undoubtedly deeply buried at the time of the granite invasion. In that position, deep-seated metamorphic forces were active and had undoubtedly heated and altered the rocks to such an extent that the granite intrusion did not disturb their equilibrium greatly; its chief effect was rather to accentuate the process of crystallization already in force and to increase their power than to replace them by others. This coastal strip, whose contact with the granite can at present be traced only with difficulty, offers, therefore, an excellent example of the metamorphic changes produced by granite at a deep seated level.

It is significant that in the Ketchikan district no ore bodies of consequence have been found in this zone of deep seated metamorphism, while rocks farther away from the granite and at the same time nearer the surface during its invasion, frequently show traces of contact metamorphism (spotted schists and the like) and contain valuable metalliferous deposits. The folded character and lack of uniform structure of the strata near the granite contact may also account, in part, for the absence of commercial ore deposits, since they offer no decided lines along which concentration could take place as in the isoclinal schists of the Junction district.

East of the inland border of the granite the character of the invaded rocks is noticeably different. The slates and sandstones are less altered and typical schists and gneisses are rare. Folding, and particularly faulting, are common and characteristic of the entire complex. The granite contact line is sharp and frequently traverses the bedding planes of the invaded strata. Although its general trend is parallel to the Coast range the actual line in the Unuk River exposures undulates locally and crosscuts the strata at variable angles. The intruded rocks are often indurated and heavily mineralized with sulphides near the contact and show their evidence of metamorphism by the intrusive mass.

On comparing the metamorphic effects of the intrusive granite along its western and eastern flanks decided differences are thus apparent. On the coastal side, near the contact, the metamorphism is of the deep seated type, gneisses and schists predominate and are cut by innumerable pegmatite dykes ramifying from the granite. Mineralization by sulphides is not pronounced. Farther to the west, and at some distance from the contact, evidences of contact metamorphism increase, as also the degree of mineralization; valuable ore bodies have been discovered within this latter zone. Along the eastern border of the granite, on the other hand, the metamorphism is of the contact type; argillites and slates predominate and are often indurated and heavily impregnated with sulphides. Well defined ore bodies have been found in the near vicinity of the granite contact. The geologic interpretation of these data indicates clearly that the rocks to the east of the granite were less deeply buried at the time of its invasion than those on the coastal side. In other words, the inland rocks were then above the zone of deep seated metamorphism (rock flowage), and were, therefore, profoundly affected by the invading intrusives and accompanying pneumatolytic solutions. Furthermore, the mineral-bearing solutions emanating from the granite encountered new conditions of temperature and pressure on invading the adjacent sedimentary rocks and deposited then, as supersaturated solutions in their new environment, a portion of their dissolved contents, especially the metallic sulphides.

Although in such a large belt the phenomena of contact metamorphism are not so pronounced and concentrated as in the contact aureole of a small intrusive boss, they are more extensive and, on a large scale, equally as varied. It has been frequently observed that in a small contact aureole different contact minerals are found at different distances from the intrusive mass and that under similar conditions an evident relation exists between a given contact mineral and its distance from the invading rocks; and in a general way this law has been found to hold true for this eastern contact zone of mineralized sedimentary rocks.

The age of sedimentary complex east of the granite has not yet been determined accurately because of insufficient fossil evidence. It is probable, however, from the work of Dawson on Stikine and Skeena Rivers, that they were deposited chiefly during the Paleozoic era.

Occasional belts of included sedimentary rocks were observed within the granite belt and found to be in a highly metamorphosed condition. They vary from argillites to mica, hornblende and calc schists of various types, and occur in long bands, often intensely folded, and trending usually parallel to the course of the range. As a general rule they appear more frequently near the mountain tops than in the valley. During the past summer two prospectors located a claim, the Cheechacho, about a mile below the International Boundary line on a vein 2 ft. wide in such an included schist band, striking east and west and dipping 50° north. The vein carries pyrite, chalcopyrite, and pyrrhotite and is reported to give low assay values in gold. The

schist band is cut by numerous offshoots from the intrusive batholite and deserves mention, since it contains the only vein on which work has been accomplished within the Alaskan portion of the Unuk River section.

Of interest are comparatively recent lava flows which were extruded near the granite contact, and, following Canyon Creek and Blue River valleys to Unuk River, spread over its valley floor and forced its waters over to the south wall, where they now pass by way of three narrow canyons. The volcanic ash from these eruptions can still be seen as black patches on the glaciers of the mountain peaks 8 to 10 miles distant. A few miles from the mouth of Blue River, the lava has dammed the valley to such an extent that a long lake has been formed and serves as a natural settling tank into which the turbid glacial stream flows, and from which it issues practically free from sediment.

The foregoing considerations tend to show that the belt of sedimentary rocks east of the Coast Range granite is a favourable one for prospecting, and deserves thorough investigation. As the inland border of granite lies entirely on the Canadian side of the International Boundary line, the Coast Range mineral belt is in British Columbia, and locations must be made in accordance with its laws.

MINERAL DEPOSITS.

The occurrence of placer gold near the headwaters of Unuk River and its tributaries has been known for many years. In the earlier eighties prospectors discovered gold-bearing gravels up Sulphide Creek and spent several seasons profitably in extracting the gold by means of rockers and other primitive methods. The difficulties of transportation, however, were so great that they ultimately abandoned their claims. In the succeeding years occasional prospectors visited the region, relocated the placer deposits, and also discovered well mineralized veins carrying good values in silver, gold and lead. A primitive trail was built along the north bank of the river, and access to the region thus facilitated. The present wagon road follows approximately the blazes of this old trail.

The most promising claims which have been staked are situated on Sulphide Creek, and have been acquired by the company interested in construction of the wagon road. Other locations have been made near the head of South Fork, also near Boulder Creek and Canyon Creek.

Sulphide Creek—Recent discoveries have been made on this creek near its mouth, and consist of two veins which have been developed by several short drifts and open cuts. One of the veins outcrops along a narrow gash and has been traced about 1,000 ft. up the gulch. It strikes usually N. 25° W., dips 30°-60° N.E. and varies in width from 2 to 8 in. The vein minerals are chiefly tetrahedrite (grey copper), pyrite, sphalerite, galena and native silver; near the surface they are usually altered and enveloped in a soft ferruginous matrix of weathering products. The native silver is a product of the surficial alteration of grey copper. About 100 tons of ore are reported to have been taken

from this vein and to have given high assay returns, particularly in silver. The country rock consists of altered limestone and breccia with some quartzite and slate, cut by intrusives of several types. The second vein outcrops a short distance south of the first vein, and is exposed along the face of a steep cliff, where it is easily recognized by its brown oxidized coating. At the surface it appears to be 20 to 30 ft. wide and is heavily mineralized in spots with pyrite, fine galena (steel galena) and occasional sphalerite and chalcopyrite. Native gold is said to have been observed in the oxidized portions of this vein which has been prospected by a short tunnel 25 ft. long at 1,400 ft. elevation above sea-level. The vein shows distinct banding and strikes N. 5° W. with dip 80° to 85° E. A fine-grained basic dyke is exposed along the west side of the tunnel. On both these veins the development work which has been accomplished is not sufficient to permit definite statements in regard to their future. The indications, however, appear sufficiently favourable to warrant the test which the company plans to give the property in the near future.

At the junction of Sulphide Creek and Unuk River the river gravels contain some free gold, and fine colours can be seen in every pan of material tested. The gold is flaky and considerably worn. No thorough sampling has yet been done and depth to bed-rock is unknown. As the river valley, however, is wide and has passed through a long period of glacial erosion, it is probable that bed-rock is at some distance from the surface. Local irregularities were observed in the bed-rock floor near the placer gravels and similar variations may also be expected at the claims. It appears that these placers might be exploited by dredging, but large boulders are likely to be encountered.

South Fork.—Near the head waters of South Fork, below Sulphide Creek, a second group of claims has been located 16 miles above its junction with the Unuk River, on veins within the sedimentary belt east of the Coast Range granite. These claims were not visited by the writer. Well defined deposits are reported and plans for future development are contemplated.

Boulder Creek.—Below South Fork on the same side of Unuk River prospects have been located on similar veins near Boulder Creek, a glacial stream, about 10 miles in length and rising near the Coast Range contact.

North Fork.—The territory drained by North Fork and by Glacier Creek, two glacier-fed streams reported to be about 15 to 18 miles long respectively, has not been prospected systematically. The ore bodies which have been discovered are similar to others in this belt, and are frequently rich in galena, with good values in silver. The same statement applies to the region near the headwaters of Unuk River.

Canyon Creek.—In the vicinity of Canyon Creek several ore bodies have been discovered, and are significant because of their close proximity to the granite contact along which Canyon Creek has cut its course. The principal prospects near Canyon Creek are the Black Bear claim and the Daily Boy group. The first is located on a vein 2 ft. wide, outcropping along the

selvage of a diorite porphyrite dyke, and contains auriferous pyrite and pyrrhotite. The Daily Boy group is located in a gulch adjacent to Canyon Creek, on veins occurring in altered black slates, argillites and quartz-

with a deep brown crust of ferruginous compounds, not unlike brown paint in appearance. The complex is cut by lamprophyric dykes of variable width and loose contact selvages. The veins which have been



Pipe-Line for Taylor Air Compressor Plant, near Ainsworth.

ies. The entire assemblage of strata is folded and faulted considerably, and is characterized by intense imbrication and mineralization by sulphides, especially pyrite. On weathering they often become covered

discovered in this gulch contain, besides pyrite, pyrrhotite, and occasionally galena and sphalerite. No development work of note has been done on either of these prospects.

SUMMARY.

The geologic cross-section exposed by the Unuk River valley, across part of the Coast Range, consists of two parts; on the west, a wide belt of Mesozoic granitic masses, formed during the same general period and grouped into one great unit, the Coast Range batholite, while on the east intrudes partially metamorphosed, and probably Paleozoic sedimentary rocks in which ore deposits have been discovered. A discussion of the type of metamorphism of this rock-complex leads to the inference that its metamorphic changes were largely due to the contact action of the intrusive granite; that the impregnation of these rocks by metallic sulphides was essentially concomitant with their contact metamorphism, that at the time of the granitic invasion this sedimentary belt was nearer the surface than the invaded strata on the coastal side of the batholite, and that the different physical conditions resulting from differences in relative position to an intrusive are important factors in determining, not only the type and intensity of metamorphism, but also the kind and degree of sulphide mineralization.

From these considerations it is inferred that the sedimentary belt to the east of the Coast Range granite in the Unuk River section merits investigation and may reward careful prospecting for ore bodies. The difficulties of transportation which have been encountered heretofore will be materially decreased by the completion of the wagon road to Sulphide Creek. Prospectors will then be able to devote a large part of their energy to the search for and development of metalliferous veins in the region.

THE TAYLOR HYDRAULIC AIR COMPRESSOR AT AINSWORTH.

AMONG the power installations of West Kootenay there is one concerning which very little has been published since its successful establishment in that district six years ago. The revival of interest in Ainsworth camp, on the west shore of Kootenay Lake, makes the present an opportune time to redirect public attention to the enterprise, unfortunately not as yet adequately rewarded, that gave to Ainsworth facilities in connection with the provision of compressed air for power and ventilation purposes not possessed in similar advantageous degree by any other mining camp in British Columbia.

The Kootenay Air Supply Co., Ltd., was on September 13, 1897, specially incorporated for purposes under the Water Clauses Consolidation Act, 1897. Its authorised capital was \$50,000 and its registered office at Nelson, B.C. Little or no information is just now available to the writer relative to its early history other than this brief statement, but there was published in the B. C. MINING RECORD for July, 1900, an article descriptive of the company's installation, which is here reproduced:

The first drill ever run by compressed air derived direct from falling water, under the Taylor patents, was started in operation in April, 1900, at the camp of Ainsworth, the plant having been installed by the Kootenay Air Supply Co., of Nelson, B. C.

Now that the plant is completed, and the compressed air, automatically made, is being distributed throughout the camp and used for a variety of purposes in mining camp work, it is of more than passing interest to mine owners to whom compressed air is the necessity of their daily business, and no one can go to Ainsworth and see the novel features of the installation there—the water collecting the free air from nature and leaving it tightly boxed in a chamber, compressed to 87 lb. pressure ready for the drill—without being impressed with the simplicity and effectiveness of this invention.

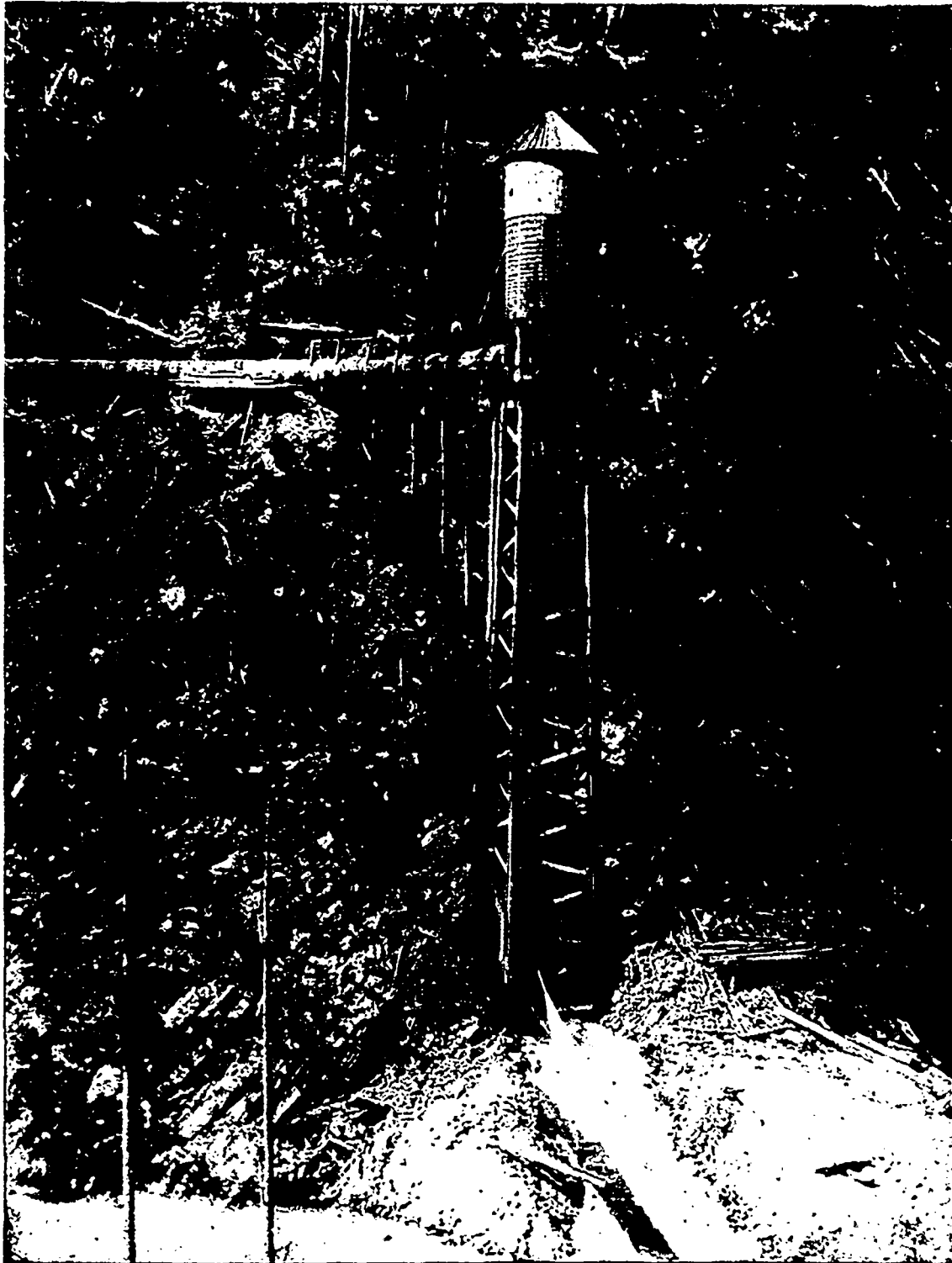
The whole process of converting the raw energy into manufactured power ready for delivery through the pipe lines, is absolutely automatic, with no machinery of any kind, and so long as the water comes from the flume the compressed air is being made.

DETAILS OF THE WATER POWER PLANT.

