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EIGHTEENTH YEAR OF PUBLICATION

The Canadian Mining Review

Established 1882

Vol. XIX—No. III. OTTAWA, MARCH 31st, 1900. Vol. XIX—No. III.

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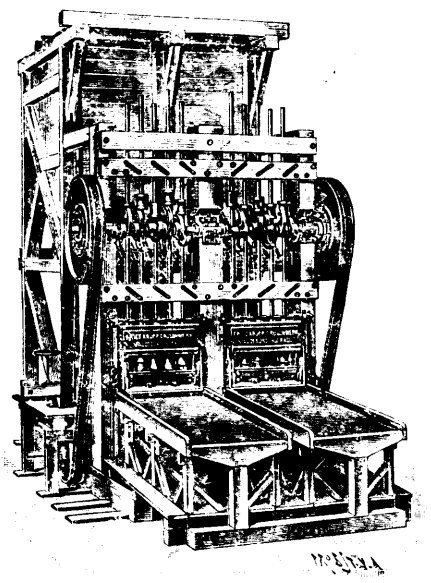

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Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.
Secretary, Canadian Mining Institute, etc.

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VOL. XIX., No. 3. MARCH, 1900. VOL. XIX., No. 3.

A Plea for Safer Mining Methods.

One of the most encouraging evidences that a mining industry has passed beyond the embryonic stage is to see the leading mines thoroughly developed and their underground operations carried on in accordance with well matured plans. No mining is really cheap that is not conducted systematically, and a system can only be evolved after the deposit has been explored, so that its position and extent up to a certain limit may be accurately known. The tendency in some of the mines of the Dominion has been to start production too soon, and this has led to many errors, the seriousness of which has not been fully appreciated. Although the cost of the ore delivered at the surface may be low during a period of active production, the actual cost in all cases that have come to our notice has been exceedingly high, when the dead work, and the changes in underground methods of mining and handling are taken into account. But beyond such considerations is another of grave import. The methods of ore winning necessitated by this scramble after a large output from an undeveloped mine may be characterized as an unsystematic gouging out of the vein. The ore bodies are stripped as clean as possible, regardless of consequences. No respect is paid to the maintenance of suitable shaft pillars, and supporting ribs and arches of ore are few and far between, and usually of wholly insufficient dimensions. The chasms left, (by some stretch of the miners' imagination called "stopes.") are often frightful to behold, and constitute a perpetual menace to the lives of the workmen and to the security of the mine. That accidents by collapse of the hanging wall in these yawning "stope" caverns have been rare in Canada is no argument for a continuance of this reckless custom. The memory of the old Copper Bay disaster is still fresh in the minds of our older mining men, and the conditions are favorable today in more localities than one for a repetition of this accident, on even a more tremendous scale. It is the plain duty of the mining inspectors throughout the Dominion to take cognizance of this state of affairs, in view of the frequent protests of the miners against the conditions imposed upon them, which they do not hesitate to declare are threatening their lives. It is easy for officials to become too meddlesome and exacting, and to demand more than could be expected of mining companies in the way of provisions for safety, but we do not think there have been any embarrassing exactions imposed in Canada by the representatives of the provincial governments. The error has been certainly on the side of too great laxity. There is no excuse in these days for leaving stoping chambers of vast dimensions without support for the hanging wall. The caving system, which is safe under intelligent, skilled direction, is not applicable to the great majority of Canadian mines, and the square set method of timbering is too expensive. But rock filling is cheap, and thoroughly effective. It has been applied with success in a number of Canadian properties, where the margin of profit in mining was not great, and its use should be insisted upon as a way out of the difficulties which, from evidence before us, threaten the security of a number of important mines.

Some Points on Riffle-Washers.

We are pleased to see that the riffle-washer is gaining rapid ascendency in Canadian gold mills over the vanners, which so long held the day against all other concentrators for fine pulp. It undoubtedly means an increased saving at a reduced cost, which is a matter of great importance in a country where the gold ores are mostly of low grade. In the hands of an experienced man the vanner will give an almost ideal concentration with classified sands, but it is a delicate type of machine, requiring greater skill than is often possessed by the ordinary millman. This difficulty was met in part by the introduction of the corrugated belt, which would give fair results without such careful adjustment as was needed for the plain belt. But it did not do as fine work as was possible with the older form of machine under the best conditions, and was withdrawn after a brief trial, to be re-introduced in obedience to the demand for a less delicate appliance, which could be operated economically without such constant attention. The riffle-washer, however, of which the Wilfley table is at present the best known representative, has solved the problem very neatly. The friction of ore particles on a surface is not utilized in this machine. A series of riffles of gradually diminishing height from the head towards the foot of the table, are placed lengthwise on the concentrator, nearly at right angles to the flow of the pulp and fresh water, which flow is induced by a side slope of the table. A reciprocating motion in the direction of the riffles causes the material banked behind each riffle to advance toward the discharge end, where the stips are shallower. Thus every opportunity is afforded for a settling of the heavy particles in the ore, while the gangue is washed over, escaping along the edge of the table. The rich ore follows from the end of one riffle to the next longer one, and so on to the last, whence it discharges into the heads-box. The adjustments of the table are the number and length of reciprocating strokes per minute; the slope of the table, adjusted by a lever arm; the quantity and dilution of the pulp; and the quantity of feed water. A tyro can soon learn to achieve good results with this simple appliance. But, as usually happens with new devices,

the machine is not perfect, nor does it lend itself to the sort of work which is often demanded of it. A peculiarly bad feature is the return of the middlings to the same table. This unnecessarily complicates the mechanism, and, worse still, it is based upon the false assumption that the middlings represent a product of mixed gangue and ore which should have been separated. In this conception the middlings constitute an accident, which, were it true, would indicate that the machine is not doing the fine work which it showed theoretically. As a matter of fact this product is inevitable, consisting of particles of approximately equal mass, which must of necessity issue together Normally this product would constantly increase as more ore was fed to the table, whereas it represents a constant quantity as the machine is now operated. Hence it becomes necessary in practical work, if this middlings-return is adopted, to compromise the matter by splitting the discharge into heads and middlings at such a point as to allow more gangue to go over with the heads than should be permitted. To obtain really perfect work a separation of heads and middlings should be made, and the middlings subsequently recrushed or ground, and then returned to the table. With some ores such an extension of the system might not be as economical as that now in use, but there are many cases where it would unquestionably prove profitable. Another defect in the use of this machine is that of feeding to it unclassified pulp. The concentrator yet remains to be invented which will do as good work with mixed sands and slimes as with material which has been sorted in a hydraulic classifier. A recognition of this fact in practice will greatly increase the efficiency of the riffle-washer.

Selective Action of Cyanide Solutions.

Some interesting notes have recently appeared (Trans. Inst. of Min. and Met., Nov. 15, 1899,) upon experiments made by Mr. H. H. Greenway, to determine the selective action of potassium cyanide solutions on ores containing copper, gold, and silver. He arrives at the very startling result, widely at variance with preconcieved ideas, that a cyanide solution for dissolving gold and silver and not the base metals associated with them is a saturated and not a weak one. He gives figures showing a gradual increase in cyanide consumption on ores containing copper up to the point of saturation, at which the amount consumed " was almost incapable of estimation." This offers an interesting field for further investigation, which may lead to important practical results.

A point of no little moment in cyanide work, which has not received the attention which it deserves, is the velocity of the percolating solutions. It is generally understood that the highest rate of solvency of gold and silver is accomplished when the speed of the solvent is just sufficient to remove the film of saturated solution around the precious metal particles as fast as it forms. This is true, but the superficial area of the particles has much to do with the matter, so that the same velocity will not apply in all cases. There is a maximum velocity of solvent at which a maximum rapidity of solution can be effected, which should be determined for each ore. And it should be borne in mind that this velocity is not the same for silver and gold. By leaching at the proper velocity for the gold, and subsequently at another velocity for the silver, very great improvement in total extraction can in many cases be obtained. The only exception apparently is where the gold and silver are alloyed, when the same velocity will give the maximum possible extraction with that ore.

The output of Zinc ore in Ontario last year was about 1,300 tons. It was the yield of the Zenith mine near Rossport, on the C.P.R. Several other deposits of the metal have been located in the same neighborhood.

The late Addison C. Rand.

It is with mnch regret that we make the announcement in these columns of the death of our old friend Mr. Addison C. Rand of the Rand Drill Company, New York, the Laflin and Rand Powder Company and other large American enterprises associated with the mining industry. The sad event occurred unexpectedly at his home in New York, on Friday evening, 9th instant. The late Mr. Rand was one of the pioneers in rock drilling and air-compressing machinery. During the excursion through Canada in 1889 with the American Institute of Mining Engineers, he quickly recognized the possibilities of our mining industry and immediately established at Sherbrooke, Que., the branch establishment of the Rand Drill Company, which has grown and prospered into the large works at that point now operated by the Canadian Rand Drill Co.

The late Mr. Rand was a fine type of the American business man. Shrewd and enterprising in business, genial and hospitable in private life, he was universally esteemed and had a wide circle of friends. He was identified with many of our mechanical and engineering societies. He was one of the founders of the Engineer's Club of New York, and officiated as its treasurer from its organization to the time of his death. He was also prominently identified with the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the New York Chamber of Commerce and other bodies. We extend our sympathies to his family in their sore bereavement.

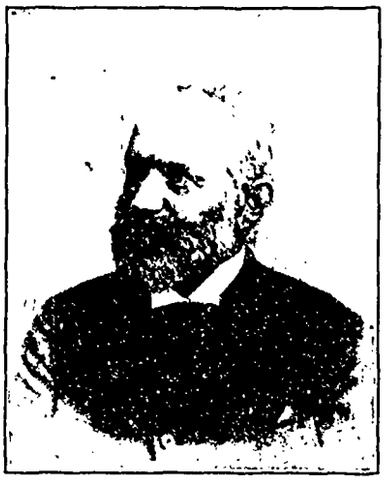
ONTARIO NOTE AND COMMENT.

The record of the Mikado gold mine for February was as follows: Mill ran 26 days; crushed 853 tons ore (2,240 lbs.). yielding 621 ounces gold from plates; cyanided 479 tons tailings (2,240 lbs.), yielding 179 ounces bullion. The value of the output was over $12,000. It is reported that the yield for the first two weeks of March was upwards of $14,000.

Returns to the Bureau of Mines show that in 1899 the gold mines of Ontario yielded 27,594 ounces of gold worth $424,568, which is an advance of 11,333 ounces in weight and $149,490 in value over the output of 1898. The bulk of the gold came from the mines in western Ontario, though the two or three producing properties in the eastern part of the Province, such as the Deloro and the Cordova, contributed a fair share. To these is likely soon to be added the Diamond mine, situated about six miles from Madoc, near the village of Queensboro, which has been sold by Mr. D. E. K. Stewart to a company under the management of Mr. Leopold Meyer. A $12,000 stamp mill is to be erected, 600 cords of wood have been contracted for, and it is expected that bullion will be turned out at an early period of the coming season.

The quantity of iron ore raised in the Province in 1899 was 16,911 tons, which came entirely from eastern Ontario, and consisted mainly of magnetite supplied to the blast furnace at Hamilton. There were smelted 64,749 tons of pig iron, valued at $808,157, a considerable advance over any previous year. The domestic ore mined is as yet far from meeting the requirements of Ontario furnaces, it being understood that the charcoal furnaces at Deseronto ran throughout the year mainly, if not wholly, on foreign ores.

Payments made by the Ontario Government out of the Iron Mining Fund during 1899 amounted to $8,647 19. This is a fund of $125,000, established by the Legislature five or six years ago, out of



THE LATE ADDISON C. RAND,
New York.

THE LATE H. A. BUDDEN,
Intercolonial Coal Co., Montreal.

LIEUT. J. EDWARDS LECKIE, M.E., Greenwood, B.C.

Presented by The Canadian Mining Institute with a sword on the occasion of his leaving for South Africa with Strathcona's Horse, 9th March, 1900.

which the miner of ore raised and smelted in the Province is entitled to a bounty of $1.00 per ton on the metallic product of his ore. This fund will lapse with the close of 1900, unless provision is made for its extension by the Legislature during the current session.

Enterprises now under way for the opening up of iron mines will, if carried to completion, greatly change the aspect of affairs before the close of the present year. The deposits of hematite found in the Michipicoten mining division have now been proven by the diamond drill to be of large, even enormous extent, and as the railway from Little Gros Cap, on Lake Superior, has been completed, heavy shipments from these mines seem inevitable during the coming season. On the iron ranges of the Mattawin and Atik-okan rivers, the Mattawin Iron Company, in which Folger Brothers of Kingston and Mackenzie, Mann & Co. are interested, is proceeding steadily with exploration work by the diamond drill. In Peterborough County, the Belmont mine which yields a high grade magnetic ore will be worked on a much larger scale than in the past. A contract has just been made to deliver 3,000 tons of ore.

The profits to be made in making pig iron during the present great demand are causing a heavy flow of capital into the smelting business. A blast furnace is in process of erection at Midland, while at Sault Ste. Marie the manufacture of pig iron and nickel steel is part of Mr. F. H. Clergue's extensive programme, and a bonus of $50,000 has been granted by Fort William for a furnace to be built at that town. Other places are following suit. Ottawa, Collingwood and Welland are all said to be desirous of entering upon the production of pig iron, and are not likely to experience much difficulty in finding capitalists willing to be paid for embarking upon a business which is likely to yield large returns for some time to come.

The reported ptoduction of copper in Ontario during 1899 is 5,668,000 lbs., valued at $176,237, and that of nickel 5,744,000 lbs., worth $526,104. Both of these metals, with the exception of a small amount of the copper which came from Parry Sound, were contained in the matte produced by the Canadian Copper Company at Sudbury. The copper contents of the matte are valued at about 3 cents per lb., and the nickel contents at about 9 cents. In the statement put out a few days ago by the Geological Survey of the mineral production of Canada for 1899, the practice is continued of valuing the copper and nickel contents of ore and matte at the market value of the fine metals. This is a palpable error, as a moment's reflection will show. If the matte were refined in Canada, and metallic copper and nickel produced here, it would be quite correct to use the fine metal prices as a basis for computing the value of our output; but when both the copper and the nickel product of Ontario mines are exported in the form of matte to be refined in the States, common sense dictates that the metals should be valued in the shape in which they leave the country. It would be as reasonable to value all the wheat exported as flour, all the pulpwood as paper, or all the wool as cloth. It is the processes to which the matte is subjected after leaving Ontario that give the value to and govern the selling price of the copper and the nickel; and statements compiled without recognition of this self evident fact are misleading, and are likely to be received with incredulity. There is no excuse for "padding" statistics.

Accidents continue to be frequent from the careless handling of explosives, both in mining aud other operations in which resort is had to blasting. Recklessness and ignorance pay a heavy death toll, and it is time to inquire whether something cannot be done to stop this waste of useful lives. The commonest source of accident in winter time is lack of care or the use of improper methods when thawing frozen dynamite. Safety is often separated from danger by a very narrow range of temperature, lack of skill, hurry, or the contempt bred of familiarity, trespasses upon this margin, and the result is often death or maiming for life. It is said that the Ontario Government is considering the expediency of revising its rules governing the employment of dynamite in mining. It is proper to adopt all possible safeguards which legislation can provide, but after all is done, the matter is one for the miners themselves, and nothing can take the place of knowledge, intelligence and care, in dealing with so dangerous and withal so treacherous a substance as dynamite, Over stringent regulations would probably fail of effect, for they would be evaded or ignored, but if a short treatise could be prepared and circulated generally amongst miners, explaining the nature and behaviour of high explosives, and the proper methods of using and handling them, probably as much good would be accomplished as could be attained in any other way.

A further extension of the gold fields of western Ontario has been reported. Messrs. Upham & Shores, formerly operating at Steep Rock Lake, on the Seine River, are now at work with about 50 men developing a find situated on Sturgeon Lake, east of Lake Minnietakie, about 60 miles north of Bonheur station, on the C.P.R. The discovery is said to be a most promising one, and is believed to be connected with the deposits at Lake Minnietakie, though the connection has not been traced

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"Golden Whale" is the euphonious name given to a property in the New Klondike region, owned by Messrs. Watson & Munro. A small 2 stamp mill has been installed, and is showing the ore to be of paying quality. The new Crown Point mine, of which Mr. R. H. Ahn is manager, is situated about a mile north of the Mikado. It has a large body of low grade ore, on which a shaft has been sunk to a depth of 90 feet. A 5 stamp mill is turning out bullion. The Gold Panner and Combine are two properties which show unusually rich ore. A 10 stamp mill is being erected on the former. Considerable difficulty is being experienced by many of the western Ontario gold mines in procuring an adequate supply of miners. Here is a chance for some of the British Columbia men who are having trouble with the eight hour day law.

The assay office established by the Bureau of Mines at Belleville, is now in its second year, and is doing useful work in assaying at reduced rates mineral samples from all parts of the Province, and in directing attention to the mineral resources especially of the eastern part of Ontario. Mr. J. W. Wells who is in charge of the office, has at present in hand the analysis of a large number of samples of salt, &c., from the salt wells of the Province, as well as of peat from a number of deposits, reports on both salt and peat being in course of preparation by Prof. De Kalb, Inspector of Mines for Eastern Ontaria.

Active operations are in progress at the Zenith Zinc mine near Rossport, on the C. P. R. The ore has to be teamed about 12 miles to the railway, and can be got out much more cheaply in winter than in the summer time. A considerable tract of land in the neighborhood of the mine has been taken up for zinc ore. The zinc refinery at Hamilton, of which Mr. John Patterson is manager, is nearing completion.

Projects for the establishment of additional blast furnaces are in the air, as is natural in these days when pig iron is almost qualifying

to rank as a precious metal. One of the latest schemes is to work the old Ironsides mine, near Ottawa, on the Quebec side, and to smelt the ore both at Ottawa and at Welland on the Welland canal. The Canadian Steel Company has these enterprises on foot, and is negotiating with both Ottawa and Welland authorities for exemptiou from taxation and other inducements.

A lease of the water privilege at Alice A Falls on the Seine River has been granted by the Ontario Government, to Colonel J. H. Hillyer of West Superior, Wis., upon condition of developing 6,200 horse power within a year. The power is to be transmitted and nsed in the Alice A and other mines in the Lower Seine region. A similar lease of the Sand Island Falls on the river of the same name has been granted to the Preston and Olive Gold Companies, who are to develop 1,000 horse power for use in their mines.

The Iron Industry in 1899.

By Mr. GEORGE E. DRUMMOND, Montreal.

[Paper read before the Canadian Mining Institute.]

The year 1899 has passed into the annals of the iron trade of the world as a remarkable one. The values of iron, steel, and all the products thereof enhanced by from fifty to eighty per cent. (50 per cent. to 80 per cent.) over the values of the previous year, great scarcity of ore and fuel everywhere in the producing countries, a rate of consumption unparalleled in the history of the trade, and a production of pig metal never before equalled in any one year.

The United States, the chief iron market of the world, produced 13,620,703 gross tons of pig iron as against 11,773,934 tons in 1898, an increase of 1,846,769 tons, or nearly 16 per cent.

In 1898 there was made 2,121,254 tons more than in 1897, and in 1895 2,788,920 tons more than in 1894. This will give some idea of the enormous strides that the United States iron producers have made in the development of their business during the past few years. The approximate consumption of iron in the United States for the year ending 31st December, 1899, was 13,774,727 tons, the consumption exceeding the production and lowering the available stocks in yard until they amounted to only some 64,429 tons at the close of 1899, as against 291,233 tons on December 31st, 1898.

The number of furnaces in blast at the close of 1899 was 289, as 202 on December 31st of the previous year.

The demand for iron is as active as ever, and the consumption is going on at such a rate that with limited vessel freighting capacity from the Upper Lakes, it is doubtful whether more than sufficient ore for actual requirements can be brought down to the Eastern furnaces during the coming year. It is therefore, safe to say, that prices will remain fairly high throughout 1900.

GREAT BRITAIN.

The actual figures of production and consnmption for 1899 are not yet to hand, but the output will probably approximate somewhere about the figures of 1898, viz., about 8,600,000 tons. The stocks in public yards and in maker's hands have however, been very largely drawn upon, so that the total consumption in England and Scotland will exceed that of 1898, and the stocks on hand at the close of last year will be reduced to a very small quantity. The falling off in the shipments of Scotch pig iron to Canada, which has been a marked feature of the trade during the past few years, was completely changed in 1899. In Scotch pig iron alone the shipments to British North America exceeded 10,000 tons, against about 2,000 tons in 1898. This large increase is due to the fact that American furnaces were almost unable to supply the local demand, and the same can be said of Canadian furnaces. It is evident from the present condition of the market that a considerable quantity of Scotch iron will come to Canada durlng the first half of 1900 at least, as Scotch prices, although high, are still lower than American figures for delivery in the Eastern part of Canada. It is however, well to notice that while the climax in price has apparently been reached in the case of American iron and steel, such is not the case in Great Britain. The enormous development in the export trade in British coal has increased the cost of all iron products to such an extent, that there has been a marked advance in all classes of iron and steel since the beginning of 1900, and it is evident that this will continue during the present scarcity of coal. The war in South Africa is almost directly the cause of this advance in the price of coal, and the scarcity of shipping will also further increase the cost of material delivered on this side, owing to the expected advance in freights during the coming season of direct navigation. Scotch Warrants opened at the beginning of 1899 at 49/7, and closed at the end of the year at 66/11, showing a raise of 17 4 per ton. The highest price reached was was in July, when they touched 75/7, and the subsequent break in the market has been due entirely to the position of the financial market, and the uneasiness in England on account of the South African war. Iron masters however, do not hesitate to say that the Scotch trade is in a very firm position, and there is no liklihood of any material decrease in prices for a long time to come.

EUROPEAN PRODUCERS.

Figures are not yet to hand from the various iron producing centres of Europe, but Germany and Luxenburg, who stood third on the list in 1898, producing 7,232,988 tons, have experienced great prosperity in the trade during 1899, and when the figures are brought down they will probably show a production in 1899 exceeding that of the previous year. Basing on 1898 figures the European iron making countries stand in the following order as producers.

Germany and Luxenburg.....	7,232,988	metric tons	(2,204 lbs.)
France.....	2,534,427	"	"
Russia and Finland.....	2,222,469	"	"
Austria and Hungary.....	1,308,423	"	"
Belgium.....	979,101	"	"
Sweden.....	531,766	"	"
Spain.....	261,799	"	"

CANADA.

Canada, which in 1898 occupied the tenth position among the iron producing countries, enters now in earnest upon her career as an iron producer. Advices received om Hamilton, Deseronto, Ont., New Glasgow, N.S., and adnor Forges, Que., without including any allowance for the output of charcoal iron from the Drummondville furnace (the records of which are not yet to hand) show the largest output in the history of the country, viz., 101,931, net tons of pig iron, 23,000 tons of steel ingots, and 3,900 tons of steel forgings.

The year has witnessed the formation of the Dominion Iron & Steel Company to smelt at Sydney, C.B., the ores of Newfoundland with the mineral fuel of Nova Scotia. These furnaces are planned upon a splendid scale. It is said that 1,000 tons of iron per day will be the rate of output. This, at the lowest rate of calculation, would add 300,000 tons of iron per annum to the present Canadian output. Details of the plant and of the actual output are not at the moment available, but it may be relied upon that the works will go into operation within the next year on a very large scale of operations.

The new furnace plant of the Canada Iron Furnace Co. at Midland, Ont., decided upon during the year 1899, is now rapidly nearing completion, and will go into blast about the 1st of May next. The Midland works will have an output of at least 30,000 tons of iron per annum, these two new enterprises helping to place Canada, as a producer of iron, upon a level with Sweden.

For several years past the Canadian Mining Institute has been devoting considerable attention to the task of educating the Canadian public upon this most important question of iron production. At last

these efforts are being rewarded. Legislators and capitalists alike are evidencing an interest in the industry that they have never shown in the past, and we believe that the experience of the next few years will serve to strengthen the faith of the Canadian people in their own country with regard to its possibilities as an iron producing centre.

A notable feature of the year's work is the good progress that has been made in the matter of developing the iron mines of the country Considerable activity has been shown in this respect in the Ottawa district, and also at various points in Ontario and Quebec, but by far the best discoveries and greatest development work has been done in the Michipicoten, Lake Superior district. The members of this Institute have long held that a thorough investigation would prove that the Canadian side of Lake Superior is as rich in iron as the American side, and the work now in progress in the district mentioned proves the correctness of this view.

The Helen Red Hematite mine, on Boyer Lake, in the Michipicoten district, was located by Mr. F. H. Clergue, of the Lake Superior Power Co., Sault Ste. Marie, less than a year ago, but already this gentleman, with indomitable pluck and energy has not only uncovered the deposits, but by means of diamond drills has demonstrated, at latest accounts, that he has over 4,000,000,000 tons of high class Bessemer ore in sight. He has planned and almost completed the first link of the Algoma Central Railway from Michipicoten Harbour to the Helen mine, and thence onward to a point on the C.P. Railway. This line, when completed, will make the first link of a railroad destined eventually to reach James Bay, and open up a country rich in natural resources. At Michipicoten Harbour M. Clergue and his company have now under construction a magnificent dock for the handling of iron ore outwards to vessels. This dock will have a capacity of 500 tons per hour. The ore is of most excellent quality, comparing favorably with the very best grades from the American side of Lake Superior, and will find a ready market not only in Canada but also in the United States, reversing somewhat the condition of affairs that has existed for the past few years, when the Ontario furnaces had to rely to a very large extent upon the product of American labor and American mines, in the ore as well as in the fuel department.