The plant is located on Coffee Creek, to the south of Ainsworth and about $2\frac{1}{2}$ miles from the principal operating mines. The creek has a flow varying from 2,500 cu. ft. per min. to a large volume. The flume used is stave barrel construction, round steel bands being bolted around it every 3 ft. The flume is 1.350 ft. in length and 5 ft. diameter in the clear. The available head at the compressor is $107\frac{1}{2}$ ft. The water at the compressor tower is received in a wooden tank 12 ft. in diameter and 20 ft. high; a downflow pipe passes from the water level through the bottom of this tank down perpendicularly. At the creek level a shaft has been sunk 210 ft. deep. The downflow pipe (which is 2 ft. 9 in. in diameter, outside measurement, of stave pipe construction throughout, the stay bands being set from 6 in. to 3 ft. apart, dependent on the pressure to which the particular section is subjected), passes down the middle of this shaft, terminating in a steel bell-shaped chamber at the bottom. The downflow pipe discharges into a deep groove, this being open to the chamber at about its middle. The dimensions of this chamber are height 17 ft. and diameter 17 ft., the bell shaped bottom standing about 2 ft. from the bottom of the shaft, thus allowing the water to pass out. The discharge of the mingled water and air from the downflow pipe into this groove causes it to swirl around the whole circumference of the chamber, some 51 ft., giving the air an opportunity to leave the water and to rise into that portion of the chamber which is above the line of the channel, while the water drops below to the rock bottom of the shaft, and the water in the supply tank (at the head) rises in the shaft on the outside of the bell and the downflow pipe to the level of the creek. This back water column is an important factor in this system of compression; its weight on the falling water in the downflow producing the pressure, every $27\frac{1}{2}$ in. of height of column of backwater increasing the pressure of air and water in the downflow pipe 1 lb.: Thus the shaft being 210 ft. in depth, and the depth of the groove which is the effective back head, being 200 ft., the air pressure roughly will be, 200 ft. divided by $27\frac{1}{2}$ in., or 87 lb., which the gauge on the compressor records. The air in the chamber has been isothermally compressed, the moisture has been absorbed from it by the water which sur

rounds each globule in its passage down, and it goes to its useful work three times dryer than the original air that was impounded, cold and pure. A goose neck

out of this pipe. It is shown discharging through the pipe at the foot of the trestle in one of the accompanying illustrations. On the other hand, when more air



Tower of Compressor Plant on Coffee Creek, near Ainsworth.

pipe reaches from the surface of the creek to the level of the dividing line between the air and water in the chamber, and whenever more air is being made than used, the air displaces the water, and the surplus pass-

is being drawn than made, a pressure valve on the surface of the ground shuts off the flow until the automatic air-maker catches up to the demand. In other words, by this device the pressure cannot vary to ex-

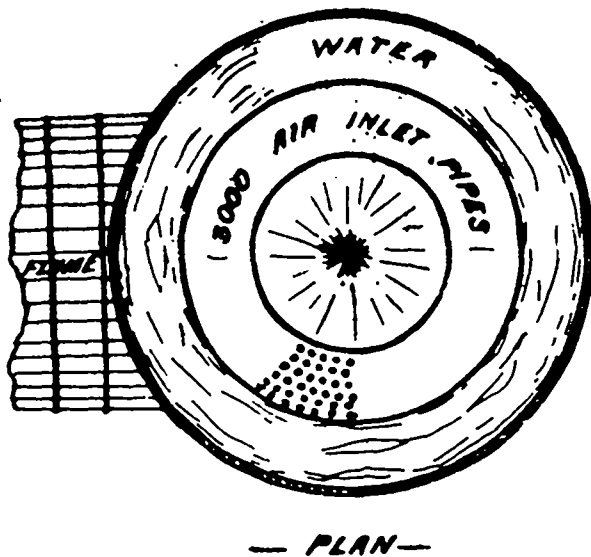
ceed 1 lb., or 27½ in. of water column, and the compressor plant can be left alone to do its work perpetually.

THE AIR-MAKER.

The accompanying sketches show the elevation and plan of the tank at the head of the trestle, where the water is received from the flume and the air is impounded. The air-maker is an inverted iron tank placed over the funnel of the downflow pipe. It is 7 ft. in diameter, and arranged with a screw lift, so that the amount of water allowed down the downflow pipe can be regulated. Around the circumference of this tank are inserted 3,000 pieces of ¾-in. gas pipe, the upper orifice of which is open to the air, the lower orifice being in the water, all of which must pass these lower orifices in rushing down the downflow pipe. The speed of the water in the downflow pipe is approximately 34½ ft. per sec., and the speed with which the air is drawn in with it will be nearly the same. The air is received by the water in millions of globules which retain their individuality, gradually becoming smaller in their passage down until finally liberated in the chamber below.

EFFECTIVE WORK OF THE PLANT AT THE COMPRESSOR.

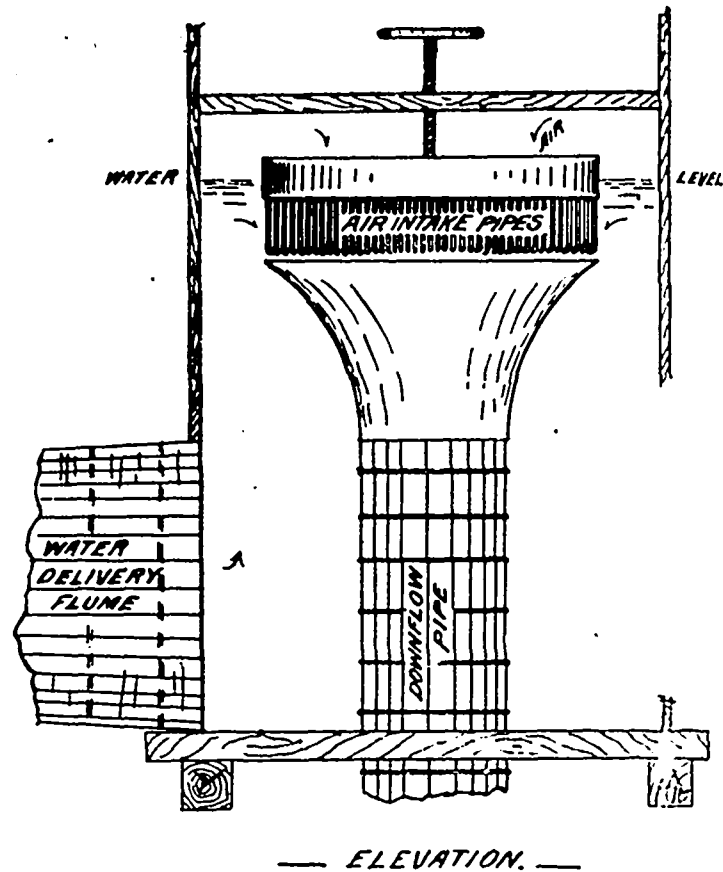
The flume has a fall of 4 ft. to the mile and the velocity of flow is figured at 3.72 ft. per sec., and the



volume at 70 cu. ft. per sec. The actual effective head is 107½ ft., and the available horse-power allowing 75 per cent. efficiency is 620 h.p. The area of the downflow pipe being 4½ sq. ft. and the area of the shaft 32 sq. ft. the speed of the water in the penstock or downflow pipe is 34½ ft. per sec. The amount of free air taken in under these conditions is 85 cu. ft. per sec., or 12 cu. ft. of air compressed to 87 lb. The motor air horse-power will be 465. The efficiency of the plant will vary with flowage.

THE AIR PIPE LINE.

In all the construction a light-lap welded pipe with screw joints has been used. The air leaves the compressor in a 9-in. pipe, branching some little distance out, one branch being left for later construction, the



main branch running north parallel to Kootenay Lake to mines around Loon Lake. This branch is of the following dimensions, 6,200 ft. of 7¼ in. pipe, to the Dictator, 4,000 ft. of 6¼ in. pipe along the west side of Loon Lake serving the Lady of the Lake and Mamie mines, and 1,100 ft. of 5-in. pipe branching north east to the Tariff, Highlander, and the big tunnel of the Philadelphia Mining Co. The total length of straight line is 11,300 ft. The properties reached by the pipe line at present are: The Eden, Crescent, Last Chance, Dictator, King Solomon, Krao, Lady of the Lake, Mamie, Little Donald, Black Diamond, Little Phil, Tariff, Highlander, Albion, Spokane and Trinket, and the intermediate claims.

The tunnel of the Philadelphia Mining Co. is now in 700 ft. and is being driven from the bench above the Stevenson concentrator to tap the various ledges of the camp. This tunnel will give a depth of 900 ft. at the highest point of the hill, it has already intercepted the Tariff vein and drills supplied from the Taylor plant are driving the cross-cut tunnel ahead and drifting to the ore body on the Tariff ledge.

THE AIR'S USEFUL WORK.

Air was turned on to the pipe-lines in the early part of April and the first machine drill ever run by air direct from a column of water was started in the big tunnel of the Philadelphia Mining Co. on the 16th of that month. Mr. E. E. Knowles, the mechanical engineer in charge of the plant, said:

"The machine drill first started was a $\frac{3}{4}$ -in. Rand and is 12,000 ft. from the compressor at Coffee Creek. It started without a hitch and with 85 lb. air pressure at the drill. This pressure is absolutely maintained at all times. I will venture the statement that there is not another machine in the world today working with as dry and pure air as this one, and I will also add that there is none giving better results. Manager Henry Stevenson, of the mining company above referred to, who is using the air, has expressed himself as being highly pleased with the air and the pressure at this distance from the compressor was a surprise to him. Here is an instance of what the capabilities of this system of compressing air will do. The company referred to has a developed water power with a working head of 1,000 ft. and is using a Pelton wheel belted to a mechanical compressor; yet this cheapest of plants to operate has been shut down for the simple reason that the company is getting its power furnished at its very door for just one-half what it was costing it for labour to run its plant, to say nothing of its investment, interest, oil and repairs. The Taylor compressor is running smoothly, with not a man nearer to it than three miles. At least it is presumed to be, as it is breathing into this machine drill at a rate that pleases the men who are running it and causes the muckers to get a hump on themselves." The work at the Philadelphia tunnel is in charge of Mr. Chas. Sherwin, and in conversation with him he made the statement that the effective work of the air could not be beaten; after shooting a round of eight holes the men go back to work in from 15 to 20 min., with the tunnel clear of impurities, and as clear as a bell in every way. Mr. Sherwin says that with all his experience with mechanical compressors, including some with a capacity of 50 drills, he has never used air that is equal to the Taylor hydraulic air for clearing out smoke and impure air; and he also dwells on the fact that this air is an infinitely better power factor inasmuch as it is always at constant pressure, and thereby the machine men are able to do better work and to break more ground.

COST OF THE PLANT.

The installation at Ainsworth has cost in the neighbourhood of \$60,000, including incorporation, water-power development, and pipe line. Of this investment \$20,000 covers the pipe-line cost, \$10,000 the water-power improvements, and \$30,000 the compressor. The last-mentioned cost was especially heavy in Ainsworth by reason of the fact that the shaft was sunk in an unusually hard formation and involved a cost of nearly \$50 per ft.

On the basis of a gross air-power of 600, the output when 4,200 cu. ft. per min. is used of the capacity of the water flume, this would represent a capital investment of \$100 per h.p., or upon a motor h.p. of .465 (allowing loss in delivery and loss in engines) the capital cost per h.p. would be \$130.

The company is now selling the power delivered at the mines at \$4 per drill, with a liberal reduction where more drills are used. The power is being used for pumping, hoisting, blacksmith forges and ventilation, the drill charge including ventilation,

THE HEAD WATERS OF WHITE RIVER, YUKON TERRITORY.

LAST MONTH mention was made in the B. C. MINING RECORD (p. 326) of a recent discovery of native copper at the head of White River, near the boundary line between Yukon and Alaska. As the find has been described in northern newspapers as an important one, the following report by Mr. R. G. McConnell, taken from the "Summary Report of the Geological Survey Department of Canada for 1905," is here reprinted, for official information relating to the White River country will probably be read at this time with more than usual interest. Mr. McConnell reported as under:

Work was continued during the season of 1905 in the district about the head of White River. The time available for work in this distant region is somewhat brief, as the summer is short and a considerable portion of it is occupied in travelling. On this account the examination of the district necessarily partook of the character of a reconnaissance. A topographic survey of the district was made by Mr. F. H. Maclaren, the topographer of the party.

TOPOGRAPHY.

The region examined lies along the landward base of the St. Elias Range, east of the Alaskan boundary, and is included in the drainage basin of White River, one of the principal western tributaries of the Yukon River.

The north eastern slope of the St. Elias Range is largely drained by various branches of White River, the principal of which are the Kluane, Donjek and the Generk Rivers. The trunk stream bends to the northwest and crosses the Alaskan boundary before reaching the mountains.

The Kluane River flows out of Kluane Lake, a large sheet of water about 40 miles in length, lying along the base of the St. Elias Range, and fed mostly by Slims River, flowing from the Kaskawulsh glacier.

The Donjek is a typical glacial stream. Its muddy waters, flowing in numerous branching channels, spread out in seasons of flood across a bare gravel flood plain from one to three miles in width. The channels change continually, new ones being constantly opened and old ones blocked by the rapid, overloaded streams. Bars easily fordable at one hour are often impassable the next.

The Donjek appears to issue from a large glacier which occupies the whole width of its valley a few miles inside the mountains. I was informed, however, by a prospector who had explored its upper waters, that the glacier is fed by an ice stream descending a tributary valley from the northwest and that the upper portion of the main valley is free from ice and partially wooded.

The Generk, though scarcely 12 miles in length, carries a large quantity of water and is one of the principal feeders of White River. It heads in the Klutlan glacier and flows northward parallel to, and a few miles east of, the Alaskan boundary. Like the Donjek, it has built up a wide gravel flood plain through which it winds in a multitude of interlacing channels.

The Klutlan glacier has a width, at present, of from two to four miles. It has evidently receded rapidly in recent years, as it is bordered on the south by a wide belt of rough morainic country, now free from ice. Its rate of motion is slow, and in places it appears to be stationary, as trees occur growing on shallow soil underlaid by clear blue ice. The lower portion and sides of the glacier are buried in debris. A ridge of fresh uncovered ice in the upper central portion of the glacier, only seen from a distance, suggests an active glacier over-riding an older almost stationary ice and gravel mass.

The St. Elias Alps, the principal topographic feature, form the southwest boundary of the district, and extend to the sea. The mountains and mountain ridges of this range are characterized by extreme boldness of outline. Steep slopes, precipitous cliffs and high broken peaks and crests prevail. The larger streams, such as the Donjek and St. Clair, have cut deep, wide valleys back into the heart of the range, while the smaller ones are usually inclosed in narrow steep-sided and often impassable canyons. The central portion of the range and all the higher mountains are covered with deep continuous snow fields, and glaciers—some of the first magnitude—are present everywhere.

The St. Elias Range is bordered along its whole northeastern front by a wide continuous depression occupied in different portions of its length by a number of small streams. The depression is crossed transversely by all the large streams flowing from the range, and evidently antedates by a long period the initiation of the present drainage system. The summit of the depression between Kluane River and the Donjek has an elevation of 1,500 ft. above the former, and between the Donjek and the Generk of about 100 ft.

East of the depression is a broken upland cut by a system of interlocking valleys into mountain groups and ridges usually rising from 3,000 to 4,000 ft above the valley flats. The mountains, while rugged in places, are more worn and are tamer in appearance than those in the St. Elias Range, and their inferior height has also prevented the great accumulation of snow and ice which forms such a conspicuous feature of the latter.

Forest.—The forest trees are few in number and include only the white and black spruces (*Picea alba* and *P. nigra*), the aspen (*Populus tremuloides*), and occasionally the balsam poplar (*Populus balsamifera*), and the birch (*Betula papyrifera*). The forest is sparse as a rule and ceases at an elevation of 4,000 ft. above the sea.

GEOLOGY.

The geology of the district proved less interesting than was expected, as the older rocks along most of the St. Elias Range and for some distance eastward, are buried beneath a great thickness of comparatively recent effusive and fragmental volcanics.

Tertiary.—A band of rocks referred to the Tertiary follows the St. Elias Range from the Duke River to the St. Clair. They are well exposed on a small stream which enters the Donjek from the west a mile above the mouth of Wade Creek. They consist here mostly of grayish conglomerates often only slightly indurated,

formed of smooth and well-rolled pebbles of quartz, quartzite, slate, chert and diorite. A band of red, iron-stained conglomerate occurs at the base of the formation, derived mostly from the debris of under-lying dioritic rocks. With the conglomerate are beds of grayish and yellowish tufaceous sandstones, dark, often carbonaceous shales, and occasional bands of lignite.

The conglomerates and associated clastic beds of the Tertiary alternate with numerous lava sheets from 15 to 100 ft. in thickness which appear to be contemporaneous with them. The lava sheets are usually andesitic in character and, in places, are slightly vesicular. They have smooth surfaces and decrease in thickness gradually towards their termination. They conform perfectly with the inclosing clastic beds even when the latter are steeply tilted. No dykes connecting them with the sheets were observed. The vulcanism which accompanied the deposition of the Tertiary beds was of long duration, as the latter are overlaid by at least 4,000 ft. of effusive and fragmental volcanic rocks.

The Tertiary beds which outcrop along Maple Creek consist mostly of shales and sandstone with some conglomerate and an occasional lignite seam. On Granite Creek and east of the St. Clair River conglomerate is the principal constituent of the formation.

The Tertiary beds are strongly folded in places, especially near the mountains, and therefore antedate in age the last movement which produced the St. Elias Range. No determinable fossils were obtained from them.

Mesozoic Beds.—The mountains of the St. Elias Range fronting on Kluane Lake are largely built of hard greenish tufaceous beds alternating with dark shales, breccias and, occasionally, agglomerates. Similar rocks outcrop at the canyon of Duke Creek and also at the lower canyon of Burwash Creek. The beds of this series, as a rule, are sharply folded and, in places, are overturned and broken. The rocks, usually hard, are more or less altered, and occasionally pass into green chloritic schists.

Specimens of the Triassic fossil *monotis subcircularis*, were obtained from a band of dark shales outcropping near the centre of the lower canyon of Burwash Creek. It is unlikely that the whole series is referable to one period as, in places, it is many thousands of feet in thickness. It probably represents the product of repeated volcanic outbursts, possibly continued into the Tertiary.

Upper Palæozoic.—The rocks referred to the Upper Palæozoic consist mostly of massive limestones and marbles associated with hard shales and slates and feldspathic sandstones. A good section of these rocks is displayed along the Donjek Valley from the point where it leaves the St. Elias Range up to the Donjek glacier, a distance of about seven miles. The outer range at this point is built of diorite. The diorite is followed by a wide band of crushed, reddish weathering limestone underlaid by grayish massive limestones and alternating limestones and shales. The latter limestone underlaid by grayish massive limestones, both holding fossils of Carboniferous age. The

tufaceous beds are cut by diorite, above which is a second band of massive gray limestone, followed by dark slates, altered in places into a schist. The slates are succeeded by reddish granites and diorites.

The limestones and associated rocks strike in a northwesterly direction and dip uniformly to the northeast at angles of from 30° to 70°. This outward dip is unusual in the great mountain ranges of the west, and is not a constant feature of the St. Elias Range, although it occurs at several points.

At the head of Burwash Creek the outer range of the St. Elias Mountains is built of massive limestone, and bands of limestones and shales similar to those on the Donjek, but dipping at a high angle in the opposite direction. North of the limestones—and apparently underlying them—are hard feldspathic quartzites, dark shales and iron-stained tufaceous beds. These beds have a nearly vertical attitude and their age relationship to the limestones is uncertain.

The mountain groups northeast of the trail from Burwash Creek to the Donjek are built largely of slates, tufaceous rocks and limestones similar to those in the St. Elias Range. West of the Donjek the limestones disappear and the rocks outcropping along the valleys of Wolverine and Harris Creeks consist mostly of hard, imperfectly cleaved slates and tuffs, cut by numerous diorite dykes and by a granite area.

The rough grouping of the clastic rocks of the district into the three series briefly described above is only intended as a provisional one and will doubtless be greatly modified when the region is examined in detail.

MASSIVE IGNEOUS ROCKS.

Andesites and Basalts.—Effusive rocks have a wide distribution in the district. A large area, commencing within a few miles of Kluane Lake, crosses Duke River valley and extends northward to the "gap" of this stream. A second small area—probably a disconnected portion of the first—occurs south of upper Burwash Creek. Between the Donjek and the Generk the mountains of the St. Elias Range, and a wide flanking plateau, are built entirely of these rocks, and they extend westward across the Generk to the Alaskan boundary.

The effusives rest on the Tertiary north of the Donjek and are therefore the youngest rocks in the district. The lava sheets in the Duke River area are nearly horizontal and show no signs of disturbance. North of the Donjek the sheets are often sharply bent and in places are broken and faulted.

The effusives in this series consist mainly of augite andesites of a somewhat basic type, and basalts. The sheets range in thickness from a few feet to several hundred feet, and are usually separated by tufaceous beds varying in texture from a fine ash to a coarse breccia. The series has a minimum thickness of 5,000 ft.

Amygdaloids.—Bands of a green amygdaloidal rock occur at several points in the district, usually associated with the Mesozoic tufaceous beds. The upper portion of the lower canyon of Burwash Creek is cut through this rock, and it was also found at the upper canyon of Tatamagouche Creek and on one of the

creeks flowing into Kluane Lake. It is important as it is supposed to be the source of the native copper which occurs loose in so many of the creeks of the district. Lithologically it is a vesicular diabase. The augite in the section examined is mostly altered to chlorite, and the cavities are filled with calcite usually surrounded by a ring of chlorite. A similar rock—also associated with copper deposits—occurs in the Windy Arm district.

Gabbro-diorite.—This is a dark gray rather fine textured intrusive, widely distributed in stocks and dykes throughout the district. It is a hard rock and in the St. Elias Range usually weathers into high bold peaks. It cuts the beds of the Mesozoic series but is older than those referred to the Tertiary. While usually massive it is slightly sheared in places and is occasionally seamed with small quartz veins.

The mineral constituents of the gabbro-diorite exhibit considerable variety in different sections. In places the rock is a typical diorite consisting essentially of hornblende, some biotite, and labradorite. This type passes by the substitution of augite for hornblende into a gabbroic variety, and by the addition of quartz and microperthite into a grano-diorite.

Quartz Porphyrite.—A yellowish porphyritic rock showing, in thin sections, a fine grained quartz and feldspar base, through which crystals of a plagioclase-feldspar, biotite and quartz, are porphyritically distributed, outcrops in considerable masses along Burwash Creek. It is probably the youngest intrusive on the creek.

Dunite.—Areas of dunite, partially altered in places into serpentine, occur on Burwash Creek and on a branch of Quill Creek.

ECONOMIC GEOLOGY.

Coarse gold occurs in nearly all the streams in the district except those flowing over the recent volcanic rock, but no rich concentrations have so far been found. Brief descriptions of all the creeks worked, with the exception of Arch Creek, are given in the "Summary Report for 1904," and need not be repeated here. Ruby Creek, the centre of mining operations in 1904, is now almost abandoned and the miners have moved on to Fourth-of-July Creek, a parallel stream flowing out of the same range. A few claims are being worked on Fourth-of-July below the mouth of Snyder Creek. A feature of the workings of this creek is that the auriferous gravels rest on a band of boulder clay which constitutes the bed rock. The boulder clay band has not been pierced, and there is a possibility—as pointed out in last year's Summary—that pay-gravels may exist beneath it. The gravel bed overlying the boulder clay is shallow and easily mined, but carries comparatively light values.

A large amount of work was done on Bullion Creek by the Bullion Hydraulic Co. This company has taken over most of the ground below the canyon and spent the season in installing a hydraulic plant. A flume 5 ft. by 3 ft. 6 in., with intake on claim No. 26, has been built down the valley to claim No. 48, a distance of about a mile. In places where the valley slopes were favourable the flume is replaced by short ditches. The grade of the creek is steep and a head of 175 ft.

is gained in this distance. The water is supplied to the monitor through a pipe 1,200 ft. in length and 30 in. in diameter at the intake. At the time of my visit excavations for a bed rock flume were in progress. The monitor was employed for this purpose and appeared to be doing very efficient work. Preparations were not completed in time to admit of a satisfactory test of the creek before the season closed.

A number of claims were worked on Burwash Creek throughout the season, both above and below the canyon, with varying results. The values in the upper part of the creek have proved generally unsatisfactory and some of the claims have been abandoned. A stretch of fair ground several claims in length has been found in the valley about a mile above the canyon and a second one at the foot of the canyon. The returns from the best claims seldom exceed \$10 per day per man. Mining on Burwash Creek is attended with peculiar difficulties: the creek is subject to sudden floods and on several occasions last season wing dams and drains—the result of weeks of hard work—were destroyed by the rushing waters in a few minutes.

Some prospecting has been done on Tatamagouche Creek, a northern branch of Burwash Creek. This creek is similar in character to Burwash Creek and cuts the same rocks. It enters Burwash Creek through a long canyon above which the valley is wide and open.

Further to the west is Arch Creek, the latest discovery in the district. This stream heads with a branch of Quill Creek and flows westward into the Donjek. Its grade averages about 300 ft. to the mile. Like most of the creeks of the district the valley contracts at one point into a narrow canyon. The canyon is situated about a mile above the mouth of the valley and is about three quarters of a mile in length. Half a mile above it is a second small canyon 200 yd. in length, above which the valley widens out and is bottomed with narrow flats and bordered in places with terraced slopes.

The rocks outcropping along the valley consist of hard tuffs, slates and limestones cut by several small diorite masses. The name of the creek is derived from an arch-like opening in a band of limestone crossing the canyon through which the stream had cut a passage. The slates and tuffs are traversed by small quartz veins from which the gold in the creek has probably been derived.

At the time of my visit a few claims were being worked in the canyon where the gravels are comparatively shallow. In the upper part of the valley the gravels deepen, and the few holes sunk have failed to reach bed rock. The gold obtained is found on or near bed rock, and consists mostly of heavy grains and small nuggets. The largest nugget found was obtained from No. 9 claim in the canyon, and weighed over 3 oz. It contained considerable quartz, and its rough surface showed that it had not travelled far. No ground yielding more than good wages has been found on the creek up to the present.

It is somewhat remarkable considering the number of creeks in the district on which coarse gold has been found, and the wide area over which they are distributed, that occasional rich concentrations have

not been found. The chances of such discoveries are, of course, not by any means exhausted, as none of the creeks have been fully prospected, and some of them have scarcely been touched, and it is this which keeps the miner in the field. The present yield of the best claims of from \$0 to \$10 per day can hardly be considered wages in a region where the cost of supplies is so excessive and the working season is so short and broken.

Copper.—Native copper is almost as widely distributed in the creeks of the district as gold. It is found on Bullion, Sheep and other creeks flowing from the St. Elias Range, and also on Burwash, Tatamagouche and Arch Creeks, in the region between Kluane River and the Donjek. It is not found on Ruby, Fourth-of-July, nor any of the streams cutting the old schists of the Ruby Range.

The principal copper creek in the White River district is Klefsan Creek. This stream is situated in Alaska, about four miles west of the International Boundary. It was examined by Mr. A. H. Brooks of the U. S. Geological Survey, in 1898. Brooks found that the stream copper, in part at least, was derived from calcite veins cutting a dioritic rock exposed along the valley. These copper-bearing rocks do not extend far in an easterly direction, as they are soon buried beneath a great accumulation of young volcanic rocks.

Areas of a dioritic rock apparently similar to that on Klefsan Creek occur on most of the copper-bearing creeks in the Kluane district, but no mineral discoveries have so far been made in them.

The upper part of Burwash Creek canyon is cut through a green, often iron-stained, diabase amygdaloid. This rock is cut by a few small calcite veins, which are usually stained with copper and carry small quantities of chalcopyrite and occasional grains of native copper. Similar copper-stained amygdaloids occur on Tatamagouche and several other creeks in the district. No veins of commercial importance have been found in them up to the present.

Native Silver.—Occasional coarse grains and small rough nuggets of native silver occur with the gold on Burwash and Arch Creeks.

Coal.—Lignite coal of good quality occurs throughout the Tertiary area extending along the foot of the St. Elias Range from the Donjek to the St. Clair. The veins vary in thickness from a few inches up to 4 ft.

In the course of an interview with the *Daily News*, of Nelson, Mr. D. R. Wilkie, president and general manager of the Imperial Bank of Canada, said: "The bounty granted by the Dominion Government to the lead industry has been helpful in stimulating and steadying the industry and making it possible to benefit by the good prices now ruling for both silver and lead. Personally I would have preferred protection in place of a bounty, but if protection is impossible, I favour the bounty under existing circumstances. I think the bounty should be continued for a cycle or years, as this would guarantee the future of the lead-smelting industry."

THE NANAIMO-COMOX COAL-FIELD.

By Dr. H. S. Poole.*

IN accordance with instructions I left Ottawa on May 10. On reaching Victoria the courteous officials of the local government freely placed at my disposal such information as they possessed respecting the coal fields of Vancouver Island, which I was to investigate, and to endeavour to obtain a history of past workings for coal, with a view to elucidate the geology and further help to form an opinion of the future prospects of coal mining in that field. Through the kindness of Mr. W. F. Robertson, provincial mineralogist, I made acquaintance with many who had been, and some who were now, connected with the coal industry of the island. Mr. E. B. Mackay, the chief draughtsman, kindly supplied me with copies of all available maps of the Lands Department. These, however, seldom showed, even approximately, the country roads, so the services of Mr. Thomas Budge were called in. With a cyclometer on his bicycle, and a prismatic compass he traversed the roads and ways in the neighbourhood of the mines and the district between Ladysmith and the entrance to Nanoose Bay. I was exceptionally fortunate in securing the assistance of Mr. Budge, who has large local knowledge of the country and its geology, and is further a coal mine manager by profession. Mr. Budge has placed at the service of the Survey a collection of sections he has himself prepared from specimens of the rocks of the Vancouver series in the neighbourhood.

Mr. A. Dick, who has spent the best part of his life among the mines of this country, aided me by the exercise of his retentive memory, and was as painstaking to keep me historically correct as he is zealous to require compliance with the law in his office of inspector of mines.

Records of several boreholes in both the Nanaimo and Comox fields were obtained through the kindness of Mr. T. R. Stockett, general manager of the Western Fuel Co., and Mr. F. D. Little, general manager of the Wellington Colliery Co., who also were good enough to furnish copies of maps.

Information was sought for data obtained in the course of prospecting and working the coal fields since they were reported on by Mr. J. Richardson in 1876-7.

Inquiry indicated that in the northern section of the island nothing further had been disclosed of the structure about Fort Rupert, Coal Harbour, McNeil's Harbour, etc., than what was described by Dr. G. M. Dawson in his "Report of Northern Vancouver Island," Part B, 1886.

Mr. W. Hogan who was a good deal with Mr. Richardson in the seventies, advises that prospecting on the coal measures at Gillies Bay, Texada Island, disclosed that the outcrop of coal seen there was only a patch, apparently on a fault.

Opposite Crofton on Osborne Bay explorations were made on Salt Spring Island, between the public wharf

and Vesuvius Bay. Two boreholes were put down in 1901, where some coal and black shale cropped vertically on the shore, one near the public wharf to a depth of 400 ft. computed by the drill man 1,500 ft. over the coal. This is in line with the theoretical continuation southward of the horizon of the coal beds at Nanaimo, but the borehole record was not obtained, and general report makes the prospect unsuccessful and the ground faulted. At Koksilah in the Cowichan section, an exposure of black shale reported to be coaly induced the sinking of a trial pit by Mr. Wood. The locality was not visited nor the statement confirmed that limestones in the neighbourhood, which is south of Duncans, are full of fossils.

Explorations outside the field of immediate examination, on a more extensive scale were those at Tumbago Island in 1893, when people of Victoria sank a shaft at No. 1 borehole, some 60 ft. on the eastern side opposite its mid-length. Next they bored on the western side close to the water from a base blasted out of the rock, so I am informed by Mr. A. Dick. The bore reached a depth of 300 ft., having passed through bituminous shale and coal at 280 ft., the coal being so friable that a large quantity was pumped up in the bore. The channel alongside is reported to be 40 ft. deep, and it was thought it gave access to the borehole. Contrary to his advice, says Mr. Dick, a shaft was sunk on the site of the borehole and this at 200 ft. met so heavy a flow of water that it was abandoned, and then the 60-ft. shaft was put down and stopped for want of funds. The surface on the island here slopes with the strata at 16° to the eastward.

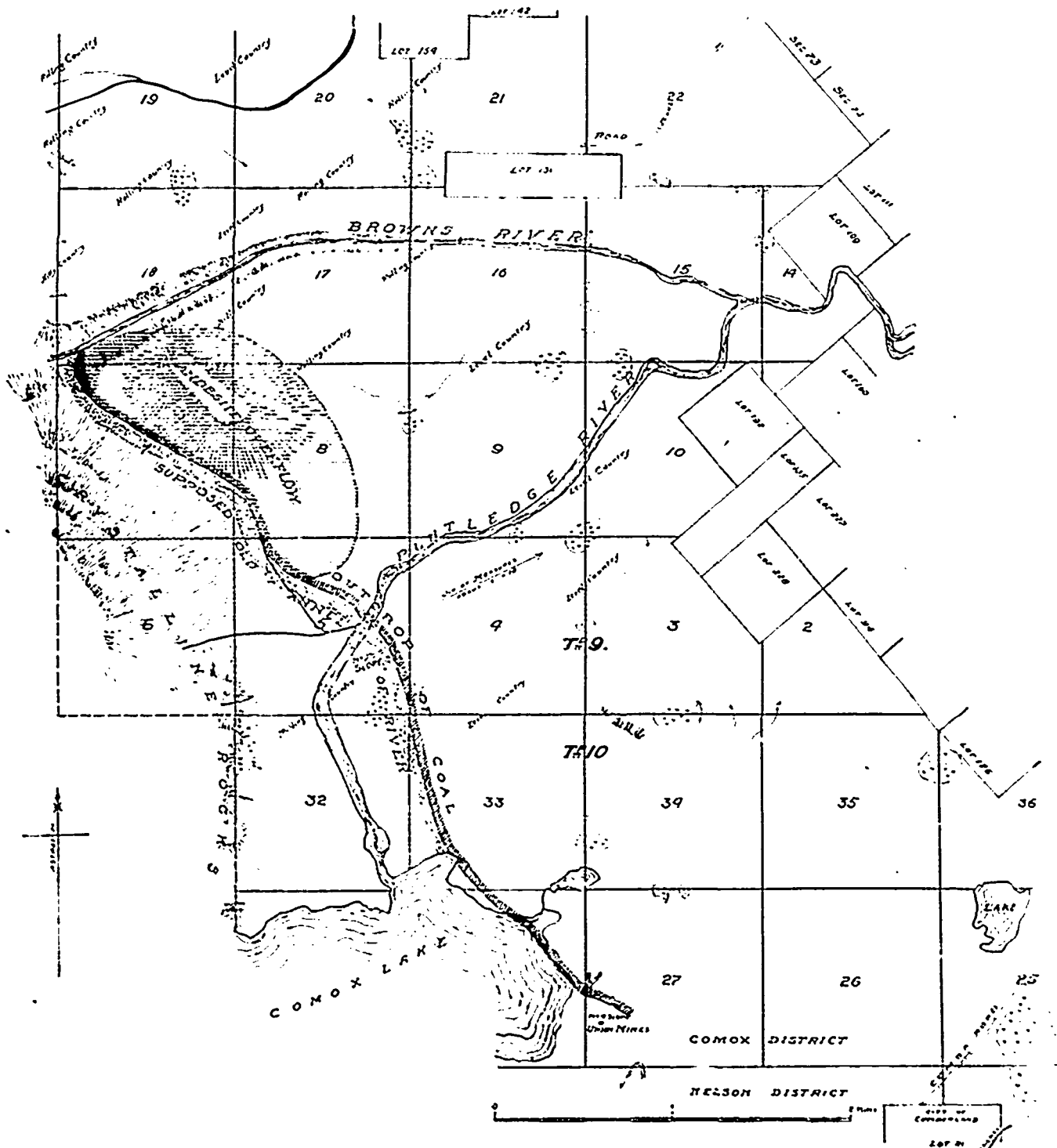
It is of interest to prospective miners of coal in this locality to know that the grant of railway lands with their mineral rights, by the Act of 1887, does not include in the reservation the islands on the east coast of Vancouver Island, and their mineral rights therefore go to the owner of the surface, with whom negotiations may be made. In conduct of this inquiry, so far, attention was solely given to the sedimentary beds of the western littoral and no study was made of the basal rocks, the Vancouver series, of the interior, on which the coal bearing beds rest. These rocks and their metallic contents have been the special study of Mr. W. J. Sutton in the interest of Messrs. Dunsmuir & Sons, the holders of the E. and N. Railway concessions, and he has travelled more among them throughout Vancouver Island than any other trained observer. His collection of specimens of these rocks is unsurpassed, and he has noted, on a map of the island he has prepared on a large scale, the data he has accumulated. The interests of Messrs. Dunsmuir & Sons in much of the regions he has explored has now passed, with the sale of the railway, to the ownership of the Canadian Pacific Railway Co.