The Nova Scotia Steel Co. report that in addition to the mining of ore for use in their own plants in Nova Scotia, they have largely increased the production of Wabana ore for shipment abroad, their output for 1899 aggregating over 300,000 tons; 190,000 tons of this going to Germany and Scotland, about 90,000 tons to the United States; the balance being used in the Ferrona furnace. They advise that the outlook for mining operations in 1900 at Wabana is equally as good as last year, and that they have already sold upwards of 200,000 tons for delivery in Philadelphia during the coming season.

It is to be hoped that field development work will be carried on vigorously throughout Canada from now forward. There will be ample market for the product of all the iron ore mines likely to come into operation during the next few years. It is reasonable to suppose that the furnaces at Sydney and North Sydney will be glad to have a supply of Canadian ore of the right quality for mixture with Newfoundland ores. This will be entirely in their interest, so that mine prospectors and owners have a wide open field for their energies and enterprise in developing Canadian iron mines.

While the work of development, so far as the mines are concerned, is not at all likely to be over-done, the same may not be equally true in the smelting department. By the close of this year the output of iron from Canadian furnaces will considerably exceed the consuming power of the country in so far as actual foundry practice, upon which we have most largely depended in the past, is concerned. The furnace owners will now have to undertake operations in the manufacture of steel of all descriptions, so as to work up a large part of their outputs into higher products than the majority of them have touched in the past. If this is carried out successfully, and on a modern basis, a great part of the output of the new furnaces can be absorbed within the country, and so far as the new works at Sydney are concerned, it is firmly believed that a very considerable part of their output will find a market among the consumers of Great Britain and Continental Europe. The same applies of course in the future, as in the past, to such high class charcoal iron as Canada may produce, for which a ready market may always be expected abroad. With proper management the business can be made entirely successful, but it will have to be planned upon a thoroughly modern basis in every department.

In considering the causes that have brought about the present most encouraging condition of the iron industry in Canada, naturally the principal credit should be given to those first adventurers in the enterprise of iron making, who have had to fight for a footing under the discouraging conditions that have existed during the past few years. Granting them first due praise for what they have done to establish the industry, we must also acknowledge cordially the good will shown by the Government and the Loyal Opposition in the Dominion House, in settling the question of the iron duties and bounties *upon something like a permanent basis*, thus encouraging capital to invest in the enterprise of iron making in Canada, an enterprise which we believe will do more for the building up of the country than almost any other industry, and which may yet become an important factor in Imperial considerations.

The Ontario Mining Law.

By J. M. CLARK, M.A., L.L.B., Q.C., Toronto.

Before dealing with the mining law of Ontario it may be convenient to give a brief history of its development.

Prior to 1845 there were in Upper Canada (now Ontario) no special laws or general regulations relating to mines. Each case requiring executive action was dealt with as it arose by Order in Council.

The Gold Mining Act of 1864 introduced a system of Gold Mining Divisions and Mining Licenses, one class known as "Crown Lands Gold Licenses" and the other as "Private Lands Gold Licenses."

This system was extended in 1868 to Silver Mining by the Gold and Silver Mining Act of 1868 which was in turn repealed the next year when the General Mining Act of 1869 was substituted. This Act introduced the system of mining locations in addition to that of mining divisions.

All royalties, taxes or duties theretofore imposed or made payable upon or in respect of any ores or minerals extracted from patented lands were repealed and such lands declared free from every such royalty, tax or duty.

The Ontario Mining Law remained substantially in this condition until the Mining Operations Act of 1890 was passed.

The whole law was radically mended in 1891 when royalties were again introduced and in 1892 all the previous legislation was amended and consolidated, the idea being that the law was then put in a permanent and definite shape. Since 1892, however, there have been several changes in the form of Acts to amend and improve the mining laws.

At present the Statutory Mining Law of Ontario is contained in Chapter 36 of the Revised Statutes of Ontario, 1897, as amended in 1898 by by 61 Vic. Chapter 11 and again in 1899 by 62 Vic. (2) Chapter 10.

This legislation is divided into five parts, the first part containing general provisions, the second dealing with mining locations, the third

with mining claims, the fourth with mining regulations and the fifth with offences and penalties.

Instead however of discussing the Mines Act and its amendments in the order in which the various clauses have from time to time been enacted I have concluded that it would be more convenient to deal with the matter by taking the case of prospectors seeking to discover mineral and following them through a course of prospecting, followed by acquisition of title and the subsequent working of the property until say they form a company in the ordinary course which company if not wound up on account of insolvency usually comes to grief on account of over-capitalisation.

Supposing that an individual prospector comes to the Province of Ontario with a view to acquiring mining property. It would first be necessary for him to decide whether he intends to prospect in a mining division of which at present there is only one, that of Michipicoton, or on lands not situated within any mining division. In the event of his choosing territory within Michipicoton the mining division set apart on the 9th day of September, 1897* he will find that the first thing necessary for him to do is to secure a miners' license which he may do upon payment of the sum of ten dollars. This license authorises him to explore within the mining division for one year, when he must renew his license. A licensee who discovers mineral in place within the division has the right to stake out a mining claim provided the lands have not been withdrawn from location or exploration or are not included in the previous mining claim, or in lands reserved by the Crown.

The mining claim is to be staked out in the manner prescribed by the Act, by four stakes and where there are standing trees the boundary lines have to be blazed.

The licensee cannot stake more than one claim on the same vein and cannot stake out and record in the same mining division within a radius of fifteen miles more than four claims in any year. The dimensions of a mining claim are defined to be a square of fifteen chains containing twenty-two and one-half acres, but there is power by regulation to vary this so however as not to make a mining claim exceed forty acres. The boundary lines are to run north, south, east and west astronomically and the ground included in each claim is bounded under the surface by lines vertical to the horizon.

The apex rule which was abolished in many countries on account of the interminable litigation inherent in the system of extra-lateral rights has now no place in the mining law of Ontario. British Columbia abolished the system in 1891 except as to rights previously acquired. Until 1897 a modified form of the apex rule applied to mining claims in Ontario but it never had any application to mining locations. This Apex Rule has been a source of trouble in several of the United States but the difficulties (mainly arising out of vested rights) in the way of its abolition there seem insurmountable.

The rule of the English Common law now in force in Ontario and in fact in the whole of Canada is much preferable. A mining claim does not include a valuable water power. In Ontario there is important special legislation as to water powers.

The claim becomes forfeited unless the inspector is duly notified and a plan furnished him, and also becomes forfeited unless the license of the holder is kept in force.

$150 has to be expended every year upon each claim taken up in stripping and opening up mines, etc. The Act provides that this expenditure shall consist of labor actually performed by grown men to be computed at the rate of $2 00 per man per day. Where several parties combine to work five claims or less the mining operations may be carried on upon one of the claims. The licensee has a right to abandon his claim. Provisions are made as to party walls between claims and there is now a provision for a patent being obtained to a mining claim after the working conditions have been complied with for a period of four years. Supposing the prospector to desire to prospect on Crown lands not situated within any mining division there is a statutory right to explore except in cases of lands withdrawn from sale, location or exploration as being valuable for their pine or for other reasons.

If the lands are wholly vested in the Crown in right of Ontario then they are dealt with as mining locations. If however the surface rights have been granted and the minerals reserved then mining rights can be obtained. If however the title has completely been granted by the Crown then the private owner would have to be dealt with. It is to be borne in mind that in the case of surrendered Indian Reserves where reserves were legally laid out prior to Confederation the title would have to be obtained from the Dominion Government. It has has further to be borne in mind that according to the law of England (which in this respect is the law of Ontario and indeed of all the Provinces of the Dominion) gold and silver mines, until they have been aptly severed from the title of the Crown and vested in a subject are not regarded as *partes soli* or as incident to the land in which they are found. Not only so but the right of the Crown to land and the baser metals which it contains stands upon a different title from that to which its right to the precious metals must be ascribed.

In the Great Mines Case the Judges decided that in the case of the baser metals, no prerogative is given to the Crown; whereas all mines of gold and silver within the realm whether they be in the land of the Crown or of subjects belong to the Queen by prerogative with liberty (to quote from the Justices) "to dig and carry away the ores thereof, and with other such incidents thereto as are necessary to be used for the getting of the ore"

This prerogative right to gold and silver mines is included in the term "royalties," which by Sec. 109 of the British North America Act are granted to the Provinces. There is not time to admit of a discussion of this important question in all its bearings. Suffice it to say that the mining man must at his peril see that he has a title not only to the baser metals but also to the precious metals.

Take the ordinary case of ungranted Crown lands, belonging to the Province of Ontario, if the prospector makes a discovery his first step is to apply to the Crown Lands Department, or to any agency thereof for the location. The application should be in writing and must be accompanied by an affidavit showing the discovery of valuable ore or mineral thereon by or on behalf of the applicant and that he knows of no adverse claim.

The applicant must pay into the Crown Land Department one-fourth of the purchase price or rental within sixty days and within three months the remaining three-fourths.

In the case of unsurveyed territory it is necessary also to have a survey in accordance with the Act put in within four months of the date of the application.

The area that may be obtained by an individual is limited to 320 acres, and that which may be obtained by any firm, partnership, syndicate or incorporated company is limited to 640 acres

The Act contains specific directions as to the form and size of the locations and the price is fixed by statute. The applicant may obtain either a patent granting him the freehold, or a lease which under the terms of the Act is renewable. In case there is no dispute the patent or lease is issued in due course upon the legal requirements being duly complied with.

*See McPherson & Clark's Law of Mines in Canada, page 833.

In case of a dispute the matter is decided by the Commissioner of Crown Lands, according to what Chancellor Vankoughnet, who had filled the office with great ability, aptly designated Crown "Lands Law."

The facts are proved usually by affidavits more or less true, sometimes by *viva voce* evidence more or less false.

To illustrate how binding the obligation of an oath is considered, I may mention the case of affidavits filed in the Crown Lands Department at Toronto, to comply with the old regulations requiring agricultural lands to be fenced before Patents issued. It was the case of an officer who had a supreme contempt for the snake fences of Ontario, he and a military friend fenced round the land desired with swords after the most approved Aldershot style. Then he put in an affidavit that he had fenced round the land, and his friend swore that he was disinterested and was personally aware of the fact.

There is no appeal to the courts from the decision of the Commissioner which is usually final.

But the courts have jurisdiction to repeal and avoid letters patent issued erroneously or by mistake or improvidently or through fraud.

There is a provision for encouraging prospectors by giving to the first discoverer of minerals a free grant of a location of forty acres where the vein, lode or other deposit is not less than five miles from the nearest known mine. There is also a provision allowing prospectors to stake out locations in unsurveyed territory under regulations, where the Commissioner of Crown Lands is satisfied that the lands have no value for pine timber, and the prospector under this staking clause may hold the locations for a period of two years, subject to an expenditure of $3 00 per acre in the first year, and $7.00 per acre in the second year for actual mining work, after which he is required to complete his application as provided in the case of ordinary lease or sale of a mining location.

In the case both of patents and leases $1.00 per acre has to be expended during the first two years, and not less than $1 00 per acre during each remaining year of a period of seven years, or in all $6.00 per acre during the first seven years after the issue of the lease or patent.

It is also important to know that at the expiration of ten years the lease is convertible into a patent, or the lessee may at any time during the term upon payment of all rent due and performance of all other conditions become the purchaser This part of the Act also provides for the case of one of several co-owners failing to contribute his proportion to the expenditure required under the Mines Act.

Where an owner of land has only the surface rights, the Department may sell the mining rights, and the owner of the mining rights may then work subject to payment of compensation to the owner of the surface rights. In the case of failure to agree on this the compensation is ascertained by the Director of the Bureau of Mines.

After the patent of mining a location is obtained the property is then subject to the jurisdiction of the Ontario Legislature, to which is granted by the British North America Act exclusive jurisdiction over property and civil rights. The Province has also power to deal with all matters of a local or private nature in the Province, and also to levy direct taxation within the Province in order to the raising of a revenue for Provincial purposes. Under this authority Part 4 of the Mining Act has been passed adopting certain mining regulations.

These are substantially adapted from the English Metalliferous Mines Act of 1872, as amended by subsequent English legislation.

The authorities are collected at p. 274 et seq of The Law of Mines in Canada.

The person working the mine is also subject to the jurisdiction of the Parliament of Canada as defined by the British North America Act.

The only headings of Dominion jurisdiction to which it is necessary to refer are: (Sec. 91)—

s.s. 2. The regulation of trade and commerce.
s.s. 3. The raising of money by any mode or system of taxation.
s.s. 24. Indians and lands reserved for Indians.
s.s. 27. The Criminal law.