Beside the help obtained from government and colliery officials, information was had of private individuals, so much at least as they felt at liberty to make known: but I found myself unexpectedly barred from some records of exploration by the view that the secrecy insisted on while borings were in progress was still binding, although necessity for reticence and private interests had long ceased. In the East the prac-

*In "Summary Report of the Geological Survey of Canada for 1905."

tic I believe to be this, where coal is the object of search: to regard secrecy as no longer necessary when once the information obtained is utilized, and then

In the absence of official data, and with press notices of the closing down of collieries, an impression of late was produced away from Vancouver Island



Map of country in vicinity of Nos. 4 and 7 Slopes of Wellington Colliery Co's Comox Collieries, near Cumberland, Vancouver Island, showing considerable area in which coal measures occur; also locality of Lava Flow referred to in Dr. Poole's Report.

place at the disposal of the public all secondary details, regardless of their cost. The result is that many structural details, of no financial value whatever to the explorer, but pertinent to this inquiry and only to be had by boring, have not been secured.

that the workable coals are of less extent than Ottawa and the East had been led to suppose. Now there are some people who have a vague idea that a coal mine is like a spring of water, with a flow to last at least their day, and they do not realize what "worked out"

really means. What has happened is this: Wellington, which for many years was a busy centre of trade, has ceased to have an output of coal, the openings there have been abandoned, and in their stead mines at Extension have been developed, and Ladysmith has increased its population. At the same time it is true the coal operator in Vancouver Island has had many disappointments, many unexpected difficulties to meet that are specialties in this coal field, in comparison, say, with the structure of the coal-bearing deposits of the opposite side of the continent.

In Cape Breton the beds carry a fairly uniform thickness for miles. Coal, sandstone, shale and fire-clay, each occur and re-occur in their due order of deposit, while in Vancouver Island the records of sections taken only 1,000 ft. apart read so differently that it is hard to determine which are the beds continuous in both, which have been suppressed, and which have been unduly developed within that short distance.

Many of the difficulties that meet the miner are totally apart from question of geological consideration. There are questions of supply and demand, questions connected with labour and questions of cost, all outside an inquiry touching the possible extent of the fields and the workable character of the coals. Active operations are at present in the hands of two corporations alone—the Wellington Colliery Co. and the Western Fuel Co. The business of the latter company at Nanaimo was suspended for some months by a strike of the miners, and the pits were closed during the time of my visit. I had, however, through the kindness of the colliery officials, opportunity to go below at both Extension and Cumberland.

Under guidance of Mr. John Matthews, manager at Cumberland, in the Comox coal field, the reported occurrence of anthracite coal was examined, together with exposures of coal altered and coked by igneous dykes on Brown's River, some four miles from No. 7 slopes, which are being opened by the side of the Funtledge or Courtney River, two miles below Comox Lake. At an exposure on a small water course half way between the two places a lava flow has converted some coal into a dense silvery coke. The exposure was limited, but so far as it permitted inspection the alteration extended but a short distance from the dyke. From this point to Brown's river the flow of andesite has made a hill 1,000 ft. above the sea and capping the coal measures. What its effect may be on the underlying coal seams can only be conjectured: but neither here nor at No. 7 slopes could the coal mined be classed as in any degree anthracite. The exposure at Brown's River is above where Richardson took his No. 1 section, published in the Survey report for 1872-3, page 36; and it is opposite where the river takes its plunge in cascades through a narrow gorge of the older diabase against the outcropping sedimentaries. Mr. Matthews wrote an article on this locality in the B. C. MINING RECORD of Victoria, January, 1904.

Another unusual, close association of coal and igneous rocks occurs also in the same district, but in this case under reversed and ordinary conditions, the

coal being the newer of the two. Right in the heart of the town of Cumberland, in the workings of No. 6 shaft, bosses of diabase project up through the pavement of the lowest seam at several places; there is no dislocation, the coal merely thins over them, but the contact is very close; in one case not an inch of what may have been mud intervenes between the weathered surface of the igneous protrusion and the coal. The bosses appear to have belonged to a spur from the hills; among its depressions first were deposited the grey shales and sandstones, these overlapping its sides apparently failed to complete the levelling up of the surface and so left these knobs of rock still exposed when the time came for the deposition of the coal seam. In a comparison of the conditions attending the workable seams of coal in the two great divisions of the coal field, the Nanaimo and Comox, this proximity of the workable coals to the unconformable rocks beneath in the latter division is in marked contrast with those in the former, where depths of 1,000 ft. or even more of sediments, with thin coals and massive blue shales prevail.

Another important feature of differentiation between the two divisions is the association at Nanaimo of the working coals with thick beds of conglomerate, and their practically total absence in the worked portion of the Comox division.

As to the area of the coal-bearing series, it may, in general terms, be said to extend down the whole west coast of the island; but the area in which it is probable coal in workable thickness exists in very much less, while the area that may be regarded as proved is comparatively small. The difficulties in the way of exploration are numerous; vegetation is rank, the surface is largely disguised under thick layers of wash gravels, and there are no inducements to the public to prospect over the major portion of the more immediately promising ground, as these lands are held by the present coal operators who have no occasion to explore much ahead of their requirements. Still, if it be desired that a conjecture be hazarded of the quantity of coal exceeding a thickness of two feet, and within a vertical depth of 4,000 ft. an estimate of 600,000,000 tons, though based on most incomplete data, would seem conservative and yet at the same time sufficiently large to allay apprehensions of any immediate shortage in the output.

The fossils collected in connection with the above geological work have been submitted to Dr. Whiteaves, paleontologist to the Survey, for determination.

The London *Critic* recently observed, in its "Market Gossip" notes: "While so much attention is being devoted to the prospects of Victorian (Australian) deep lead enterprises, the public would do well to keep their eye on Cariboo Consolidated, a kindred undertaking, but operating, as its name implies, in the Cariboo district of British Columbia. After years of wrestling with water and other difficulties, the company has now got to work, and it looks like being a big success. I offer my congratulations to the directors and the shareholders."

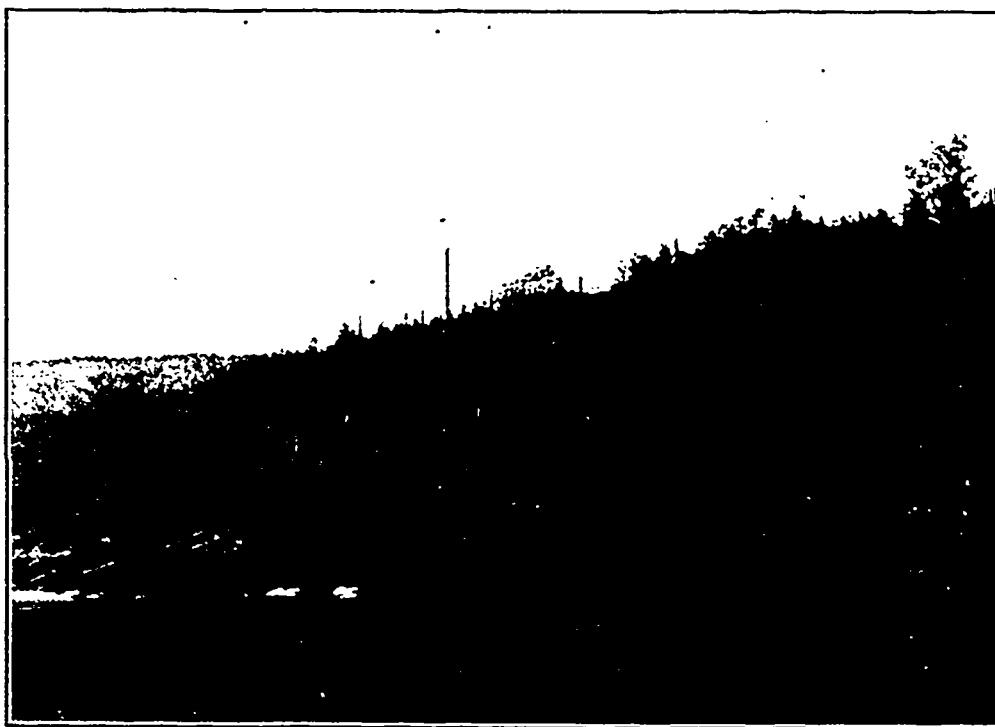
GRAHAM ISLAND (OF THE QUEEN CHARLOTTE GROUP), BRITISH COLUMBIA.

By Dr. R. W. Ellis.*

THE greater part of the season of 1905 was devoted to an examination of the coal deposits and other possible mineral resources of Graham Island, the largest and most northerly of the Queen Charlotte group of British Columbia. The party left Ottawa on May 10, and after a week spent in a further examination of the Quilchena and other coal areas in the Nicola Valley, which had been examined in detail the previous year, reached Vancouver on May 21. Here, after hiring men and securing outfit and supplies, we sailed by the "Princess Beatrice" on May 26, and reached Skidegate, via Port Simpson, on the

places, the country being very rough and hilly. Several large seams were found; the shafts and tunnels, made some years ago, were pumped out, and the area was carefully studied in order to arrive, if possible, at some definite conclusion as regards the actual structure of the district. The details of this work will be published in the regular report on the resources of the island, now being prepared.

It was found impossible to force a way across the centre of the island from these camps to the head of Masset Inlet and we were, therefore, after finishing our investigations on these coal seams, obliged to return to Skidegate. Here, after some delay, a fishing boat was secured, and though no one could be found who knew the western coast, and though the chart of this part of the island was practically worthless as regards details, we started from the village by way of



Lower Sandstone overlying Agglomerates, Skidegate Inlet, Queen Charlotte Islands.

evening of May 31. It was here found necessary to pack our supplies and outfit inland to the coal locations, and for this purpose a number of Indian packers were secured for several days.

The first three weeks were spent in examining the coal outcrops at Camps Robertson and Wilson. The former of these is situated about eight miles northwest of Skidegate Harbour, the trail taking off inland at the mouth of the Honna River, which is about four miles west of Skidegate post office (oil works), the Indian village being rather more than two miles farther east. Camp Wilson is situated about eight miles north of Camp Robertson. The trails were bad in

Skidegate Channel westward. This channel affords a passage for boats at high water only, and after reaching the western entrance we examined the west and north coasts as far as Masset on the north end of the island, studying on the way the so-called oil-bearing rocks south of Frederick Island, and the lignite deposits of Virago Sound and Masset Inlet, and the coast about five miles east of the entrance.

The shores of the large lake-like expansions near the centre of the island were examined, and here our party divided, my assistant and one man with a light canoe ascending the Yakoun River to the lake at the head (Yakoun Lake), a very difficult trip owing to the low condition of the water and also to the fact that, for much of the distance, the river was obstructed by heavy log-jams. It was found impracticable to take

*In "Summary Report of the Geological Survey of Canada for 1905."

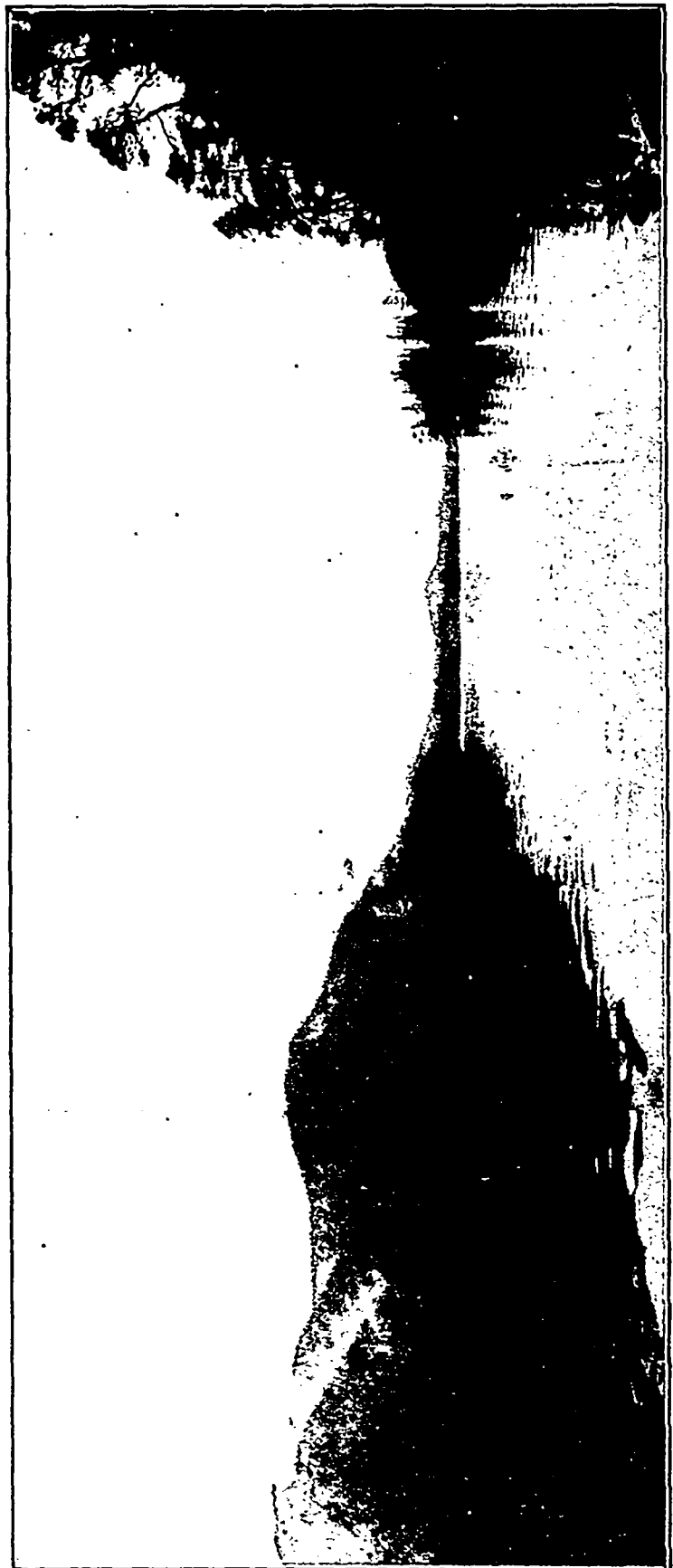
the canoe all the way to the lake, and the party, therefore, forced their way through the jungle along the stream until they struck a trail leading across to Camp Robertson, whence they made their way out to Skidegate.

After coming back with the boat to Masset village the examination of the north and east coasts was continued, but owing to a very heavy and prolonged gale we were detained for ten days at Tow Hill, through the impossibility of rounding the dangerous northeast corner of the island known as Rose Point. The black gold-bearing sands of the east coast were examined, and they were found to extend south from Cape Fife nearly to Lawn Hill, or to within about 14 miles of Skidegate. This place was reached on August 2 and the boat for Vancouver was taken on the 8th, that city being reached on the 13th. As there is only one boat a month to the island this was the only possible course to pursue, the stormy season setting in before we left the island.

KETCHIKAN, SOUTH-EAST ALASKA.

THE Alaska Copper Co. owning a group of copper properties situated on a high mountain at Hetta Inlet, Prince of Wales Island, and a smelting plant at Coppermount, on the inlet, is employing about 140 men at its mines and smelter, and is steadily increasing its working force, as more men become obtainable. The smelter is reducing about 200 tons of copper ore per diem. The returns from the last lot of matte shipped to Tacoma, Puget Sound, Wash., for converting into blister copper, says the *Ketchikan Mining Journal*, showed an average for the 112½ tons shipped of .402 per cent copper, 1.13 oz. gold, and 6.04 oz. silver per ton. The company recently purchased at San Francisco, Cal., the bark "Hayden Brown," gross tonnage 864 tons and net 769; this vessel is being dismantled and converted into a barge which will be used for carrying ore to the smelter, copper matte to Tacoma, and coke and other supplies for smelter and mines up to Prince of Wales Island. It is stated that the company has also purchased a coal mine and coke ovens in the State of Washington, whence fuel supplies will henceforth be shipped to Coppermount.

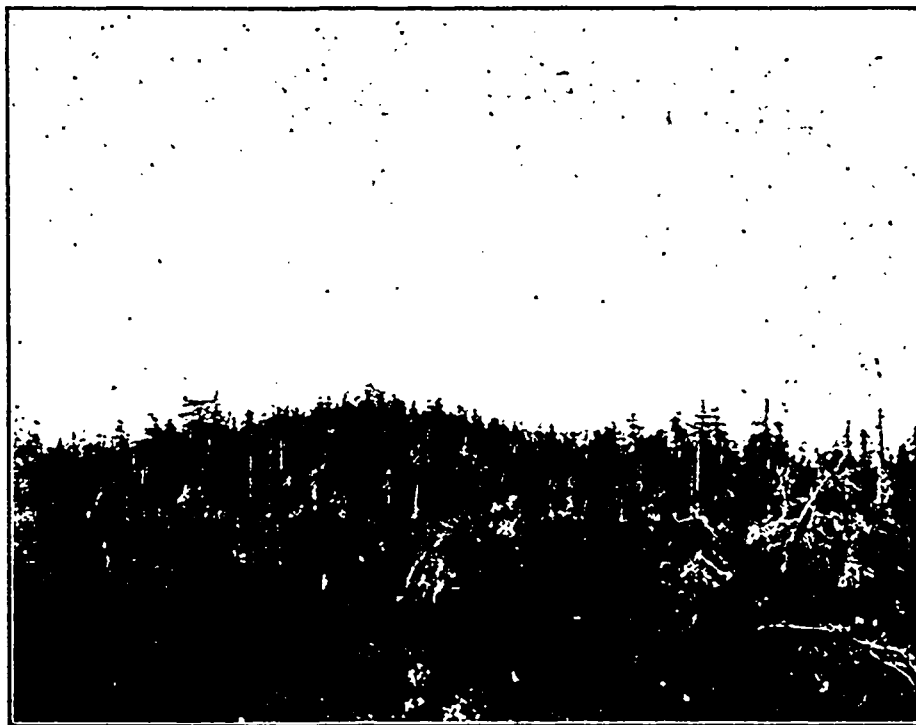
At the Cymru mine, on Moira Sound, Prince of Wales Island, the Cymru Copper Co. has 1,000 tons of ore awaiting the completion of the tramway from the mine to the dock, after which shipment to the smelter will be commenced. The ore bunkers on the dock have been finished; their holding capacity is now stated to be 1,600 tons, which is larger than intended when construction was commenced. A locomotive, to be operated by gasoline, for hauling ore cars, has been taken from Ketchikan to Baldwin. It is planned to commence shipping ore early in September. Provision has been made to work the mine without interruption at all seasons of the year.



Yakoun Lake, Graham Island, Queen Charlotte Group.

The Alaska Metals Co. has erected a compressor house at Bruce, on the west coast of Prince of Wales Island, where is situated the claim formerly known as the Corbin property, located along the coast line between Coppermount and the landing for Jumbo Basin. The compressor and hoist are in position, and it is expected they will be ready for operation by September 1. Several buildings for accommodation of miners have been erected. Shipments of ore taken out in the course of development are made at intervals to the smelter at Coppermount. The *Mining Journal* states that the ore improves in quality as depth is gained, and the outlook for the mine is considered promising.

permount on Hetta Inlet, and the Jumbo near Sulzer on the same inlet; and two west coast properties—Alaska Metal Co.'s claim (formerly known as Corbin's) at Bruce, and the Tymans' Red Wing. Some gold properties have been worked on Gravina Island and others on Revillagigedo Island, and quartz from these milled. The entire group of islands of the Ketchikan district has been described by Mr. H. W. Turner, of Portland, Oregon, formerly manager of the Omar Mining Co.'s mines, as being fairly seamed with mineralised lodes, the ores being rich in sulphides and adapted to smelting operations. At present there are two smelters treating copper ores—one at Hadley on Kasaan Bay, on the eastern side of Prince of Wales Island, and the other at Coppermount on Hetta Inlet in the southern part of the island.



Moss Swamp overlying Coal Measures, Queen Charlotte Islands.

The list of producing mines in the Ketchikan district is gradually becoming larger, although some of the properties mentioned below have not yet shipped any considerable quantity of ore. Nearly all the shippers are copper mines situated on Prince of Wales Island. Included in the shippers are: The Cracker Jack (gold), Mt. Andrew, Uncle Sam, Brown-Alaska Co.'s Mamie and Hadley Consolidated Copper Co.'s Stevenstown, all on Kasaan Bay; Alaska Copper Co.'s Rush-Brown property on Karta Bay, an inlet from Kasaan Bay; Omar Mining Co.'s Khayyan on McKenzie Inlet, a south branch of Skowl Arm; some gold-quartz claims at Dolomi camp; Niblack Copper Co.'s mine at Niblack Anchorage; Cymru Copper Co.'s Cymru on Moira Sound; Alaska Copper Co.'s Cop-

The tram leading to the Valparaiso gold-quartz mine at Dolomi has been finished, a distance of three-quarters of a mile from the landing. A 6-ft. vein of good ore has been struck in the mine.

The s.s. "Humboldt" took down on her last trip five tons of ore for the Unuk River Mining and Smelting Co. The ore was brought to Ketchikan by the s.s. "Walrus" and goes to Tacoma for a smelter test.

The Shakan marble quarry in the northern part of Prince of Wales Island, has 1,600 tons of marble ready for shipment. The marble will go to Tacoma and from there east. Col. C. E. Nason, the manager of the company, has been successful this season in his work of opening the quarry and getting out a large quantity of merchantable marble.

MINING IN AINSWORTH CAMP, WEST KOOTENAY.

AINSWORTH MINES are again attracting favourable notice, and the prospects of the camp for the continued operation of a number of the properties are better now than for years past. Ainsworth was the pioneer lode mining district of West Kootenay, and when the late Dr. Geo. M. Dawson, of the Geological Survey Department of Canada, visited the camp in 1889 he found mining in active progress. Ten years ago the then provincial mineralogist, Mr. Wm. A. Carlyle, visited Ainsworth, and examined some of its mines. In the introduction to his report, which was published as "Bulletin No. 3," under date January 15, 1897, he observed: "The mining industry of British Columbia, it must be remembered, apart from the placer gold and coal mining, is of very recent inception. Until eight or nine years ago the great extent of the mountainous country lying between the Canadian Pacific railway and the Boundary line was a wilderness known to few save Indians and hunters, or prospectors for gold diggings, but the finding of silver-copper ore on Toad Mountain, and the beginning of work on the silver-lead ore deposits on the east side of Kootenay Lake, discovered many years ago by men in the Hudson's Bay Co.'s employ, with the subsequent discovery among the mountains near by of other silver ledges, signalled the commencement of lode mining in the Kootenay. But it was not until 1890-91 that these silver mines were beginning to attract mining men to this Province from abroad, and active operations were getting well under way despite the difficulties and great cost of bringing in supplies and transporting ore to the smelters, when all progress was for a time stopped and hope crushed by the sudden collapse in silver values, occasioned by the closing of the Indian mints to the free coinage of this metal." Later in his report he remarked: "In Ainsworth district the mining industry for some time back has been quietly progressing, but not with that advance the success of the present mines and the mineral indications would seem to warrant. This is due to several facts, one of which is that many were attracted to the high-grade silver-lead veins of the Slocan, whose early prospectors of 1891-2 flocked in from the town of Ainsworth after Eli Carpenter and John Seaton, making their difficult way up Kasle Creek, located the Payne claim in September, 1891. Again, many good properties, Crown-granted, owned by men who can afford to wait, now lie dormant, like others that carried ore of such a grade that was in earlier days hardly profitable, but now, with cheaper rates and easier means of shipment, should pay well if developed. Disastrous forest fires destroyed several good mining plants on claims on which work had been fairly started, but has not since been resumed; and again, many have had an unwarranted lack of faith in the probable permanence of these veins and ore bodies, especially of those in the limestones, which have been considered as merely 'pockets' and local, but to one who has worked in silver ore bodies in limestone, as in Colorado, this pocket

theory is not so alarming a bug-bear, as the general experience is that when one ore shoot is found others are almost invariably discovered on prospecting further along the line of break, up and along which have come from greater depths the ore-bearing solutions that have impregnated the country rock in favourable places and formed ore shoots. The fact that at Ainsworth (or Hot Springs), where most work has been done, good veins of very profitable ore are found in all the different geological horizons, and also that while many seem to be conformable to some extent to the stratification of these rocks, many cut through these formations, should strengthen one's belief in the probable persistence of these veins, and give greater confidence in beginning work on a good and liberal scale."

During a recent brief visit to Ainsworth the editor of the B. C. MINING RECORD was informed by Mr. A. D. Wheeler, owner of the Krao mine, that the prominent feature of the camp is a series of six or more parallel veins, the four lower ones being bedded veins in schist and the upper ones contact veins between schist and lime. The vein on which the Krao was located in 1884 seems to be the "backbone" of the camp. It is a contact vein running north and south and appears to extend a distance of approximately four miles, from the vicinity of Coffee Creek northwards to the Woodbury Creek section of the district. Along this vein are the following mineral claims, commencing from Coffee Creek and going north: Crescent, Eden, Last Chance, Crow Fledgling, Krao, Black Prince, Star, Sweden, Ayesha, Buckeye, Cataha, Attended, Bugaboo, Neglected, and several others the names of which are not remembered. Nearly all of these are stated to show good prospects of becoming mines if sufficiently developed to thoroughly prove them, and several of them have showings of mineral considered very good.

The next vein to the eastward, or towards Kootenay Lake, described as a bedded vein, is smaller in size than that just mentioned. On it have been located about the same number of claims and there is a similar proportion of good showings of ore. The more prominent claims, beginning at the southern end, are: King Solomon, Mamie, Charleston, Little Donald, Black Diamond, Little Phil, Maestro, Spokane, Trinket, Danira, Jerusalem, Libby, Highland, Josephine, Rand, and Surprise. This vein is also traceable practically from Coffee Creek to Woodbury Creek.

East of this again is another bedded vein, not readily traceable for so great a length, but for a reasonable distance about as well defined. The claims located along this vein include the Highlander, Banker, Old Jeff, and others. Still farther east is another vein on which are the Mile Point and several undeveloped prospects.

West of the first above-mentioned vein—the Krao vein, are several parallel veins not traceable for any considerable distance, but having on them claims which at one time or another have been considered exceptionally good. These include the United, Neosha, No. 1, Delle, Let-er-go-Galligher, Silver Glance, and Skyline,

all of which have been actual shippers of ore of high grade, generally speaking the highest grade ore shipped from the camp. Of these the United, Gallagher, No. 1, and Skyline were in earlier years the heaviest shippers among the Ainsworth mines, but the depressing conditions that unfavourably affected the camp in the early nineties caused a cessation of work on these properties, and they have not since been producers except in a small way when worked under lease. Present indications, however, point to an early renewal of activity, and it seems probable that next season all will be at work again. The concentrator at No. 1 is stated to have done, next to the Highland plant, the most extensive work in the camp. The Skyline has a steam hoist, as also has the Neosha.

Owing to the absence from the camp, at the time it was visited, of those in charge of several of the more important mines, it was not practicable to then obtain particulars concerning those properties, so they must have attention later. The following particulars of the several mines to which they relate may prove of interest:

Krao Mine.—The Krao was one of the early locations in Ainsworth camp, dating back, as already stated, to 1884. It was the first property in West Kootenay to ship silver-lead ore to the United States, its initial shipment having been made in 1885. The ore was shipped by the small steamer "Galena," the first steamer to ply on Kootenay Lake. From the landing on Kootenay River, across the Boundary line, to Kootenai station on a railway in Idaho there was a difficult haul. The ore averaged 149 oz. silver and 42 per cent lead, but there was little profit to the shipper in it for the expense of getting it to the railway was \$68 per ton. In 1886 the Krao shaft was sunk to a depth of 70 ft., and then the property was bonded to Butte men, who developed it for a year, deepening the shaft to 130 ft. and drifting about 250 ft. at the 100 ft. level. The drift was in ore, but none was shipped. The falling price of silver and the imposition by the United States of a duty on lead occasioned the relinquishment of the bond. In 1894 the hoisting plant and mine buildings were destroyed by fire, and the mine thereafter remained idle until last year.

In June of 1905, Mr. Wheeler, who was one of a partnership owning several mines in this camp, and to whom the Krao passed when a division of the partnership property was mutually agreed upon, decided to again work it. He opened a surface quarry or "glory hole," and from this shipped about 1,000 tons of ore, practically as mined, little sorting having been done. As the ore was of a character desirable for smelting purposes a low treatment rate was obtained and shipments were made chiefly to the Hall Mining and Smelting Co.'s smelter at Nelson, a smaller quantity going to the Canadian Metal Co.'s works at Pilot Bay. After taking out all the ore easily accessible by means of open working, it was decided to work underground. A steam boiler and pump were obtained and installed, and the mine was unwatered early this year. Since then work has been confined almost altogether to underground development. The occurrence near the surface of a better grade of ore on the footwall side of

the vein suggested the desirability of determining whether a similar condition obtained below, which resulted in ore of very high grade being found paralleling the drift previously run at the 100-ft. level. The lateral drift thus opened has been run about 35 ft. and from it 122 tons of ore mined. The returns from 62 tons of this ore, after deduction of freight charges from Ainsworth and smelter treatment costs, were about \$3,000. The returns from the remaining 60 tons had not been advised at the time the mine was visited by the writer.

The vein as opened in these parallel drifts shows a width of 15 to 18 ft. of ore and no footwall in sight, so the actual width of the vein is still an open question, particularly as there is a parallel shoot of ore which, in the opinion of some, is a separate vein, while others regard it as a portion of an extremely large vein covering the entire width of the lime dyke in which the ore occurs.

The discovery of the shoot of rich ore on the footwall side of the vein will necessitate either the paralleling of the old drift by a new one, or frequent cross-cutting to open up this supposedly more valuable portion of the mine. The general character of the ore is an iron gangue carrying galena and silver sulphides, some extraordinarily rich native and ruby silver occurring as the new drift is extended. In vugs or cavities in the ore have been found masses of wire silver and some metallic silver encased in sulphides. One large specimen of the latter weighs 34 oz. and is, so far as known, the largest piece of native silver yet found in British Columbia.

Some 600 ft. south a vein has been uncovered and 200 tons of ore shipped. This ore shows the same general characteristics as that at the shaft, and there is fully as great a width of vein in evidence. As the prevailing dip of ore shoots in the camp is to the north, it is thought this shoot, dipping towards the shaft, should be entered by it at a reasonable depth.

The water in the shaft is not heavy, but is easily disposed of by the small steam plant installed. It is intended to put in a double cylinder hoist of sufficient capacity to admit of sinking to the 400-ft. level being carried out. It is also proposed to make connection with the Kootenay Air Supply Co.'s hydraulic compressed air system, and the construction of an aerial tramway, to convey the ore down to the shore of Kootenay Lake, is also projected. These improvements will, however, not be undertaken by Mr. Wheeler should the mine be sold shortly, as it may be.

The Krao is one of a number of claims located along the longest demonstrated mineral vein in the camp, extending, as already stated, from Coffee Creek to Woodbury Creek, a distance of about four miles, and being the first of a series of parallel veins situated along the contact of the lime with the slate. This vein stands nearly vertical, while the parallel veins to the eastward dip at a gradually increasing angle as they near the lake, making very interesting results probable as they come together at depth, say at about 2,000 ft. down. The claims both north and south of the Krao show a similar general appearance, with every indication of becoming productive mines with development. Not one of those claims located either before the Krao

or about the same time had done much shipping or been developed to any appreciable extent, but the results reached here led to the subsequent excitement and development of other claims in the vicinity.

It is interesting to note that the Highlander tunnel, to which further reference will be made, has been driven to within about 600 ft. of the Krao vein which, if continued, it would encounter at a depth of about 1,400 ft., so that its eventual extension may be regarded as an important factor in connection with the future working of the mine.

United Mine.—This claim is stated to have been formerly held by the Kootenay Smelting and Trading Co., which about 1889 built a lead smelter at Revelstoke. At the present time it is held by Mr. T. G. Procter, of Nelson. It is described as being on a quartz fissure vein in lime and schist, cutting the formation and running east and west, with a dip to the south. This vein has been traced on the surface for some 900 ft.