The Dominion Parliament has the power to impose export duties, but the Provincial Legislatures have no such power either directly or indirectly.

Suppose the title to a mining property has been acquired and it is desired to form a company for the purpose of working the property, the Provincial Legislature has power to make laws for the incorporation of companies with Provincial objects. By reason of the grant of the residuum of legislative power to the Dominion by the British North America Act, the Dominion Parliament has power to legislate with respect to the incorporation of companies having other than provincial objects. If therefore, the company desire to mine in more than one Province, they may obtain a Dominion charter. If however, power only to mine in one Province is desired, then the charter should be obtained in the Province.

In the case of a Dominion or other extra-Provincial company a Provincial license is required.

The incorporation of the company is obtainable under the Ontario Companies' Act and the Supplementary Act known as The Ontario Mining Companies' Incorporation Act. This Act defines the powers obtainable by mining companies and contains elaborate and complicated provisions in regard to the stock and shares and the sale and disposition of them. Such companies also come under the stringent provisions of the Act respecting Directors' Liability. There would not be time to discuss the various provisions of the Acts which at the peril of the parties concerned must be carefully attended to. It is extremely desirable that the whole question of Company law should be carefully considered, and a comprehensive statute passed governing all companies. The subject has recently received great attention in England, and the law there is certain to be put on a definite basis within a short time.

In regard to the whole question of mining law it is a matter of congratulation that it is largely statutory.

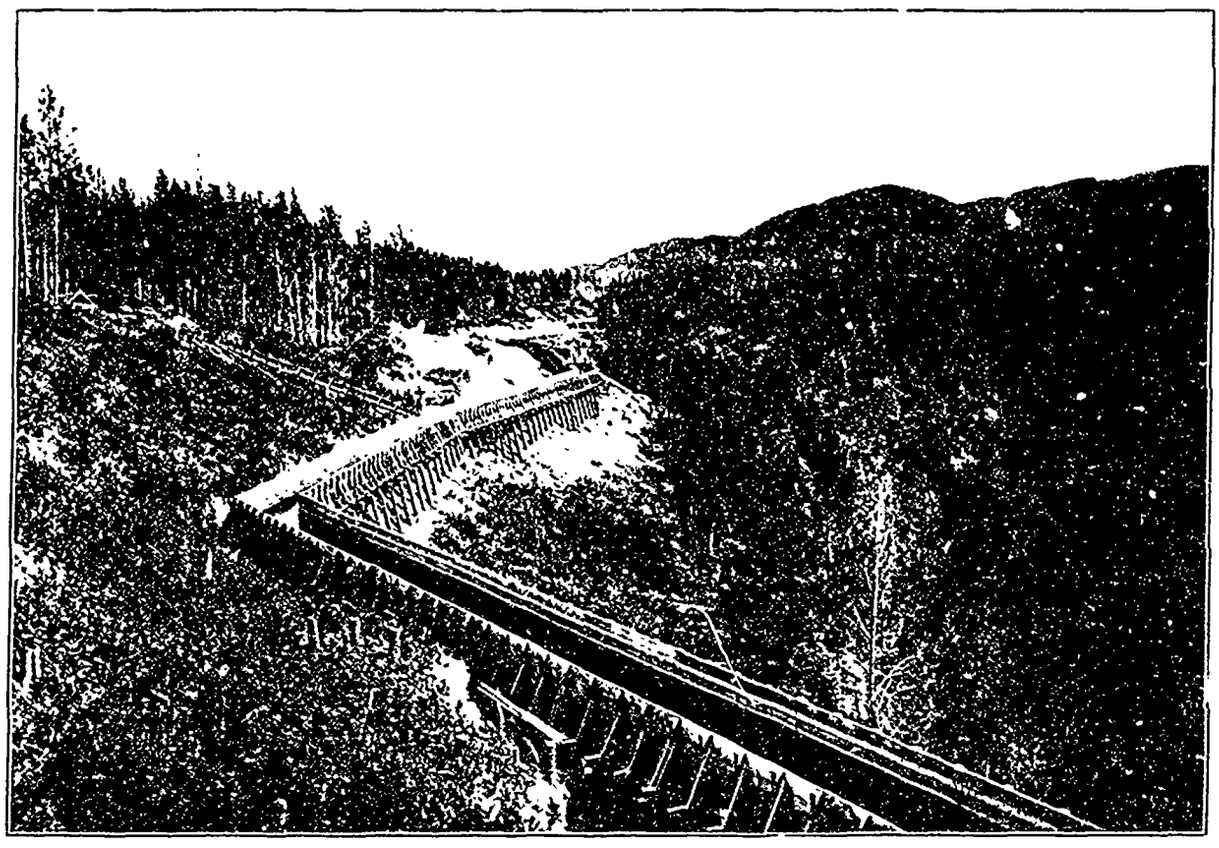
The Crown Lands Department have of course extensive rights in regard to dealing with the Crown lands which are substantially the property of the Province, but the power to interfere with the mining industry by regulation is properly very much restricted. There is a general power to make regulations given by Section 7 of The Mines Act, but this section clearly limits the power to interfere by Order in Council to very definite subjects which alone may be properly regarded as subject to executive action.

The most elementary principles of the British constitution require that no man's rights can be affected by Order in Council, unless the authority to make such Order in Council has been delegated by legislative authority.

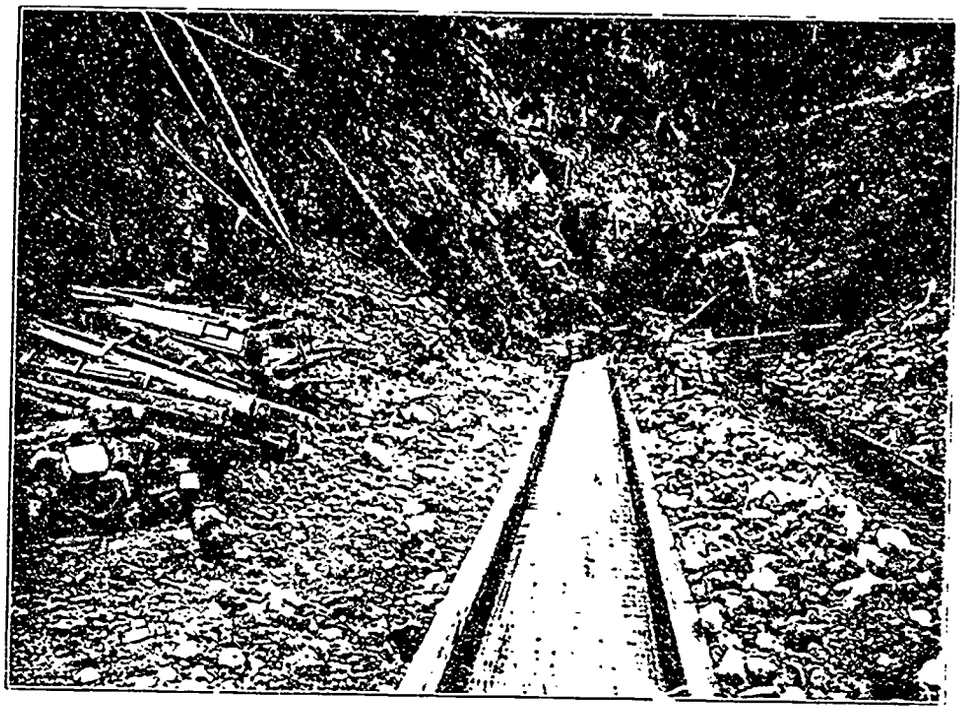
One of the greatest living authorities on Jurisprudence, Sir F. Pollock, states as the criteria of just laws in a civilized community Generality, Equality and Certainty; these three, but from the stand point of the Mining Industry, the greatest of these is certainty.

Law of Mines in Canada, p. 792.

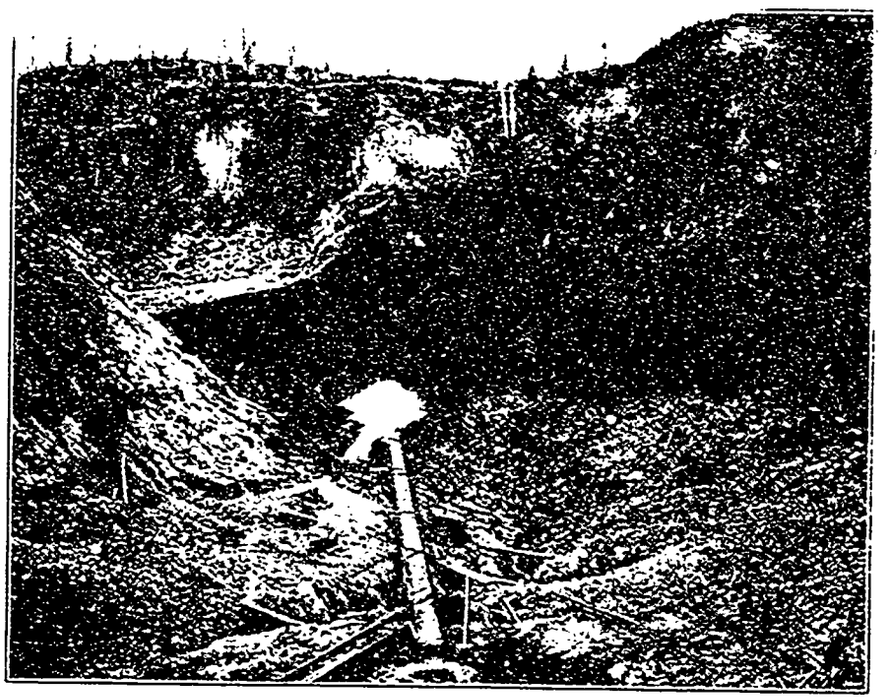
Interior Pit No. 1 Consolidated Cariboo Hydraulic Mine, Bullion, B.C., showing face of bank.



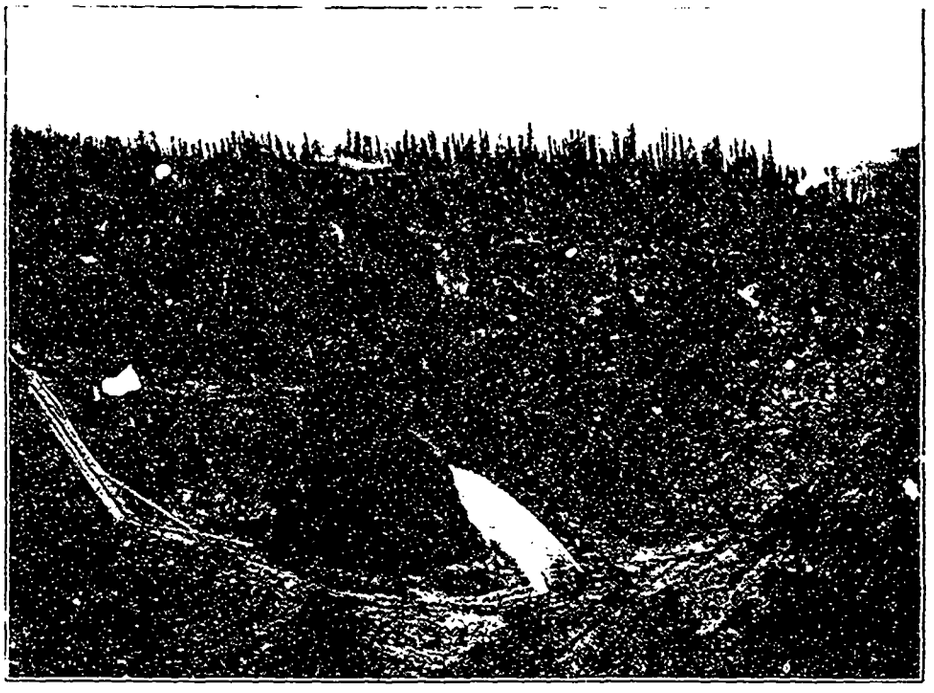
Flume constructed to repair slide out on line of Morehead Canal, Consolidated Hydraulic Mine.