The mine has been developed by an incline shaft sunk 175 ft. in ore. Levels have been opened at 50, 100, and 150 ft. respectively. At the 50-ft. level a drift has been run east 80 ft. and west 160 ft. From the latter drift at about 90 ft. from the shaft, a raise has been put through to the surface. At the 100-ft. level a drift has been run 55 ft., with a raise, starting at 36 ft. from the shaft, in solid ore up to the 50-ft. level. At the 150-ft. level the east drift is in 75 ft. and the west 115 ft. At 39 ft. east of the shaft a raise starts for the 100-ft. level, and 10 ft. farther on a cross-cut towards the footwall has been driven 24 ft. without meeting the wall. In this cross-cut 6 ft. of zinc and lead ore has been exposed. At 20 ft. from the shaft a cross-cut towards the hanging wall is in 26 ft. and this shows a 12-in. lead of ore running almost north and south. In the west drift a cross-cut in an 18 to 20-ft. dyke of trap rock shows 1 ft. of solid zinc ore. In a 6-ft. raise at the face of the west drift 4 ft. of concentrating ore occurs.

When the mine was last in operation about 1,200 tons of ore were shipped; about 400 tons remain on the dump. Zinc and lead ore from the 150-ft. level averages about 17 per cent lead, 23 per cent zinc, and 10 oz. silver. The raise from the 100 to the 50-ft. level is in an ore body 6 ft. in width and averaging 30 per cent lead, 15 per cent zinc, and 48 oz. of silver to the ton. The principal part of the stoping done in the mine has been between the 50-ft. level and the surface.

Work here was stopped on September 15. While in operation air for various purposes was obtained from the Kootenay Air Supply Co.'s system. A hoist and a 25-h.p. boiler have been installed. The shaft house is 60 by 60 ft. and 40 ft. high to head of gallows frame. Bunk and boarding houses afford accommodation for about 60 men.

Tariff Mine.—The Tariff group, owned by Walla Walla (Washington, U.S.A.) men, consists of the Tariff, Side Line, Shafer and Bobtail claims. The mine is located about a mile south of Ainsworth and 550 ft. above Kootenay Lake. It is one of the lowest

on the lake front, the Mile Point being the only one with workings nearer the water. In earlier years it was one of the larger shippers of the camp, and at that time was owned by Braden Bros., who for a time leased and operated the concentrator at the Pilot Bay smelter, on the opposite side of Kootenay Lake. The ore is a very solid galena, in fine and coarse crystals, up to 3 ft. in width, and a little zinc blende. There is also a considerable proportion of concentrating ore in a quartzose gangue.

A shaft has been sunk 300 ft. To come under this at about 100 ft. greater depth an adit is being driven from a point in the bluff below. This is in 225 ft., but it will have to be driven some 255 ft. further before it will be under the shaft. When the necessary connection with the present workings shall have been made the mine will be easily drained and the ore more cheaply taken out. Six men are working on the adit—driving contract. The mine is equipped with shaft house, engine, boiler, pump, etc. Compressed air is obtained from the Taylor hydraulic air plant.

(To be Continued.)

THE NORTHERN EXTENSION OF THE ELK RIVER COAL BASIN.

By D. B. Dowling.*

THE season's work was mostly of a preliminary character and much of the time was employed in topographic work.

The Elk River coal basin extends north and enters the valley occupied by the waters of the Kananaskis River. The area was entered from the north by the trail up the Kananaskis River. As the outfit had been left at Morley for the winter, supplies were obtained and the party were in the field in June, but as the mountains were then fairly well covered by snow, few ascents were made until the beginning of July.

A short base of 5,685.68 ft. was measured on the shore of Kananaskis Lake and a series of triangles measured extending southwest down the valley of the Elk River to a point 28 miles distant from the station at the north end of Kananaskis Lake. A check was then made on another base of two miles in length along a surveyed line forming part of a series of lines limiting the coal properties of the Elk River Coal and Oil Co. Four monuments or signals were built on the summit of Elk Range, which here forms the watershed, so that the triangulation might be carried eastward to embrace the coal basin within the mountains on the headwaters of Sheep Creek and Highwood River. Photographs from which to plot the topography were taken at each station and several at other points which seemed desirable. As the transit used could only be read to single minutes it is very desirable that a primary triangulation of this area be undertaken by the government in order to better fix the positions of our stations. Our triangles, it is

*In "Summary Report of the Geological Survey of Canada for 1905."

expected, will be extended east to meet the surveyed lines of the plains, but this entails the use of time which we can better devote to the geological problems before us. At the close of the season's work a few photographs were taken in the lower part of Kananaskis Valley to supplement the work of the previous season on the southern extension of the Cascade coal basin which was interrupted in September, 1904, by a period of smoky weather.

A general sketch of the structure of the region was obtained and may briefly be given. The southern extension of the Cascade coal basin does not reach very far south of the crossing of the Kananaskis Valley. The impression which was formed from seeing the section on the stream the previous year was that the Cretaceous rocks formed a monoclinical block which gradually ran out to the south, but further evidence shows that this block was deformed by the west to east pressure, and, instead of having the western edge of the beds drawn up by the faulting, an anticline which broadens out to the south is found in the centre, so that the section on a small stream a few miles further south reveals a double syncline and the beds become very much shattered. The base of the formation rises to the south and in a short time disappears, continuing possibly in two narrow folds the continuation of the synclines.

As the intervening mountains are not thoroughly explored it is not sure whether these folds can be traced as continuations of the beds crossing Elbow River and the northern end of the Sheep Creek coal area.

The Kananaskis Valley in the upper part is a continuation of the same structural valley as that in which the Elk runs. To gain the eastern edge of the mountains, however, the valley is eroded through several limestone ranges crossing the first obliquely, but in the lower part more nearly at right angles. The southern end of the Cascade basin is thus cut by the river at about 45°.

The upper valley is eroded along the edges of Cretaceous rocks, but very few exposures occur until the height of land is reached, and more are found in the valley of the Elk showing coal seams at several places. The mountains forming the eastern wall of this valley are practically continuous exposures of the same series of beds—the upper part of the Carboniferous limestones which dip west toward the valley. They form an unbroken wall from opposite the Kananaskis Lakes southward for about 14 miles where they become broken up into isolated peaks. Side valleys run into the range from the west, but not far enough to form passes through to the waters of the Highwood. On the west side of the Elk and Kananaskis Valleys there is a decided fault by which the limestones below are again brought up, but instead of forming a continuous wall as is on the east side considerable lateral movement has taken place since the break occurred. These beds have several strong folds which run oblique to the line of fault, and one of them running northwest towards the Spray River with apparently a fault along the eastern edge forms

a strong valley. In this there seems a possibility of a narrow Cretaceous trough extending in that direction.

In the vicinity of the Kananaskis Lakes the mountains west of this fault have been eroded back from the fault lines and both lakes lie to the west of it. The stream leaving the lower lake runs north along the strike of the rocks and then turns east. Where it joins the valley common to this stream and the Elk, it falls about 30 ft. in a cascade over the quartzites, which appear again on the flank of the mountains on the east side of the valley. Sandstones of the coal measures are exposed a few miles below the falls but not along the stream. It is not expected, however, that coal in any amount will be found on the Kananaskis below the falls, and but few seams in the valley until near the height of land.

On the Elk, however, there is a wider portion in which the coal bearing beds are exposed and many seams have been opened up by prospectors for the Elk River Coal and Oil Co. The only seam that we found on the Alberta slope is in the middle of the valley just north of the height of land. There seemed to be about 11 feet of coal very much broken up on the outcrop exposure, but possibly of fair quality beneath. The Elk rises in two lakes in the mountains on the western side of the valley, similar in origin to those at the head of the Kananaskis River. These are fed from a number of glaciers on the slopes of the higher range behind and the stream which leaves the lake is often very milky during the warmer months. The valley has been well forested but large areas have been burnt over and the trails badly blocked by fallen trees. It seems to be in precisely the same condition as described by Dr. Dawson in 1884, the dead trees apparently standing for a long time before the roots rot sufficiently to cause them to fall. In the unburnt portions the forest is vigorous and there is a large quantity of splendid fir.

PROGRESS IN DEVELOPMENT WORK AT MINES.

At Canmore new workings are commenced in the Sedlock seam. As the outcrop is near the river and about a mile below the mines, this means the opening of a new mine and a spur of railway is built to it. The output will be thus increased, as the facilities for handling coal at the present slope do not admit of much increase there. As some of the seams which produce a large percentage of fine coal have also sandy streaks in the softer parts, experiments in the cleaning of this fine coal has led to the installation of a washing plant which will be in operation this season, and the output in consequence will be of an excellent grade. Another seam above those now worked, called No. 6, is being tested, and, if of good quality, will add materially to the resources of the property.

Bankhead Mine.—During the year most of the permanent working plant has been installed. A battery of boilers with wide grate surface, to burn small coal, supplies steam for air compressors, dynamos, steam engines, etc. A large coal breaker and screening house has been erected and the temporary screens at the entry on B. level are probably removed.

In the mine the work so far has been mostly in

excavating gangways on three levels and a cross entry on the lower or A. level. A rough approximation of the amount of preliminary work is given below. On A. level the entry along seam No. 2 reaches to 1,150 ft. from a point below the temporary entry. A tunnel through gravel on this level in the opposite direction reaches the river bank at the head of the spur from the railway where the shops, coal breakers, etc., are located. The cross entry at 45° to the strike of the measures is over 900 ft. long and cuts 640 ft. of the measures which are above seam No. 2. In this distance three strong coal seams are cut. Workings on a crushed seam spoken of last year as No. 3, are abandoned and it is now called No. 2½. Nos. 3, 4 and 5 appear to be valuable seams. The workings on No. 3 extend about 500 ft. and on No. 4 an equal amount. On No. 5 preliminary work only has been started. From No. 4 a manway up the slope 500 ft. to the surface is used for ventilation. B. level, 186 ft. vertically above A. level, was opened from the slope of the hill as the original entry. On this the workings extend to a greater distance than on the others. On No. 1 seam the gangway is 1,900 ft., on No. 2 seam the gangway is 2,760 ft., on C. level, which is 192 ft. above B. level; No. 2 seam is opened by a gangway 800 feet in length.

As the coal in seam No. 1 is split up by a great number of slaty partings, the mining of clean coal is difficult and is discontinued, but a long slope is being constructed along it to connect the different levels. The mining on each slope will be independent of the others and the loaded cars will be lowered down the slope to the first level.

As the coal is very tender much small coal is produced. Some of it can be used under stationary boilers, but as there will be a large percentage of dust briquetting will probably be resorted to. In this connection it seems that a market for the small coal should be looked for in the production of power by the gas producer. In plants using lignite the efficiency can be increased by the addition of anthracite, and even the small anthracite, where it can be got cheaply, produces a good water gas that gives a high power result.

The coal lands in Alberta and the railway charter for some time held by the North West Coal and Coke Co., have been sold to a company formed by Mr. F. Clergue, well known in connection with the important mining and manufacturing industries of Sault St. Marie, Ontario. The coal holdings comprise about 50 square miles on the north folk of Old Man River about 34 miles west of McLeod and 16 miles north of Cowley. The purchasers have a large force of men employed in actively developing the coal measures. The property was thoroughly examined by engineers of the Clergue syndicate before being taken over. The North West Coal and Coke Co. was organized some time since by Nelson, B.C., men, who spent a deal of money in prospecting the coal measures on the lands secured.

KOOTENAY ORE CO.'S ORE SAMPLING AND ZINC SEPARATING WORKS AT KASLO.

KASLO was selected by the Kootenay Ore Co., Ltd., as offering particular advantages as a location for ore sampling works, and here a sampling plant was installed in the winter of 1896. The Kootenay Ore Co. was registered in England July 29, 1896, with an authorized capital of £25,000. A site for its works was selected on the north bank of Kaslo Bay, and a sampler building 80 by 60 ft. so erected as to allow of ore received at the works for sampling passing through the various processes of gravity. A railway track gives connection with the Kaslo & Slocan railway from Kaslo through the chief mining section of the Slocan to Sandon and Cody, and convenient wharfage and loading facilities have been provided for ore which has passed through the mill and has to be shipped by Kootenay Lake steamers.

The sampling plant installed comprises the following: A 9 by 15 Blake crusher; two sets of steel Cornish rolls, 24 by 14 and 12 by 12, respectively; two Bridgman automatic sampling machines, one of the largest size and the other smaller; Challenge ore feeder; sample grinders; Fairbanks track and other scales; 150-h.p. boiler and steam engine; steam appliances for heating and drying purposes; electric light plant, etc. Recently electric power for operating the sampling works and the zinc separating plant became available, the Kootenay Electric Co. having installed a 125-kw. Westinghouse generator and erected a transmission line to the works.

Although the sampling plant was installed nearly ten years ago it had only been working intermittently prior to the addition of the magnetic separating machinery. During the period mentioned practically all the ore shipped by the Ruth, Jackson, Whitewater, Last Chance, American Boy, Reco and other Slocan mines has been passed through it.

The zinc plant built during the fall and winter of 1904-5 has been in operation for several months. The building, the dimensions of which are 80 by 75 ft., adjoins the same company's sampling plant, and is so situated on the steep banks of Kaslo Bay that the ore is received from the railroad cars at the top and is delivered to the steamers beneath, with the assistance of gravity to reduce the handling required during the process of treatment.

The ore is received in large bins below the level of the track, from which it is fed by an automatic feeder to the White-Howell roasting furnace, having a capacity of 60 tons and upwards per 24 hours, according to the amount of roasting required. An advantage possessed by this make of furnace is that the degree of roast found to give the best results with the different classes of ore can be adjusted with ease and accuracy.

After being roasted the ore is cooled by passing through an iron revolving chamber, where it is rotated through currents of cooled air, and thence, after a preliminary sizing and re-crushing of the oversize, it is elevated to the top of the building, where it is sub-

jected to a very close and accurate classification, eight bins being provided (with ample accommodation for more if necessary) to contain the various degree of fineness, each accurately sized.

The ore is now ready to be delivered by an automatic feeder to the process of magnetic separation, which is effected by a number of Dings machines, whence the finished product is conveyed to the shipping bins, passing through a Bridgman automatic sampling machine on the way. The four separating machines are those of the Dings Electro Magnetic Separator Co. of Milwaukee, Wisconsin, U.S.A.—type M., speed 400, volts 110. The recovery they effect is about 90 per cent of the feed. The iron separated from the zinc is dumped and saved, there being no market for it at the present time. The plant is working with perfect smoothness, and the results so far obtained have been very satisfactory, the product being a 51 and 52 per cent zinc, with a minimum of iron.

The plant has been designed throughout on liberal lines as to capacity and space: there is room for any further bin accommodation and for as many more magnetic machines as shall be found necessary with the increase of business that may be looked for. As the process of development in the mines of the district may reveal the presence of zinc ores of a more complex and difficult character than has yet occurred, requiring a special type of machine for dealing with each variety, ample space has been allowed for any such additions without the delays usually involved by alterations of the building or foundations.

Some 1,100 tons of zinc have been shipped from the works. Of this 500 tons were sent to the Canadian Metal Co.'s smelter at Frank, a similar quantity to Antwerp, Belgium, and 100 tons to the Lanyon Zinc Co., Iola, Kansas. All this zinc was sold on the Kootenay Ore Co.'s weights and samples, the company's reputation for straight dealing facilitating settlement with mine owners.

The results of the practical experience had lately is that the plant and machinery are eminently suited to the purpose for which they were installed, having proved commercially successful after having treated a considerable quantity of ore and concentrate.

The broad effect of a custom plant of this character being in operation at a point accessible to the zinc-producing mines of the Slocan district will be that the vast bulk of ores containing zinc hitherto occurring in the mining of silver-lead can be saved and shipped as an important addition to the profits of the mine, instead of being sorted out at considerable expense and thrown away, as has hitherto been the case. The importance of this factor in the mining, as well as in the transportation, business of the district is very great. In many mines the occurrence of a body of zincy material has put a stop to further development. The actual work of development can be made profitable when a market shall be secured for the zinc material, in addition to which the opening up of new bodies of lead ore must inevitably follow the working of the intervening zinc belts. In mines which have concentrating mills it has been found impos-

sible by wet concentration to make a zinc product which much exceeds 37 per cent zinc, a point at which it does not pay to ship: this further magnetic process, by raising the grade of zinc concentrate above 50 per cent, at once makes the product saleable at a good profit. Many mines which have no mill contain bodies of zinc ore worthless as they stand, but which, by magnetic separation, can equally be made saleable.

MINING IN LA TOUCHE DISTRICT, PRINCE WILLIAM SOUND, ALASKA.

MINING operations in the La Touche district, Prince William Sound, Alaska, states a correspondent of the Los Angeles, Cal., *Mining Review*, writing from La Touche under date September 12, are progressing favourably, and while there is only one shipping company in the field at present, several others are planning to begin regular shipments of ore to the Tacoma smelter. The Beatson Company is shipping a high grade copper ore of which, apparently there are great quantities.

Just south of and adjoining the Beatson property is the Barrett mine. Here a 600-ft. tunnel has been driven along the ledge. The ore is high in copper and carries some gold. Mr. Axel Lynn is manager of the property.

The Reynolds Alaska Development Co. is engaged in extensive development work on its properties at Horseshoe Bay, three miles north of the town of La Touche, where the company has laid out a town site. An electric power plant is being installed to run the hoist, for lighting purposes, and to run the compressors. The company is also building an aerial tram to convey ore from the mine to the wharf and, when this shall be completed, will join the ranks of the shippers. The wharf now being built will be large enough to accommodate the largest ocean-going vessels. This company also operates at Boulder Bay and at Landlocked Harbour. It is a Boston corporation, the general offices being in that city. Mr. Blainey Stevens is general manager.

Four miles north of Horse-shoe Bay the Anderson Company is opening up some good ore, and plans also to build a wharf. Just now the work is preliminary to commercial activity that will follow. The mine, with development, is showing up finely.

Numerous good prospects have been located on Knight's Island, and the Guggenheims have acquired several properties there. It is said they have machinery on the way from the States to work them.

Montague Island is known to be highly mineralized, but has not received much attention until lately. The present high price of copper and the island's convenience for shipping have combined, however, to arouse the interest of mining men who not only are prospecting on Montague but over nearby islands as well. It is thought that good producing mines will be opened up on some of these within a comparatively short time.

Nothing has been found on Hoodoo Island, so its name still stands good.

COMPANY MEETINGS AND REPORTS.

ARK GROUP MINING AND MILLING CO.

The annual meeting of the Ark Group Mining and Milling Co. was held at Ymir on September 12. Among the matters discussed by those present was a proposal to advance the price of the company's stock from 15 to 17 cents.

EVA GOLD MINES, LTD.

The following is the manager's report and statement of accounts for the company's financial year ended July 31, 1906, prepared for presentation to the annual meeting of shareholders in the Eva Gold Mines, Ltd., convened for Tuesday, October 2, at Nelson:

"Balance Sheet, July 31, 1906.

Assets.

Mine—		
Balance carried forward.....	\$249,820.01	
Development	12,141.00	
New construction	334.03	
		\$262,795.04
Tools and movable plant.....		2,141.22
Stores on hand.....		2,661.60
Boarding house equipment.....		436.43
Insurance unexpired		253.04
Shareholders' liability		3,059.09
Sundry debtors		121.28
Cash on hand.....		7,772.07
		<u>\$279,239.86</u>

Liabilities.

Capital Stock—		
221,000 shares at \$1.00.....	\$221,000.00	
68,517 shares at 0.25.....	17,129.25	
49,433 shares at 0.50.....	24,716.50	
		\$262,845.75
Sundry creditors		2,846.84
Profit and loss (as per acc.).....		13,547.27
		<u>\$279,239.86</u>

Profit and Loss Account.

Debit.

Balance brought forward.....	\$4,024.57
General expense	812.94
Concentrates charges	4,525.61
Bullion charges	439.28
Office expense	1,048.25
Legal expense	86.16
Bank exchange and interest.....	16.34
Management	2,900.00
Insurance	970.00
Mining	17,808.73
Tramming	2,022.45
Milling	7,340.55
Maintenance of plant.....	1,951.56
Two per cent tax.....	616.03
Balance carried forward.....	13,547.27
	<u>\$58,109.74</u>

Credit.

Bullion	\$46,925.29
Concentrates	10,338.81
Sundry receipts	845.64
	<u>\$58,109.74</u>

Manager's Report.

"I beg leave to submit the following report of operations at the Eva mine during the year ended July 31, 1906: Work has been steadily prosecuted at the mine during the whole period, with no unusual interruptions except for

two days in August, 1905, when by an accident one of employes lost his life. The mill has been running continuously except for delays occasioned by washouts referred to later.

"Nothing exceptional has developed since my last report. The following tables will give full information, under their respective heads, of what has been accomplished in the different departments.

"Development.—This has been carried on as vigorously as our circumstances have permitted, and the following summary shows the amount and distribution: Drifts, 430 ft.; raises, 299 ft.; cross-cuts, 158 ft.; total, 887 ft. The total average cost per foot was \$13.51.

"Distribution throughout the mine workings was as follows: 1A drift, 245 ft.; 1A raises, 221 ft.; 1B drift, 97 ft.; 1B raises, 78 ft.; 6A drift, 78 ft.; sundry cross-cuts, 158 ft., and 7A drift, 10 ft.

"Mining.—The total tonnage mined and sent to the mill was 11,181 tons from different portions of the mine, as under, while approximately 200 tons in addition are broken in stopes.

"Glory Holes and Stopes.

	Tons.
1A stopes	5,466
H.M. glory hole	1,801
1B glory hole	311
5A glory hole.....	275
	<u>7,853</u>

"Development.

	Tons.
1A drift	1,088
1A raises	1,172
1B raises	692
Sundry development	376
	<u>3,328</u>
Total tons	11,181

"The total amount of waste handled during the year was 1,469 tons.

"With the exception of 275 tons from No. 5A level all the ore mined as above was transferred over both trams to the mill because it came from the upper sections of the mine. This added to the tramming cost.

"Both trams worked to our satisfaction, except that the traction cable on the main tram has not lasted as long as it should have done, and we are under the necessity of putting on a new cable.

"Milling.—The tonnage milled is estimated by keeping count of the number of buckets of ore lowered on the tram and weighing occasionally average loads. There is a chance in consequence that the tonnage estimate is not accurate, although the discrepancy will not be serious. According to these estimates we have milled during the year 11,130 tons. The net running time was 336 days, making an average of 33.1 tons per day. The total time lost was 29 days.

The values recovered in the mill were as follows:

Bullion by amalgamation.....	\$46,925.29	per ton	\$4.21
Concentrates (280 tons).....	8,792.00	per ton	0.79
	<u>\$55,717.29</u>		<u>\$5.00</u>

"The average assay value of the tailings (samples taken automatically and continuously) was 69 cents per ton. The gross value of the ore was therefore \$5.69 per ton. The average of the daily battery samples by assay was \$5.51 per ton so that the gross recovery plus the tails loss was greater by 18 cents than the average assays showed.

"The following table gives the detailed costs in total and per ton. The per ton costs are figured on the tonnage milled. As there were approximately 11,400 tons mined the mining cost per ton would be a little less than shown in the table.

	Total.	Per Ton.
Mining	\$17,808.73	\$1.600
Tramming (both trams).....	2,022.45	0.181
Milling	7,340.55	0.659
Repairs and maintenance.....	1,951.56	0.175
Marketing product	3,059.28	0.328
Taxes and insurance.....	1,586.03	0.133
Office and general.....	1,861.19	0.167
Management	2,900.00	0.260
	<hr/>	<hr/>
	\$39,129.79	\$3.503
Development	12,141.00	1.090
New construction	\$34.03	0.074
	<hr/>	<hr/>
	\$52,104.82	\$4.667
"Summed up, the results of the year's work are as follows:		
Bullion recovered	\$46,925.29	\$4.210
Concentrates recovered	\$792.00	0.790
Sundry receipts	\$45.64	0.076
	<hr/>	<hr/>
Total receipts	\$56,562.93	\$5.076
Total cost operating.....	39,129.79	3.503
	<hr/>	<hr/>
Profit	\$17,433.14	\$1.573

"Of this profit we have spent on new development, which is still an asset, and on new construction as above \$12,975.03 or \$1.164 per ton, leaving a balance of \$4,458.11 over and above all expenditure.

"Since the mill was installed there have been mined and treated 25,300 tons of ore producing \$116,274.19 in bullion and \$12,064.35 worth of concentrates, a total of \$128,338.54, which makes an average of \$5.08 per ton.

"General.—Preparations are under way to install the first half of a duplex air compressor plant which will have a total capacity sufficient to operate 15 large drills. The concrete foundations are completed and we expect the machinery to arrive by the end of September.

"We have received permission to use a portion of the air pipe line belonging to the Oyster-Criterion mine, adjoining the Eva, and we have completed connections with same from our mill to the mine workings.

"It is a difficult matter to make close estimates of our present ore reserves because several of the large masses are not yet completely blocked out by cross-cuts and raises. However, it is safe to say, after making due allowance for this, there are considerably over 100,000 tons which little more work will make available. A complete system of cross-cuts and raises from our present levels should add to the reserves a very large tonnage and this necessary work should be now under way.

"Were we operating on a scale commensurate with the size and value of our ore bodies, the results would be of a much more satisfactory nature, and I hope this will be a possibility of the near future.

A. H. GRACEY, Manager.

COMPANY CABLES AND NOTES

CABLES.

British Columbia.

Cariboo Consolidated.—Cabled report for August: During the entire month of August washed 501 cu. yd. of gravel, yielding 87 oz. of gold. Have just struck very rich gravel, drive 2 east, 17 cu. yd. of gravel yielding 19 oz. of gold. The width of the pay streak is 50 ft. Exceedingly wet. Must be drained before working on a large scale—prospects are grand. Have sent full particulars by mail. August expenses amount to ——— I have ample funds.

Cariboo Consolidated.—(Published in London on September 15): During the present month washed 104 cu. yd. of gravel, yielding 56 oz. of gold. Drain drive showing very good gravel. Impossible at present to increase the output. Exceedingly wet.

Le Roi.—August: Shipments amount to 11,720 tons, containing 4,662 oz. gold, 5,400 oz. silver, 223,200 lb. copper.

Estimated profit on this ore after deducting cost of mining, smelting, realization, and depreciation, \$40,000. Expenditure on development work during the month, \$17,750.

Le Roi No. 2.—August: Shipped 2,070 tons. The net profits are \$35,435, being payment for 2,038 tons shipped, and \$1,650, being payment for 90 tons concentrates shipped. In all, \$37,093.

Tyce.—August: Smelter ran 14 days, and smelted—Tyce ore, 2,038 tons; custom ore, 516 tons; total, 2,554 tons. Matte produced from same, 278 tons. Gross value of contents (copper, silver and gold), after deducting costs of refining and purchase of custom ore, \$39,203.

Ymir.—July: 25 stamps ran 30 days; crushed 1,900 tons ore; produced 296 oz. bullion; estimated gross value of bullion, \$3,500. Concentrates on hand, 180 tons; estimated value, \$4,500.

Ymir.—August: 20 stamps ran 30 days; crushed 1,600 tons ore; produced 313 oz. bullion; estimated gross value of bullion, \$3,500. Concentrates shipped, 145 tons; estimated gross value, \$3,750.

C. S. A.

Alaska Treadwell.—August: 240-stamp mill ran 30½ days, 300-stamp mill ran 30½ days; crushed 87,283 tons; estimated realizable value of bullion, \$75,793. Saved 1,418 tons sulphurets; estimated realizable value, \$65,289. Working expenses, \$85,459.

NOTES.

The directors of Le Roi No. 2. Ltd. have declared a further interim dividend of two shillings per share.

The Canada Zinc Co. Limited, has had gazetted a notice of its intention to apply for an order in Council changing its name to "Canada Zinc Company, Limited."

Percy McGeorge, mining engineer, of Trout Lake, B. C., has been appointed the new attorney of the Chestnut Hill Mining Co. in the place of Thos. E. Ehrehart.

All claims against the Maud Hydraulic Mining Co., Ltd. (in liquidation) are to be sent to Herbert Lockwood, Molson's Bank Chambers, Vancouver, B.C.

Notices have been gazetted of intention to apply at the next session of the Provincial Legislature for acts to confirm the incorporation and registration of the Bullion Hydraulic Mining Co., and the Cariboo Gold Mining Co., respectively. Both companies are operating in the Cariboo district.

The B. C. Gazette contains a notice of intention to apply to the Provincial Legislature at its next session for an act to incorporate a company with power to carry on the business of millmen, mining, smelting, generation and supply of power, etc. The district named in which it is proposed to carry on operations is the territory lying in the Bella Coola, Cariboo and Quesnel mining divisions.

Mr. Clermont Livingston, local director of the Tyce Copper Co., Ltd., has issued the following returns from the company's smelter at Ladysmith for the month of September: Smelter ran 14 days and treated 1892 tons of Tyce ore, giving a return, after deduction of freight and refining charges, of \$29,082.

The Dominion Copper Co., owning several important mines in Phoenix camp and the smelting works at Boundary Falls, both in the Boundary district of British Columbia, has made a first payment on its bond on the Gloucester group, in Franklin camp, north fork of Kettle River, which it bonded last May for the sum of \$10,000. The next payment will be due on February 23, 1907. The bond extends over a period of 18 months.

The Hesperus Gold and Copper Mines of Chicago, Ill., U. S. A., owning the Betts and Hesperus mine near Grand Forks, in the Boundary district, has let another contract for drilling 1,000 ft. in the mine to the Diamond Drill Contracting Co. of Spokane, Washington, which company does most of the contract diamond drilling undertaken in Boundary and West Kootenay mines.

Mr. A. H. Tuttle, formerly manager of that company's Wilcox mine in the Ymir district, has been appointed official liquidator of the Broken Hill Mining and Development Co.

in place of Samuel Bywater, who was reported to the judge in chambers to have "disappeared."

On Monday, September 10, which was the St. Eugene mine payday for August, a total of about \$33,000 was paid on wages account. The *Moyie Leader* states that this was the largest sum ever disbursed by the company on one payday at the St. Eugene, which mine is owned by the Consolidated Mining and Smelting Co. of Canada.

Le Roi No. 2.—From the mine manager's report for August: Output—A larger tonnage would have been sent to smelter but for an accident to our gravity tramway, which held us back considerably. Development—Development was carried on on the 300 ft., 500 ft. and 900 ft. levels. 300 ft. level—20.7 ft. were driven in the downward continuation of the May Day shoot. Some stoping was also done here, and the ore seems to be improving in grade, though difficult to follow. The average of all samples taken here for the month both in drift and stope was 0.35 oz. in gold and 1.90 per cent in copper. 32 drift west—41 ft. were driven eastward following ore into footwall. Ore here looks promising, and averages 0.45 oz. in gold and 1.60 per cent copper.

Ymir.—The secretary has issued a circular stating: The following returns for the months of July and August have been received from the manager: (See cables, above.) In view of the results being again very disappointing, communications were sent to the manager, who explains that there has been unavoidable delay in the completion of the second means of access to the No. 10 level, which would permit a better selection of ore. This was due, as was explained in the circular of June 6 last, to the large quantity of surface water resulting from the melting of the snow, and the general scarcity of labour, which, we are informed, has affected many of the mining districts in British Columbia. The raise has been resumed and was at August 28 up 128 ft. Good progress is being made, as the mine is well drained now, and, in the opinion of the manager will remain so for several months. With a view to increasing the water power a canal was commenced in July and was completed last month. The manager reported that it would enable him to run 40 stamps instead of 25. The directors greatly regret the disappointing returns, but there is reason to expect a better result for the month of September. The manager cabled on September 8: "September output promises exceedingly well." Both Mr. Gilman Brown and the manager urge the necessity for more rapid development with a view to opening up larger reserves so that greater facilities may exist for selecting a better grade of ore for the mill. The manager states that American capitalists are desirous of becoming interested in the Ymir Gold mine, and that they will agree on equitable terms to take shares to an amount which, he has no doubt, would place the property on a splendid paying basis, with a large amount held over as a reserve fund. The directors have intimated that they are prepared to discuss terms for introducing this capital, and arrangements are being made for a meeting of the interested parties in New York early next month.

CERTIFICATES OF INCORPORATION.

Bonanza Mining and Milling Co., Ltd., with a capital of \$1,000,000, divided into 1,000,000 shares of \$1 each.
Elk Valley Development Co., Ltd., with a capital of \$20,000, divided into 200 shares of \$100 each.

REGISTRATION OF EXTRA-PROVINCIAL COMPANIES.

Smith Creek Mining and Development Co.—Head office at Phoenix, Arizona, U.S.A. Capital \$500,000, divided into 500,000 shares of \$1 each. Head office in British Columbia at Revelstoke. Attorney (not empowered to issue and transfer stock), J. M. Scott, Revelstoke.
American Ray Mining Co.—Head office at Spokane, Wash., U.S.A. Capital, \$150,000, divided into 1,500,000 shares of 10 cents each. Head office in British Columbia at Kaslo. Attorney, W. E. Zwicky, Kaslo.

COAL NOTES.

It is stated that at the Wellington Colliery Co.'s wharves at Ladysmith, Vancouver Island, fully 270,000 sacks of coal have this year been filled and shipped to northern points, chiefly to Alaska. A beginning has been made to ship coal to Nome in bulk, notwithstanding the poor facilities at that place for landing it, but the demand is for bulk coal, so it is being shipped accordingly.

The Diamond Vale Coal and Iron Mines, Ltd., has closed a deal for the purchase from individual holders of 2,500 acres of coal lands situate near the confluence of Coldwater and Nicola Rivers, in the Nicola district. The company had for some time been actively developing its coal lands in the Quilchena basin, but, finding that railway communication with that part of the district will not be obtainable for a while, decided to acquire, in addition to its original holdings, coal areas near the recently completed Spence's Bridge-Nicola railway. The Canadian Pacific Railway Co. will shortly require up to 1,000 tons or more of coal per diem, so the Diamond Vale Co. intends to secure this business as soon as practicable, to which end arrangements for producing coal from the newly acquired property are being pushed forward expeditiously.

The installation of the new coal-handling plant for the Canadian-American Coal and Coke Co. at its colliery at Frank has been completed. The *Frank Paper* describes this plant as one of the most modern and complete coal-handling plants in Alberta. It comprises a tippie with automatic dump, shaking screens, picking belt, box car loader, etc. Its capacity is about 2,000 tons per diem. The cost of the plant and its installation was about \$60,000.

The Kamloops *Standard* says: A local company at Kamloops has taken up a large area of coal lands west of the town and has commenced prospecting its holdings by systematic methods. A calyx core drill has been set up and is now boring its way through the strata that lie above the coal. As the plant installed is an economical one, a better knowledge of the extent of the coal measures can be derived at less expense than is possible by the methods hitherto used.