Pit No. 1, Con Hydraulic Mine Double line lower sluices Right hard sluices paved with endwood sluice blocks 12" thick. Left hand sluice paved with improved steel riffles

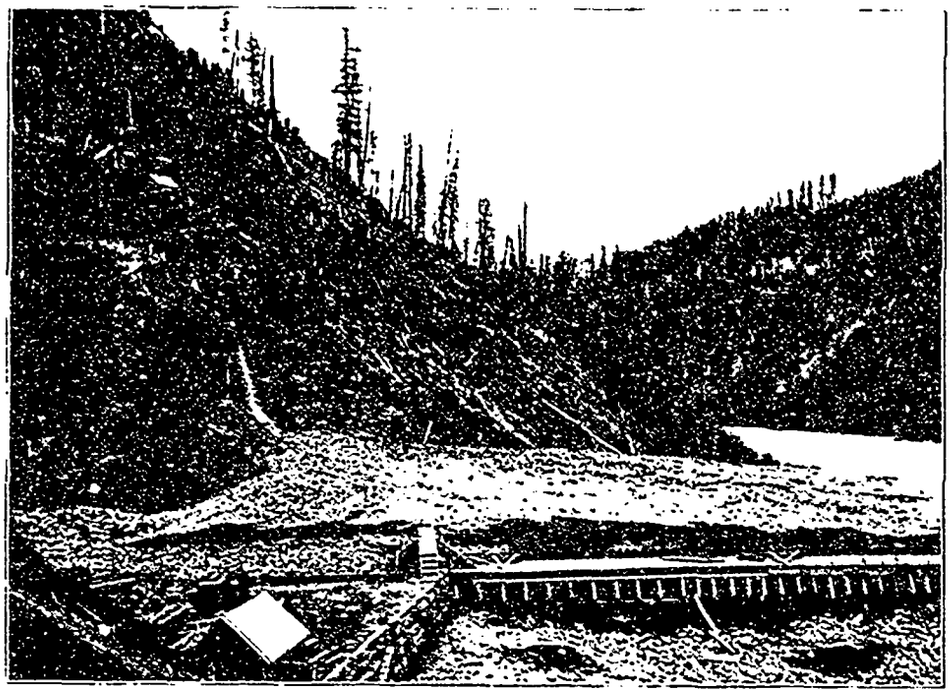


Piping Bank under bed of Dancing Bill Gulch.

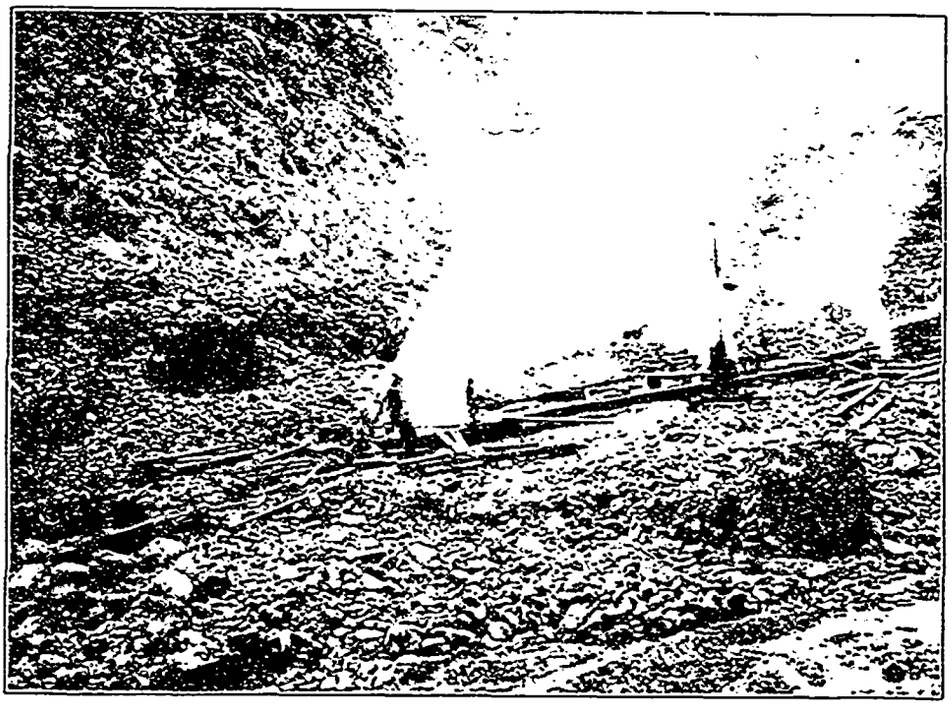


Pipe Ladder in Pit No 1, completed to floor of upper bench. Piping slope for ladder to lower bench.

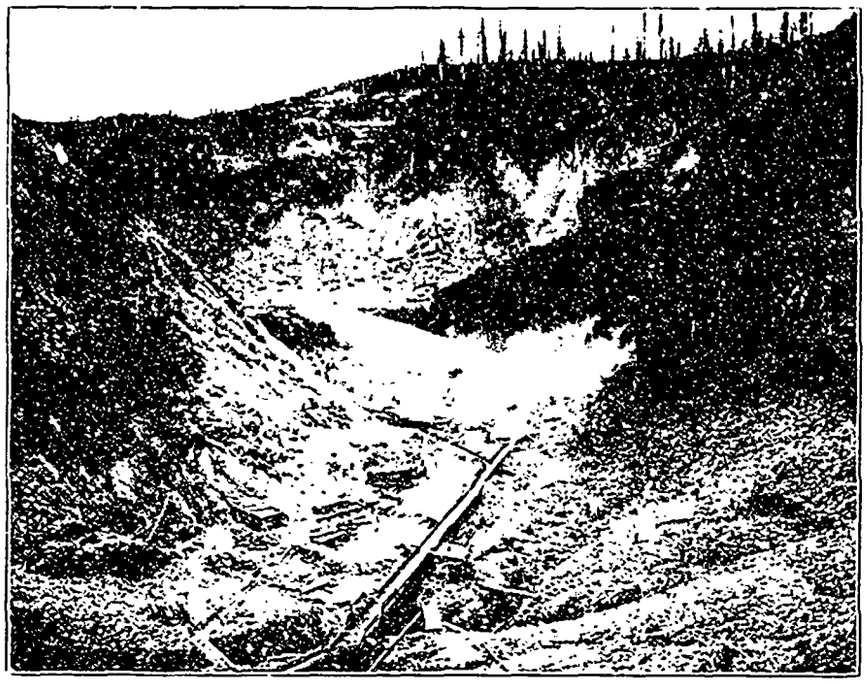
Pit No. 1, Con. Cariboo Mine. Waing up stream around the big bend of channel.



Con. Cariboo Mine Dumps into South Fork of Quesnelle River. Lower sluices 90 feet above high water.
Upper system of sluices 150 feet above high water mark.

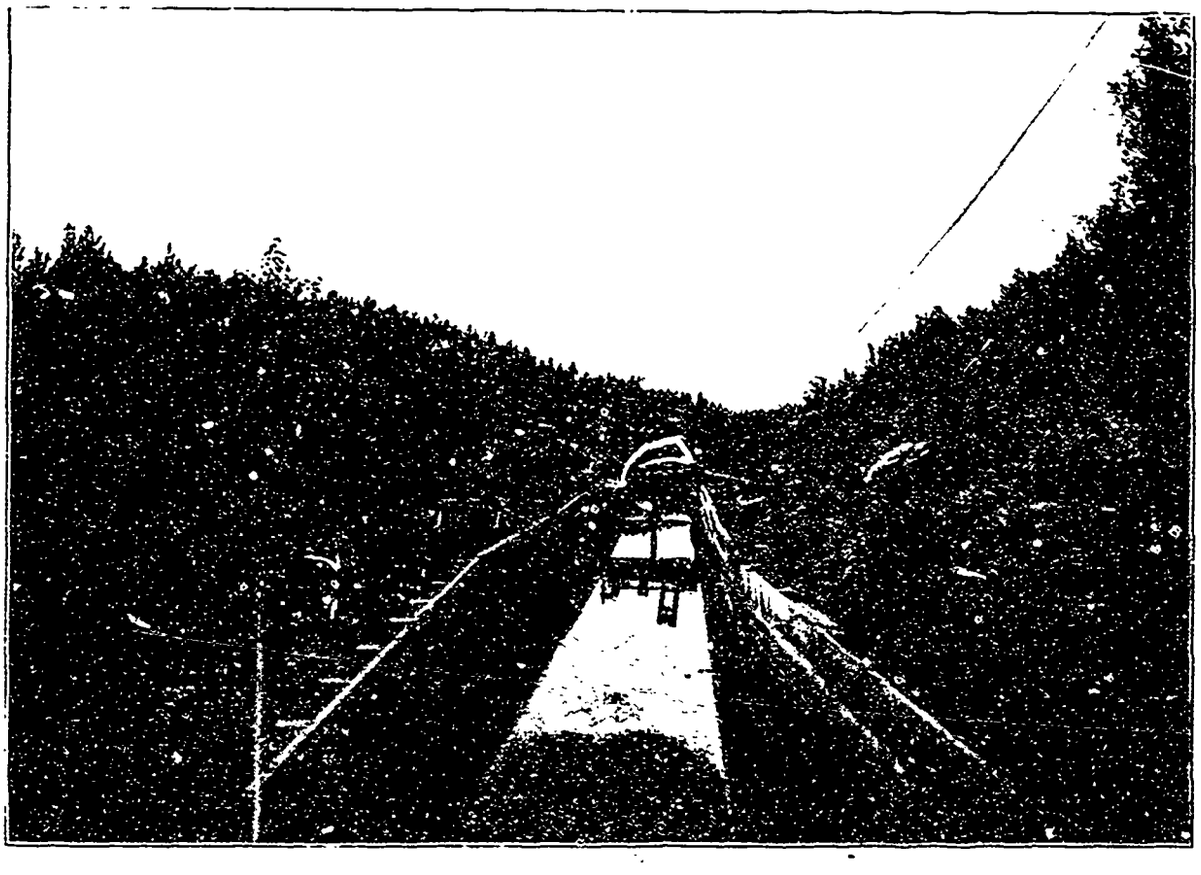


Washing in lower bench after rounding big bend in channel.