A Dawson, Yukon, press despatch states that: "Captain Miller, the original discoverer and promoter of the coal deposits at Tantalus on the Upper Yukon, has discovered a mountain of coal which he says exceeds the original in quality and quantity and accessibility. The new deposit is just back of the old and lies across the little neck or isthmus of a half-mile, which projects into the Yukon across the river." The river makes a detour of eight miles there and passengers frequently walk across the land while the boat makes the longer run. Captain Miller says: "Tantalus Butte coal mine comprises 320 acres of land known as the Tantalus Butte, a mountain about 900 ft. high, with the stratification raised 35 or over, so that the coal will slide down the mountain by gravity for 1,200 ft. to the lower level. This mountain is the largest on the Lewes River, and its rocks are in the best condition of any in the coal belt on the river."

"Hosmer is the headquarters of the Canadian Pacific Railway Co.'s colliery operations in East Kootenay," says the *Fernie Free Press*. "There this company has extensive coal measures which are identical with those operated on either side, at Fernie and Michel, by the Crow's Nest Pass Coal Co. An existing agreement with the latter company barred the C. P. R. from shipping coal from its Hosmer property before a certain date. That date is now drawing near and the C. P. R. is preparing to spend millions in rapidly getting its mines on a producing basis. The great trans-continental line is operating the property under a subsidiary company called the Pacific Coal Co., Ltd. Superintendent Brown a few months ago commenced active development work on an extensive scale and excellent progress is being made. About 100 men are employed, which is a big force at the preliminary stage, and the present plans of the company indicate that the mines will be operated on a large scale. The C. P. R. will require thousands of tons daily to coal its own engines, and a large battery of ovens will be built for the manufacture of coke."

MACHINERY AND CONSTRUCTION NOTES.

The Britannia West Copper Co., owning mining property on Howe Sound, is obtaining from the Jenckes Machine Co., Ltd., of Sherbrooke, Quebec, two 50-h.p. locomotive type steam boilers.

The Canadian Rand Drill has received from the management of the Hillcrest mine, near Frank, Alberta, an order for a Canadian Rand four-stage high pressure air compressor haulage plant. It is to be a duplicate of the compressor now being constructed for the Lille colliery (also situated near Frank) of the West Canadian Collieries, Ltd. The plant is to be complete, with storage system, charging station and arc motors and will cost about \$15,000. This will make the sixth plant supplied by the Canadian Rand Drill Co. for use in the coal mines of Eastern British Columbia or Alberta.

The Canadian Westinghouse Co., Ltd., of Hamilton, Ontario, has made a contract with the Yukon Consolidated Goldfields Co. to supply the following electrical machinery and apparatus for use in the latter company's gold dredging operations in Yukon Territory: Three 100- and three 15-h.p. 3-phase, 60-cycle, 400-volt, type F. motors; three 50-h.p., 850-r.p.m., 3-phase, 60-cycle, 400-volt, constant speed induction motors; three 30-h.p. motors; three 20-h.p., 1,120-r.p.m. motors; three 15-h.p., 850-r.p.m. motors; three 7½-h.p., 1,700-r.p.m. motors; nine 75-kw., oil-insulated, self-cooling transformers; two 625-kw., 3-phase, 60-cycle, 2,200-volt, 415-r.p.m., A. C. generators, and two 17-kw., type S. exciters for same; one 4-panel switchboard for controlling the foregoing; four 250-kw., oil-insulated, oil-cooled transformers, and four 200-kw. transformers of similar type.

The Jenckes Machine Co., Ltd., recently shipped from its works at St. Catharines Ontario, two 60-h.p. tubular steam boilers for installation at the deep-drift gold mine on Slough Creek, near Stanley, Cariboo district, of the company recently organized as the Slough Creek, Ltd., of London, England, where the order for the boilers was secured. Plant, machinery, supplies, etc., for mines in the Cariboo district have to be hauled over wagon roads from Ashcroft, which is the nearest station on the Canadian Pacific railway. Slough Creek is about 280 miles from Ashcroft.

The British Columbia Copper Co., Ltd., recently purchased from the Canadian Rand Drill Co. several machine drills and other plant for use at the Napoleon mine at Boyd, Washington, which the former company is operating in conjunction with its several mines and smelting works in the Boundary district of British Columbia.

An air compressor has been installed at the Ottawa mine situated on Springer Creek, in the Slocan City mining division.

The aerial tramway from the Vancouver Group mine down to the Wakefield mill, a distance of about 4,000 ft., is about completed. These properties are on Four-Mile Creek, near Silverton, Slocan.

The Blake crushers and rolls have been removed from the Comstock mill, in the Silverton section of the Slocan district, having been purchased by Mr. H. Giegerich of Kaslo, for use in the Montezuma mill on the south fork of Kaslo Creek. The Comstock mill was referred to by the provincial mineralogist, in his report for 1904 of the Slocan district, as "very complete and well equipped, and was erected in 1897 at a cost of \$23,000, and after running a couple of months was closed down in 1898, since when it has been unused."

TRADE NOTES AND CATALOGUES.

The Westinghouse Companies Publishing Department sends two interesting pamphlets, viz., "Gas Driven Electric Power Systems" and "The Lighting of Public Buildings." The former is a reprint of a paper presented before the Engineers' Society of Western Pennsylvania, and deals with gas driven power systems as exemplified in the Warren & Jamestown railway system, in connection with which a gas engine plant of 1,000 h.p., in two units, is operating, without

steam reserve, an entire railway system totalling 42 miles of road, half city and half interurban. The latter traverses a difficult country with but two to four cars in service, all of unusual size (35 tons) high speed (50 miles per hour), and powered 200 h.p. per car. Upon this plant, which regularly operates 80 to 90 per cent of the time, the entire traction service of an important community depends. This pamphlet is illustrated and contains much useful detail. The second publication shows the varied uses to which Nernst lamps are successfully applied, and gives particulars of the lighting of numerous large buildings, the half-tone representations of some which are well finished. Accompanying the latter pamphlet is a handy little booklet entitled "Incandescent Lamp Dictionary."

The Rossland Engineering Works has had printed an illustrated catalogue of ore and other cars, mine buckets and cages, and other mine and smelter requirements it manufactures at its works at Rossland, B. C.

BOOKS, ETC., RECEIVED.

Geological Survey of Canada.—

Annual Report (New Series), Vol. XIV., 1901; bound. With 26 maps.

Summary Report for 1905. Containing report of operations for the calendar year. By Dr. Robert Bell, acting deputy head and director. Pp. 144; with maps.

Mineral Pigments of Canada. A report of some experiments with various pigments that can be derived from minerals, ochres and clays, either in their crude state or by burning. By C. W. Willimott. Pp. 39.

Chibougamau Mining Region. A report on the Chibougamau mining region of the northern part of the Province of Quebec. By A. P. Low. Pp. 61; with map.

Canadian Mining Institute. Advance copies of a number of papers to be incorporated in the "Journal Canadian Mining Institute," Vol. IX. (These papers are printed and sent to members for discussion before being bound as part of Vol. IX. of the *Journal*.)

Columbia University, New York—The School of Mines Quarterly, a journal of Applied Science. July, 1906. Pp. 97; illustrated.

California State Mining Bureau—Register of Mines and Minerals. This pamphlet deals with Santa Barbara County of the State of California. By Lewis E. Aubury, State Mineralogist. Pp. 15; illustrated, and with map.

AN EARNEST APPEAL.

The *Mining Journal*, of London, England, recently published the following appeal from British Columbia:

DEAR SIR,—I am a Reader of your Journal a Friend often Hands it to me. Well Sir I am an English man abroad so is the Two men sitting on my Right and left sides. We have gone on the humf as they say in America that is our mony is gone I have been working here 6 years so have my mates. We have spent our mony in the Klondike and other places seeking Treasures but have never made it go but not our fault. I have a Favour to ask that is can you help us in getting a Place in some good compay say in China india or Egypt we will Pay our way home like men 3 better men never lived then we 3 I can give you all kinds of Proof If you ask it we will Pay you sir for your Trouble in case you wish I am a miner from the word go befor my coming to canada I Tried my luck on the west coast of africa so have my mates but got Beaten For want of Funds that is the case now we are all Real workmen nothing more nor less strong and sober with little money but lots of energy and experience. Now Sir will expect a Reply hoping its not giving you too much Trouble but if you can help us theres a good man do so. We are longing For a Change.—I am sir yours truly,

Michel, British Columbia,
September 2, 1906.

MINER.

MINING MEN AND AFFAIRS.

Mr. A. G. Larson, superintendent of the Le Roi mine, Rossland, was a visitor to Spokane late this month.

Mr. Donald G. Forbes has returned to Victoria from a visit to Cariboo, wher he examined some quartz properties in the Barkerville district.

Mr. W. Lawrence Austin of New York has been examining the British Columbia Copper Co.'s Mother Lode mine in Deadwood camp, Boundary district.

Mr. Chas. Camsell, of the Geological Survey Department of Canada, lately visited the Similkameen Mining and Smelting Co.'s property at Bear Creek, Similkameen.

Mr. T. J. Bernard, a mining engineer, who has for years been actively associated with mining enterprises in Australia, is on a business visit to British Columbia.

Mr. G. Burnham, superintendent of the Hamilton Powder Co.'s works near Nanaimo, left on September 8 on a month's trip to Montreal, Boston, New York and other Eastern cities.

Mr. Blanchard M. Snyder, for two or three years chief assayer at the B. C. Copper Co.'s smelter at Greenwood, is to succeed Mr. Geo. Williams as assistant superintendent at those works.

Mr. Wm. Boyd of Aldermere, Bulkley Valley, has been gazetted acting mining recorder for the Omineca mining division with recording office at Aldermere, in place of Mr. Frederick G. Heal.

Mr. B. C. Travis, manager of the Kootenay Engineering Works and The Crawford Double Rope Aerial Tramway

Co., both of Nelson, has returned from a trip to Eastern Canada and the States.

Mr. Barclay Bonthronc of Vancouver visited the Big Interior group of mineral claims, in the Alberni district of Vancouver Island, lately. Mr. W. J. Sutton, of Victoria, also made a trip to that property.

Mr. Arthur E. Hepburn has been in the Nicola country in connection with the projected development of mining properties stated to be under option to one of the Guggenheim companies of New York.

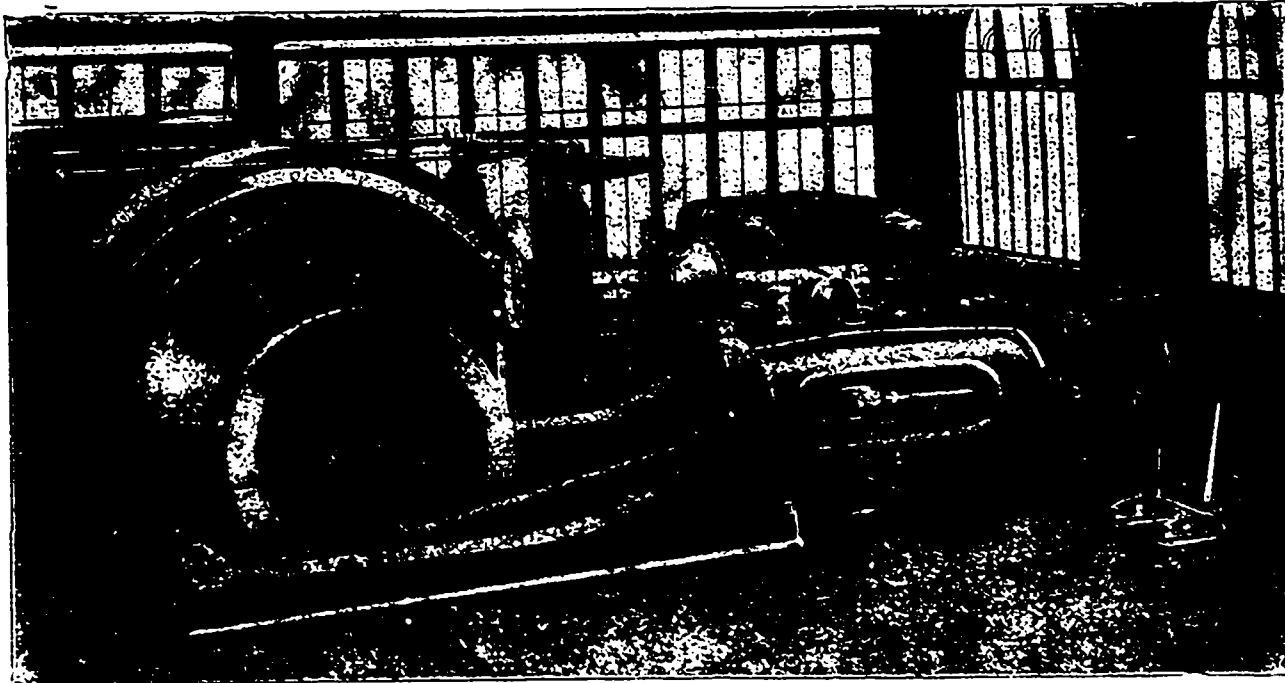
Mr. Rolla B. Watson of New York City, consulting engineer to the Shannon Copper Co., Clifton, Arizona, U.S.A., was recently in Ketchikan district, Southeastern Alaska, in the interests of Eastern clients.

Mr. G. A. King, who has had charge of the concentrator at the St. Eugene mine, left Moyie, East Kootenay, early in September for Spokane, Wash. It is probable he will go to Tonopah, Nevada, to superintend the building of a mill there.

Mr. Edward Dedolph, superintendent of the Sullivan Group smelter at Marysville, East Kootenay, recently spent a day or two at Kaslo, where, before going to Marysville, he was in charge of the assay office at the Kootenay Ore Co.'s sampling works.

Mr. Albert I. Goodell, superintendent of the Le Roi Mining Co.'s smelting works at Northport, Washington, went to Fernie just before the strike at the Crow's Nest Pass Coal Co.'s mines took place, for the purpose of completing arrangements for a supply of coke for the Northport works.

Mr. W. F. Ferrier, consulting mining engineer and geologist, of Montpelier, Idaho, where he is opening deposits of phosphate for the San Francisco Chemical Co., revisited



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Rossland early this month. Mr. Ferrier was formerly mining engineer and local manager at Rossland for the Good-erham-Blackstock Syndicate.

Mr. W. F. Dubois is again managing the Arlington mine, on Springer Creek, Slocan City mining division. Work was recently resumed at this mine after several years' shut down. This mine has been extensively developed by a series of adit tunnels and much drifting and has also been one of the largest shippers of this section of the Slocan.

Mr. Anthony J. McMillan, general manager of the Le Roi Mining Co., Ltd., left British Columbia for England late in September. He expected to overtake Mr. E. Drayton Grimke-Drayton, chairman of the board of directors, at one of the Eastern cities, and proceed with him to London in ample time to prepare for the annual meeting of Le Roi shareholders, to be held probably in November.

Mr. Geo. B. Paul, for several years accountant and latterly purchasing agent at the B. C. Copper Co.'s smelting works at Greenwood, Boundary district, has removed to Spokane, where he has secured a good appointment in the general offices of Mr. D. C. Corbin, well known in connection with railway building and mining enterprises in the State of Washington and Boundary and Southern Kootenay districts of British Columbia.

Mr. Newton W. Emmens, E.M., has returned to the Lard-deau from his home at Pittsburg, Pennsylvania, U.S.A., and is now directing prospecting operations on the Broadview group, near Ferguson, which property is being worked by the Mines Development Co., Ltd., of Cincinnati, Ohio, for which company he is consulting engineer. He is also employed in a similar professional capacity by the Elwood Tinworkers Gold Mining Co., of Elwood, Indiana, owning the Silver Dollar mine, near Camborne.

OBITUARY.

Mr. John Bowron, for 25 years gold commissioner for Cariboo district, died at Victoria on September 6 in his 69th year. Though not a professional mining man, he was more intimately associated with the history of Cariboo than any one else, having taken an active part in its affairs from the time of his arrival at Quesnel in 1863. As the most productive years of the district were 1860 to 1868, both inclusive, he saw it in the height of its prosperity. From 1866 to 1876 he was postmaster at Barkerville, the chief town of Cariboo. He was appointed mining recorder in 1872, Provincial Government agent in 1875, and gold commissioner in 1881. He resigned the two last-named positions on May 1, 1905, after having been seriously ill in Victoria for several months. He recovered sufficiently to get about for a time, but of late he failed fast until his death occurred. The late Mr. Bowron was born at Huntington, Quebec. After leaving school he studied law at Hudson, Wisconsin, U.S.A., but later the news of rich gold yields in Cariboo tempted him to join a large overland party. He married in 1869 a Miss Edwards, of Detroit, who died in 1895. In the death of John Bowron Cariboo has lost one of its most useful men, for not only was he ever ready to promote its best interests locally, but he did the district useful and valuable service in compiling an annual report on its mining progress, which report has for years been a prominent feature in the "Annual Report of the Minister of Mines for British Columbia," and thereby he repeatedly gave wide publicity to the valuable gold resources of Cariboo.

Among the Naval Stores to be sold by auction at Esquimalt, Vancouver Island, B. C., on November 6 is a quantity of rope of various sizes. There will probably also be a lot of blocks and tackle, tools, and other articles suitable for mining purposes. The advertisement of the auctioneers, Messrs. Williams & Janion of Victoria, appears in another column.