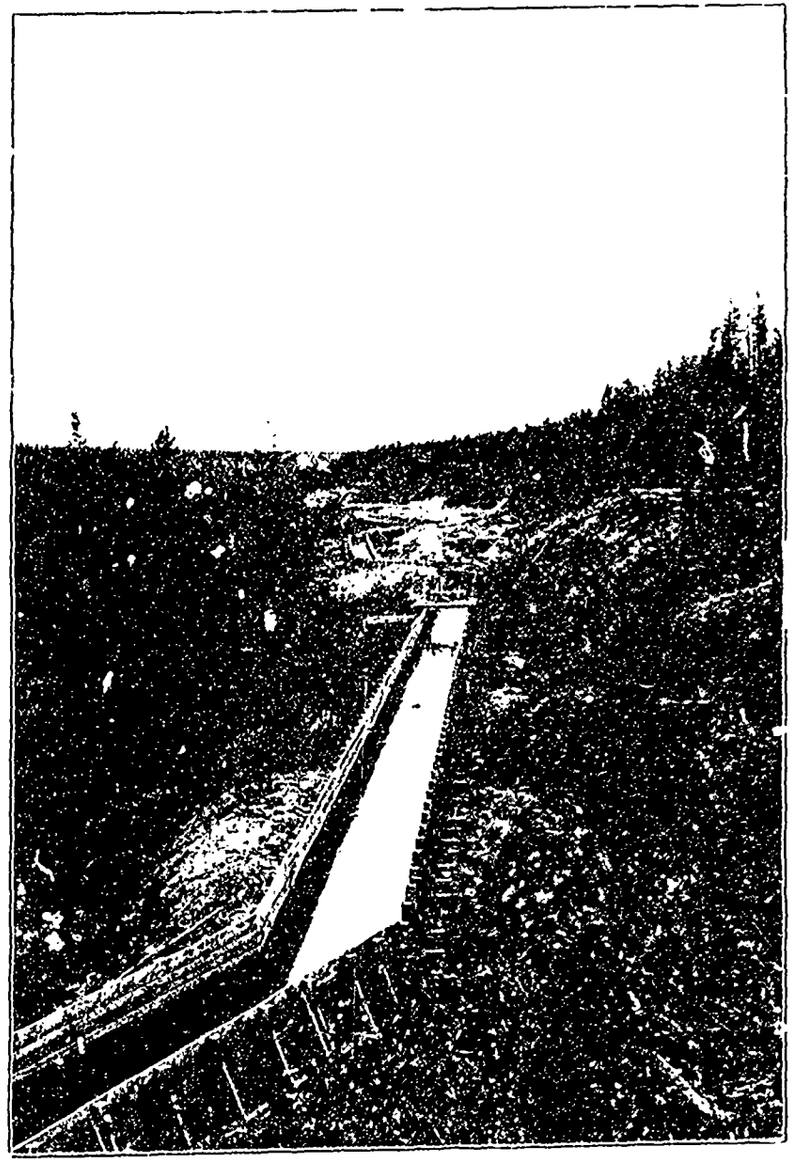
Pit No. 1 Piping Main Bank, Upper Bench

View of Consolidated Hydraulic Mine looking south east up the channel



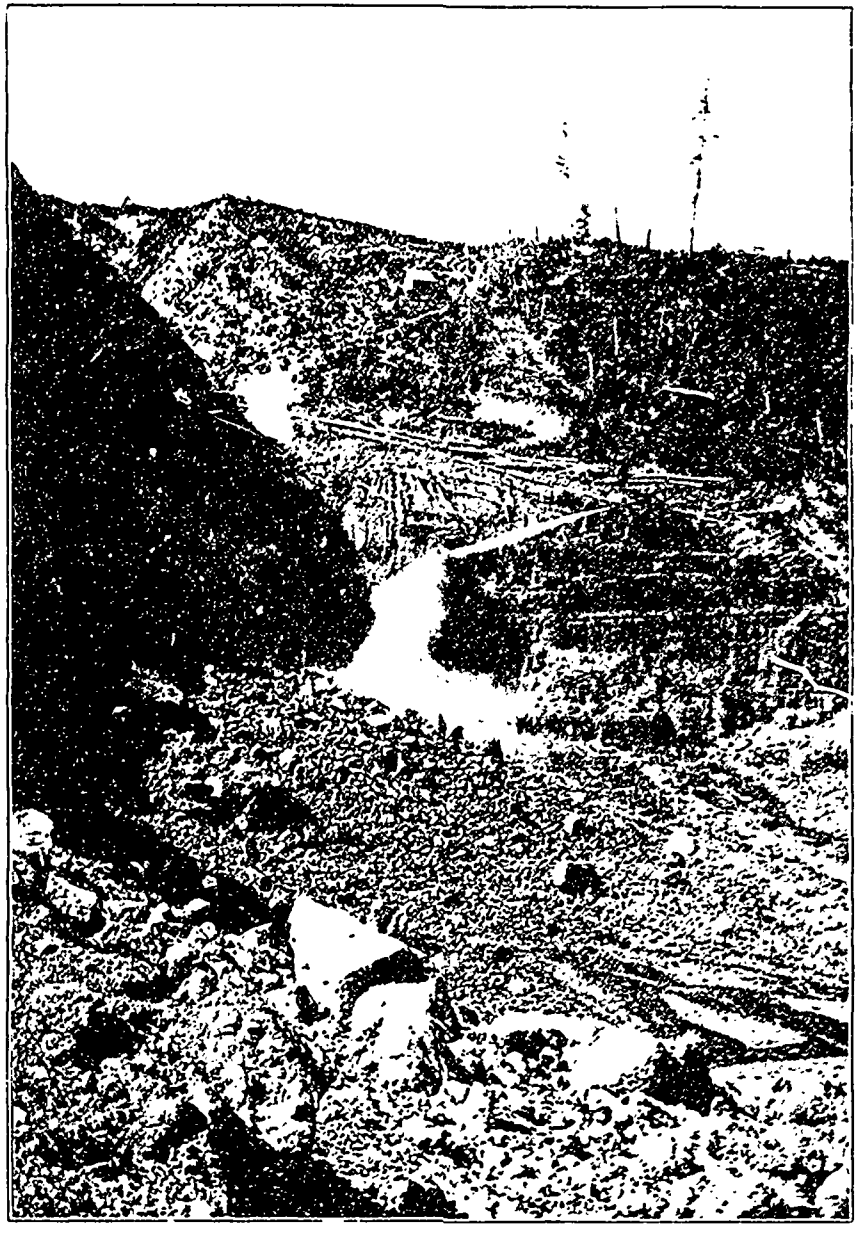
Consolidated Cariboo Hydraulic Mine—Flume on Morehead Canal.

Consolidated Cariboo Hydraulic Mine. - Washing through cuts while upper system of sluices is being repaired.



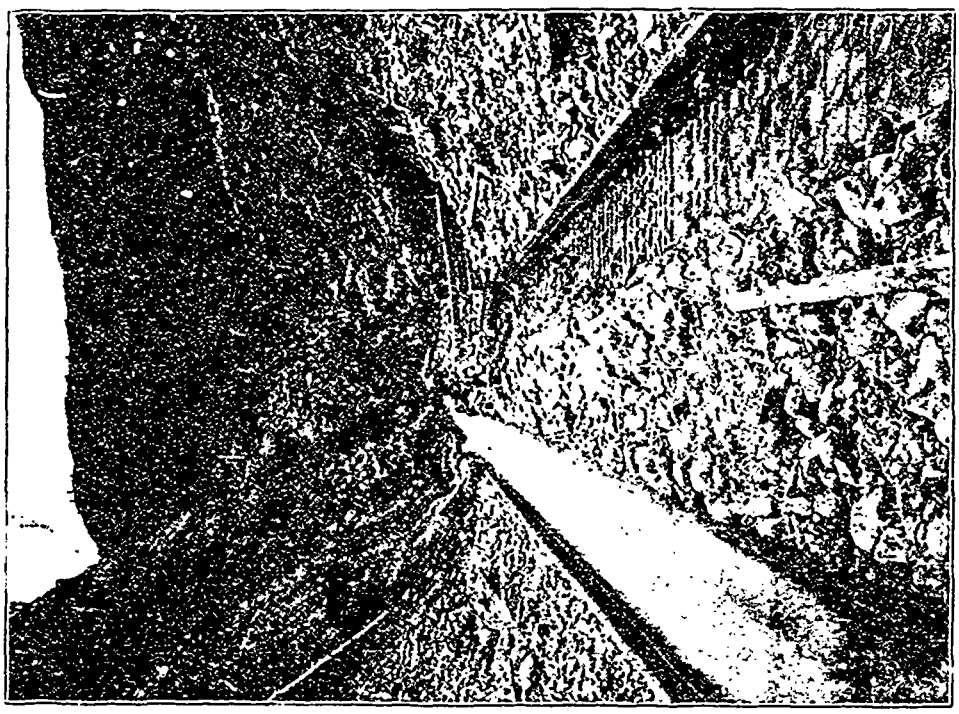
Flume constructed to repair slide on Morehead Canal.

Piping Slope for Pipe Ladder on South-west Rim.—Consolidated Cariboo Hydraulic Mine.

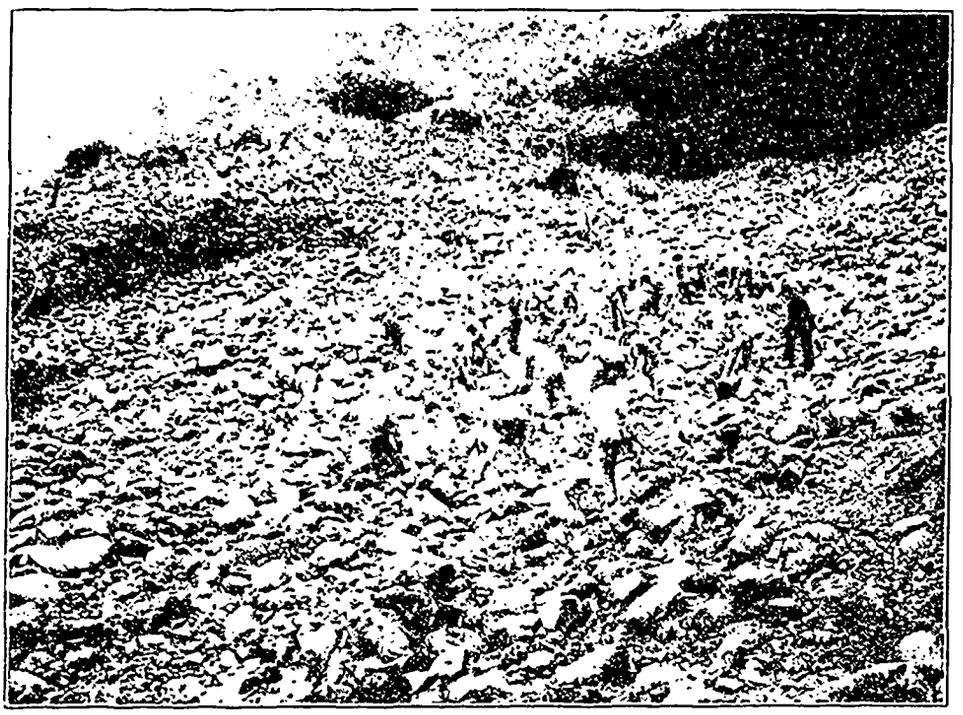


Consolidated Cariboo Hydraulic Mine.—Piping Slope on South-west Rim for Pipe Ladder.

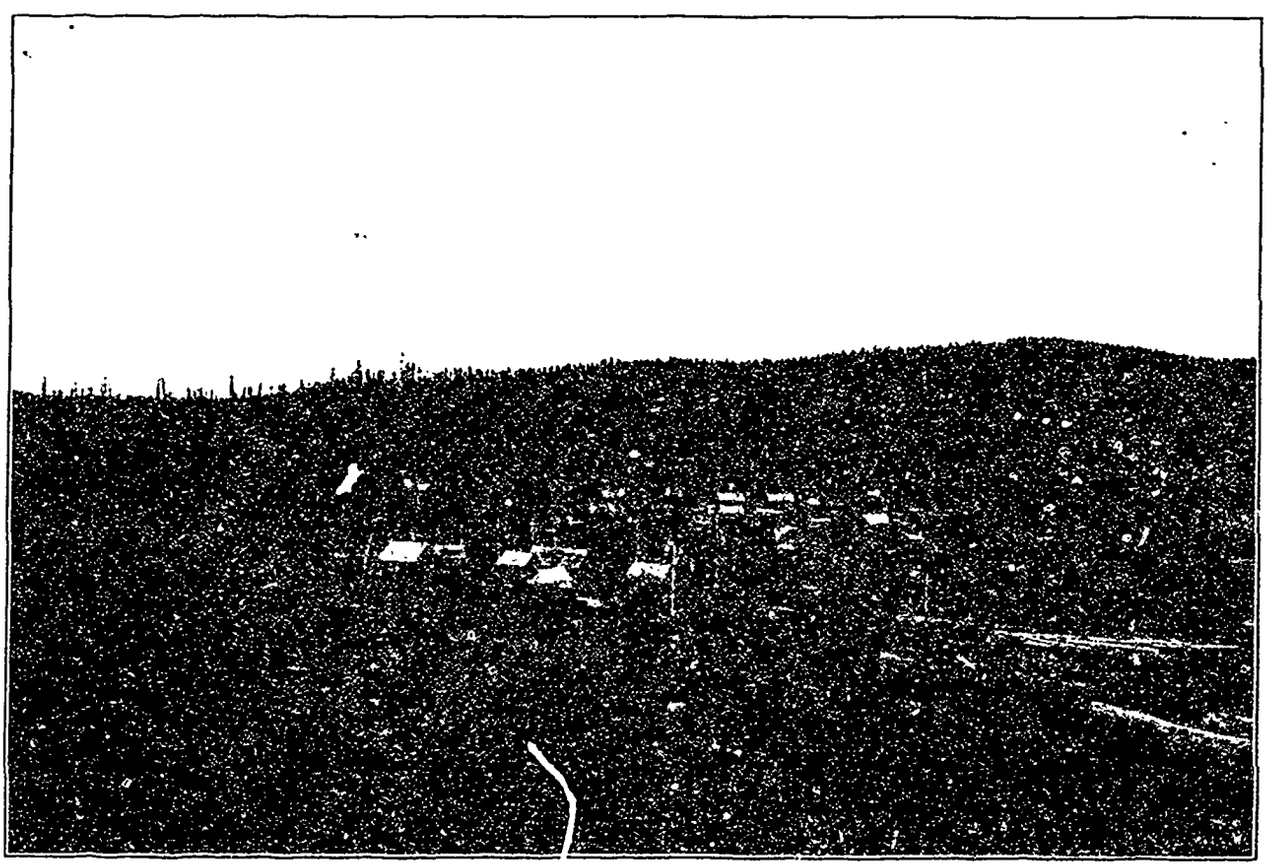
Pit No. 1, Con. Cariboo Mine.—Piping at main bank.



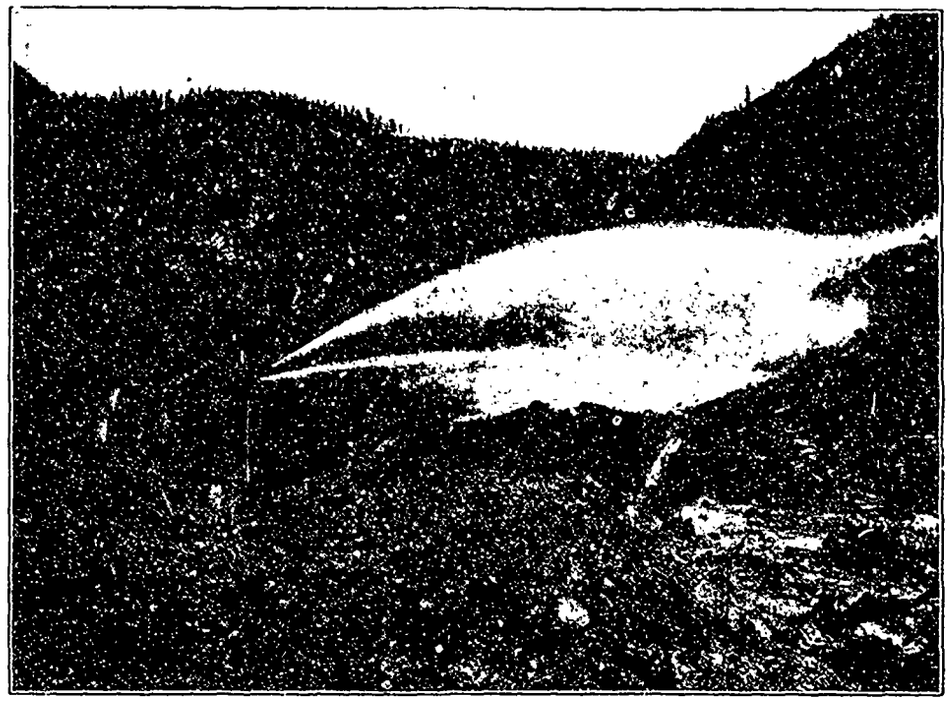
Lower system of sluices, Pit No. 1, double line of sluices seven feet wide and three feet deep.



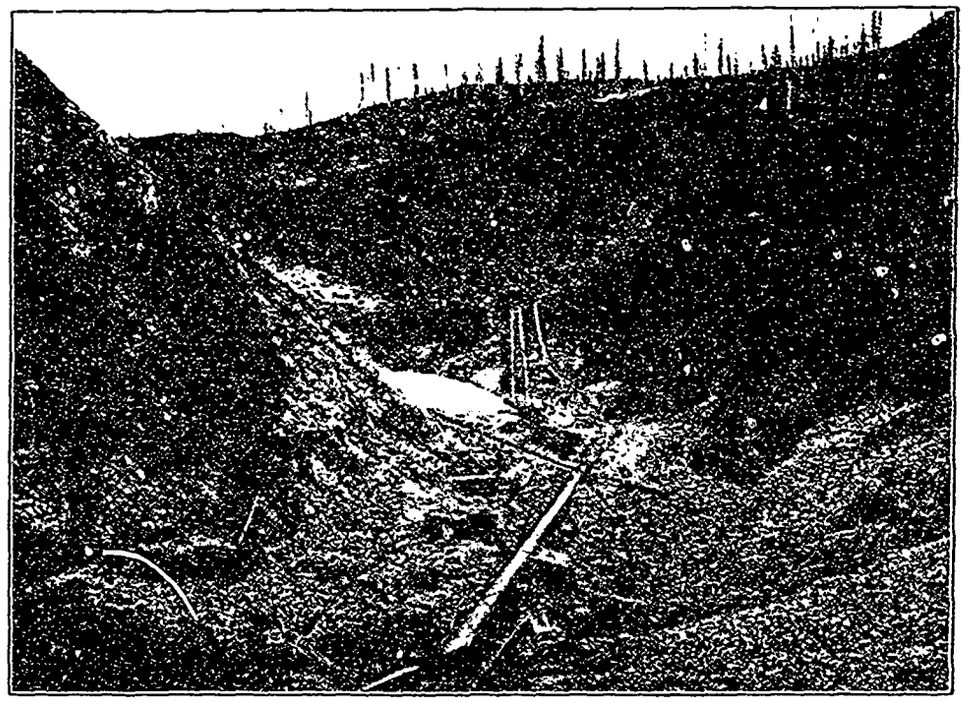
Blasting and clearing accumulation of boulders and tailings left in old Chinese workings, preparatory to installing permanent sluices



Camp Buildings, Consolidated Cariboo Hydraulic Mine, Bullion, B.C.



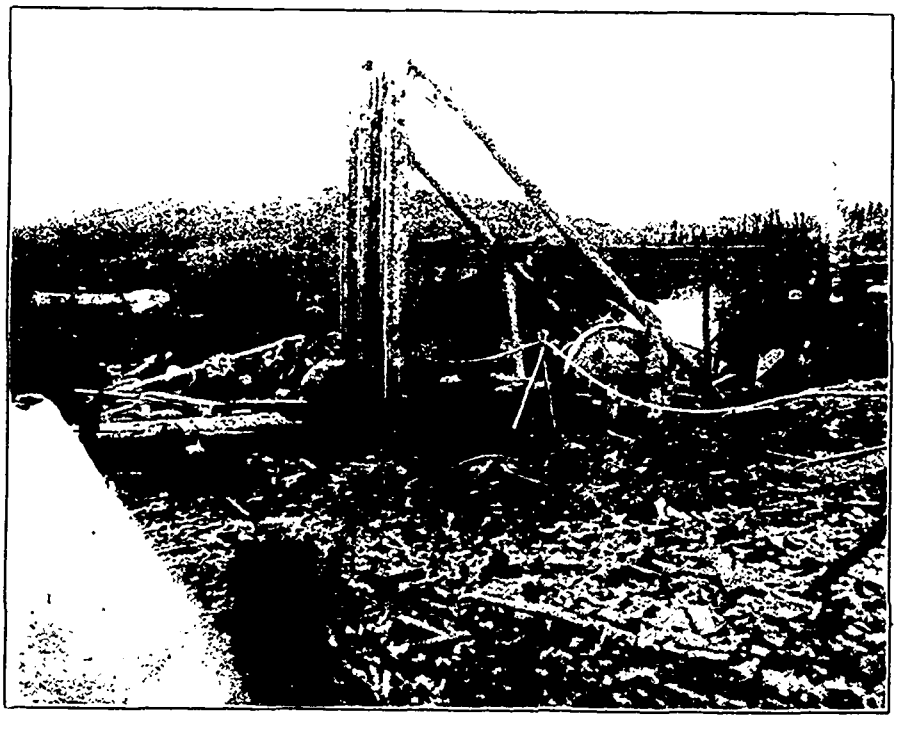
Opening Pit No. II at Black Jack Gulch, about 4,000 feet east of Pit No. I.



Pit No. I, Con. Cariboo Hydraulic Mine.—Piping Slope for Pipe Ladder to floor of workings on lower bench.

Mr T. D GREEN

View showing Offices of Messrs Tyrrell & Green, Mining Engineers, in Dawson, N W.T.



The first Hoisting Plant installed in the Klondyke, view taken on 36 above Discovery on Sulphur Creek.

(From a photo by Mr. R. G. McConnell.)

West Kootenay Notes.

By R. W. Brock, Ottawa.

[Paper read before The Canadian Mining Institute.]

I notice that my name has been placed on the programme for a paper on West Kootenay ore bodies. I do not know that I have much fresh material with which to supplement what was embodied in my paper of last year. I may state, however, that the conclusions there arrived at have received additional confirmation from the work of the past season.

Thus there seems to be no question of the genetic relationship between the "white dykes" or light colored porphyries and the ore bodies.

There are one or two points I will ask you to allow me to refer to a second time for the sake of emphasis. From what was stated of the mode of formation of these ore-bodies and their consequent irregularity, and of the faulting to which they have been subjected, in which the throw varies both in direction and extent, it is obvious how particularly necessary it is in mining these ores, to keep exploratory and development work well in advance of the actual mining, otherwise there are certain to be disappointing and discouraging stoppages in shipments, due to running out of ore.

It is also apparent that running out of ore does not necessarily imply that the ore body has been exhausted and that the mine is played out.

Another point which might be emphasized is that mineralization is seldom confined to a single plane, so that the ore-body is seldom an isolated body in a barren country rock, parallel ore-bodies are always a possibility, and hence the value of exploratory cross-cuts. For the same reason, when cross-cutting for the lead where it has been cut off by a fault, it is to be remembered—and this is not always done in practice—that the first ore encountered is not necessarily the continuation of the ore body originally followed, it may represent a parallel deposit, which has been brought up by the fault. An instance of this kind which came under my notice last summer might be given. In one well-known mine the vein continued strong and rich to a certain point, beyond which it became weaker and in about 50 feet petered out. Cross-cuts were run transversely to try to pick it up, but without success, and work in this direction was for the time being discontinued. On examining the point where the vein weakened, I found evidences of a fault—from the amount of triturated material, quite a considerable fault, suggesting, of course, that what appeared to be the continuation of the vein was in reality a parallel one brought up in place. On questioning the manager remembered having been struck at the time by the sudden change in the tenor of the ore, from high grade to a low.

There is a matter I would like to see discussed by this Institute, and that is the work of the prospector and how it can be made more effective. It is self-evident how important it is for a mining district that it be intelligently prospected, and the prospects intelligently tested. That the ordinary prospector is not always competent to do either of these of himself is apparent to any mining engineer who has an opportunity to look over his work. It is regrettable in every way that the prospector's labor, his time and his money are so often squandered, especially when this is largely due to a lack of technical knowledge. The annual assessment work represents far too frequently just so much time and money put into the ground; often, in fact, it leaves the property in a worse condition than if nothing had been done. The same time and money expended on trails or some other such thing would often prove of much greater value to the prospector, as well as to the community at large. This is due in some cases to the idea that assessment work is a peculiar form of tax levied by the government, and which must be paid by the prospector to hold his claim. So the work is shirked as much as possible, and done not where it will be most valuable but where it can be accomplished most easily. The prospector who has this idea does not recognize the fact that, properly and systematically done, it is testing his property and adding directly to its value, if the property is worth holding. Another cause for this waste of capital is his not realizing that his object should be to show up ore, and that consequently there is a difference in the proper method of procedure in developing a prospect and operating a mine. He is not always acquainted with the rule which should be inviolable in West Kootenay—follow the ore; consequently he sinks outside his ore, or runs cross-cut tunnels to tap it at depth, instead of sinking on the ore no matter where it leads him, or better, where possible, of drifting in on it. He does not always realize how much information may be gained and how much the value of his prospect may be increased by exposing the surface outcrop, nor how much better results can be obtained where only a small amount of capital is available, if it be spent in prospect pits tracing the lead in place of a shaft or tunnel which may have to be discontinued while still in country rock.

Another cause of his squandering his means is the small use he makes of assays, and the fact that when he does have an assay made, it is not of a *sample* but of a *specimen*. Few prospectors indeed are capable of selecting a fair sample.

I think it is a wise move on the part of the British Columbia Government to oblige assayers to pass a government examination. The prospector was not always in a position to judge the reliability and ability of an assayer, but will now feel confident that the licensed man will make a trustworthy examination of his ore. If the prospector could be induced to have the assayer collect his own sample much would be gained. Not only would the prospector gain a much truer idea of the value of his deposit, but with a certificate of the value and extent of his "showing" from a reliable professional man he would find it much easier to secure the interest of mining men who, wearied of looking over wildcats are sometimes too ready to dismiss the prospector's own description as the roseate opinion of a visionary. Also many of those damaging booms which originate from the assay of a *specimen* would be avoided. If the assayer were properly qualified he might, while collecting his sample, examine the property and explain on the spot how the prospect could be most advantageously proved and developed. At all events some properly qualified person should be engaged by the prospector to look over the property and furnish this assistance. The great difficulty, of course, is to make the prospector see the personal advantage in such an expenditure. Possibly if he were encouraged to incur it by having such expenditure for assays and "expert" advice allowed to count as assessment work, he might often be induced to undertake it. If so the gain to the prospector himself as well as to the province would fully justify the change from the present regulations.

There are several minerals which occur in West Kootenay, possibly in economic quantities, for which the prospector is not on the lookout. One of these is cinnabar. In a specimen of hæmatite found on Redding Creek, just across the Hooker Creek divide, a little cinnabar was noticed. A specimen of hæmatite collected by Mr McConnell from Crawford Creek also yielded cinnabar on examination. On account of its resemblance to the streak of hæmatite it might easily be passed over.

Mining Pumps.

By Mr. C. E. Morgan, Toronto.

[Paper read before The Canadian Mining Institute.]

The subject upon which I wish to pass a few remarks today has a wide range, as mining pumps are made of so many different styles.

The class of pump most commonly used when a mine is being developed or sunk is the Sinker, and, as you gentlemen no doubt all know, is made vertically. It is constructed either of the piston or

plunger type, and is largely used for sinking shafts. It is so arranged at the steam end, that should the pump become empty, the pump will still continue working without injury. This machine may be operated either by air or steam or by electricity when desired. The sinking pump being subjected to the rough usage which mine pumps invariably get, its valve gear. which is vital to the operation of the pump, should be protected in some way. The Northey Vertical Sinking pump has no external valve gear which could be broken by flying rock during the time of blasting.

When shaft is sufficiently deep a Station pump is usually installed. These are made in two classes, the direct acting or the rotative type, but when steam is of no consideration the direct acting is generally used. This pump may be made fairly economical by adding a condenser.

In mines where the water is acidulous, the plungers and cylinders of these pumps are n.. le of non-corrosive material, plungers being covered with babbit and the cylinders lined with lead.

It is a very essential point in selecting a mine pump to be sure that its valves are properly constructed and that its valve area is amply large. It is considered a good practice to allow the water to come to the pump at a velocity of 200 feet per minute, so in order to insure the durability of valve and seats the area should be 50 per cent. of plunger. This point is often lost sight of when purchasing, and accounts for the difference in prices of the various manufacturers.

The water cylinders of these heavy service pumps should be specially constructed, and valves should be so arranged as to admit of easy examination. Each valve chest should be cast separately, so as to allow of renewing same without destroying the whole of the water cylinder. Valves should also be cushioned with rubber cushions in place of springs, as usually used, as this arrangement gives by far the best results. The faces of the valves should preferably be made of leather. This type of pump is termed the Pot valve pattern.

In a number of mines that I have visited, I have found that the pumps in use are altogether too small for the work to be performed. In selecting a mine pump for a Station pump, it should be so proportioned that it will perform the work at a piston speed not exceeding 50 to 60 feet per minute. This enables the pump to do its duty without injury.

A rule for proportioning a pump for handling a certain quantity of water is arrived at by taking the quantity of water to be handled per minute and reducing same to cubic inches. For instance,—Supposing we have to handle 500 gallons of water per minute, this, multiplied by 231, which is the number of cubic inches in a gallon, and divided by 600, which is 50 feet per minute, gives area of piston or plunger, if single ; divide by two for duplex.

If it is desirable to know the size of steam cylinder we would divide the quotient arrived at by the steam or air pressure available at pump. This will give us size of cylinder required. The result is for single cylinder pumps, and for Duplex would be divided by 2. Add 40 per cent for friction.

The pump can be lined with wood, if preferred, in place of lead The staves would be of soft pine, machine dressed radially, and the outer and inner grooves suited to their respective diameter. They are cut to exact length and arranged in place. Two of the staves are then bevelled to admit of a third stave between them, and also bevelled, which shall act as a wedge. The middle stave is then driven home with a maul, and the staves will now be firmly fixed in their places in the interior of the cylinder.

Any openings in the cylinder may be lined in the same manner, care being taken that the inner end of such staves closely fit the curviture of the main stave. When these are securely wedged in place, the opening may then be cut through into the working barrels.

When electricity is available and can be used with safety, the triplex power pump is a machine well suited for mining purposes. The principle of the Triplex power pump is as follows :—The crank shaft has three cranks equally spaced 120 degrees apart, and as the pump has three single acting plungers, actuated by connecting rods, with this arrangement of cranks the strokes follow and overlap each other, resulting in a very uniform flow from the discharge pipe of pump, and an equally uniform expenditure of power. This naturally results in the smooth operation of the mechanical parts, and is particularly useful where electric motors are employed.

In the Single or Duplex crank form, the column of moving fluid must necessarily have an intermittent action, but in the pump built on our single acting Triplex Crank principle, the column of moving fluid is constantly in action, and no power is lost.

Another class of pump, which is used in the gold mines of Nova Scotia, is the Cornish pumping engine. This was first used in the Cornwall coal regions of Pennsylvania. This type of pumping engine may be described as a single acting high pressure expansive condensing engine, working single acting pumps through the medium of a beam. These pumps are usually of the plunger pattern, plungers being loaded with iron weights sufficient to counterpoise the pressure of the water power. The engine may be considered as consisting of two parts ; the power of the engine is used to lift the loaded plunger, after which the steam end part of the machine is detached and the weighted plunger is allowed to descend by gravity, at a speed depending on the quantity of engine power in action at the rate in which the water is being drawn away. The chamber of the pump becomes full when the plunger is raised, and the act of inhaling the full charge through the suction valve is a portion of the work which the steam has to perform, and a portion also subject to variation. The speed of the engine is regulated by an adjustable cataract The exhaust valve first and then the steam valves are thrown open by threadle weight, as soon as the catches are detached by the cataract. The valves are closed by a tappit on a plug rod, first the steam valve and then the exhaust valve, the former at a period of a stroke varying in practice between one-third and one-fifth from the commencement, and the latter at the end of the stroke. In engines working on thi principle, as also in all reciprocating engines pumping without cranks, there is nothing to limit the strokes of the engine to any exact length. It is necessary, therefore, that bumpers or catch pieces be provided to restrain the engine at both ends from undue length of stroke, and thick plates of indiarubber under hard wooden plugs are now used for this purpose in place of the spring beams formerly employed.

An engine thus arranged, working alone, lifting water from one fixed level to another, would work continuously with one length of stroke and at one speed, at whatever it might be set.

The single acting engine on the Cornish principle was thought to have some advantages over the pumping engine with crank and flywheel, in the fact that no power is required in the Cornish engine for keeping gearing in motion at each end of the stroke. A certain amount of percussion action is indeed necessary to overcome the inertia of the engine at the beginning of the stroke, but, on the other hand, the whole engine is brought to a dead stand at the end of every stroke by the whole effective power being completely absorbed in the work done in pumping.

The Old Valley Gravels of the Klondike.

By Mr. R. G. McConnell, Ottawa.

[Paper read before the Canadian Mining Institute.]

The gold-bearing gravels of the Klondike are of three kinds, viz : the stream gravels, the bench gravels, and an old set of gravels resting on high benches distributed at intervals along the principal producing

creeks. It is to the latter of these that I want to draw your attention for a few moments, as it presents some features which so far as my experience goes are unique.

The valleys of the principal producing creeks are bordered usually on one side and occasionally on both by wide benches, which owe their origin to a former sudden rise in the general elevation of the country. In consequence of this rise the grade, and cutting power of the streams were increased, and they were enabled to sink their channels some hundreds of feet below the old level. The portions of the old valley bottom not destroyed during the sinking, or by subsequent erosion, constitute the benches in question. They occur on Bonanza Creek from McKay Gulch at intervals all the way down to the mouth, on the lower part of Eldorado Creek, on Hunker Creek from above the Gold Bottom Forks down to the mouth, and also for some distance up Gold Bottom and Last Chance Creeks, and they are also found along Quartz Creek, a tributary of Indian River, between Calder and Canyon Creeks. They were not noticed on Sulphur or Dominion Creeks, the two principal Indian River gold streams

The benches vary in width from a few hundred feet to half a mile or more. They slope uniformly down stream, but at a lower grade than the present valley bottoms, and in consequence of this, rise gradually in the banks as we descend. Their elevation above the bed of the present valley increases from about 100 feet where they appear first, to about 300 feet at the mouths of Bonanza and Hunker Creeks.

The gravels resting on the benches consist of a deposit known as the quartz drift resting on bedrock, and an upper set of flat, rusty-colored gravels resembling those in the present valley, but very much thicker.

The quartz drift differs markedly in many of its characters from any deposit, either marine, lacustrine, fluvial or glacial, known to me. It is uniformly light greyish to whitish in color, and the long lines of white dumps from the workings now form one of the most conspicuous features of the valley. The color does not vary to any material extent with differences in the bedrock, as in many places heavy deposits of the quartz drift looking quite white at a distance, rest on wide bands of dark, graphitic schists.

The quartz drift consists essentially of a compact mixture of small, clear, little worn and often sharply angular quartz grains, and tiny scales of sericite, thickly packed with rounded, sub-angular, and wedge-shaped boulders of quartz, and less frequently of grayish mica schist, the principal rock of the district. The deposit is remarkably uniform in composition from top to bottom. Beds of coarse sand occur in places, but are infrequent, and in the great majority of the sections the siliceous grains and the light sericite scales have not been sorted into separate beds but remain intimately commingled throughout. The sands, however, become noticeably coarser towards the limit of the deposit on the upper parts of the creeks.

The boulders of the quartz drift are always more or less rounded and water-worn, and are found in all sizes from small pebbles up to large boulders 2 or 3 feet in diameter. They occur scattered irregularly through the sandy matrix or roughly stratified in it, but were nowhere found forming heavy homogeneous beds such as one would expect in a stream deposit. They do not show evidence of prolonged rolling. Well rounded boulders are occasionally present, but in the majority of cases the edges only are worn away, and wedge-shaped, sub-angular fragments, still preserving approximately the shape of the short, blunt vein from which they originated, are very common. The proportion of quartz to schist boulders was estimated at about four to one.

The quartz drift varies in thickness from a few feet up to 120 feet and in width from 100 yards to half a mile or more. It increases in volume towards the mouths of the creeks.

The quartz drift is everywhere more or less gold-bearing, but the productive portion is usually confined to the lower 2 feet of the deposit. The distribution of the gold is more patchy and irregular than is the case with the creek gravels, and does not seem to follow any well defined channel. Spots of extraordinary richness, carrying hundreds of dollars to the square yard, are occasionally found close by comparatively barren stretches. Their general richness over wide areas is, however, attested by the fact that notwithstanding the scarcity of water and the great expense entailed in drifting in frozen gravel, in a region where labor commands a dollar an hour, hundreds of rockers are at work along the various creeks. The gold in the quartz drift is more angular and contains a larger proportion of nuggets than in the creek gravels.

The upper set of flat stratified gravels mentioned before as overlying the quartz drift, has not so far proved remunerative at any point. It overlaps the quartz drift towards the hillsides and in places occupies a deep depression between the ridge of quartz drift and the valley slopes.

The precise origin of this peculiar deposit is still somewhat obscure. It resembles a glacial deposit in appearance, and also, in places, in its ridge-like outline, and I was at first inclined to attribute it to ice; but no evidences of ice action either on the boulders or on the surfaces of the bedrock were found. The bedrock is rough and wavy, and is often soft and decomposed for some distance below the surface. A glacier could not have flowed down the valley without leaving some evidences of its work. It is not a lake deposit, as both upper and lower surfaces slope down streams running in all directions, and besides clays are conspicuously absent. It has not been formed *in situ*, as the boulders are all more or less rounded. It is not, finally, an ordinary stream deposit, a fact shown by its comparatively unsorted condition, the sharp angularity of the quartz grains, and the uniformity of the sections from top to bottom. It has not travelled far or the quartz grains would show more wear, and I am inclined to consider it as due to a wash from the neighboring hills conditioned by a sudden increase in precipitation acting on a previously deeply decomposed surface, and acting in conjunction with a stream moving slowly down the valley. The large boulders were probably partially rounded before the movement commenced, and were worn to some extent during the short journey, while the smaller grains would escape with less injury. This sudden and somewhat tumultuous mode of deposition would also account for the comparatively unsorted condition of the deposit. The explanation I have offered is, however, only a tentative one, and I would be glad of an expression of opinion from the members.

The Largest Compressor in Canada.

The Dominion Coal Company has recently placed with Messrs. Walker Bros., Wigan, England, through their Canadian representative Mr. Francis T. Peacock, Montreal, an order for two air compressing engines, one pair of which will installed at their new shaft Dominion No. II, the other pair being ordered for Dominion Nos. III and IV. These air compressors will be considerably larger than any other compressors in the Dominion of Canada, the following being a brief description of them:—Cross Compound Steam Cylinders, 31 in. dia., of high pressure cylinder and 57 in dia of low pressure cylinder, Corliss valves, and two stage air cylinders, 51 in. dia. of low pressure cylinders and 32 in. dia. of high pressure cylinders, with Walker Brothers' patent cast steel Inlet and Outlet air valves and intercooler between low pressure and high pressure cylinders. The stroke of the engines will be 5 ft. 0 in., fly wheel 20 ft. 0 in. dia. Automatic governors and regulators will be furnished with the engiues. Some idea of the size of these engines may be gathered from the fact that each pair of compressors will occupy a floor space of about 25 feet by 56 feet. The weight of each pair of compressors is approximately 163 gross tons.

SUCCESSFUL MEETING AT MONTREAL.

Many New Members Elected—Valuable Papers and Interesting Discussions.

The Third Annual General Meeting of the members of the Canadian Mining Institute was held in the Club room, Windsor Hotel, Montreal, on 7th, 8th and 9th inst. The following signed the register of attendance :—

Mr. S. S. Fowler, S.B.M.E., London & B.C. Gold Fields, Nelson, B.C.
Mr. Charles Fergie, M.E., Intercolonial Coal Co., Westville, N.S.
Mr. David G. Kerr, C. & M.E., Cordova Exploration, Ltd., Marmora, Ont.
Mr. P. Kirkgaard, M.E., Canadian Gold Fields, Ltd., Deloro, Ont.
Major R. G. Leckie, Can. M. and Metallurgical Co., Sudbury, Ont.
Major-Gen. Sir Henry C. Wilkinson, Regina (Can.) Mine, Rat Portage, Ont.
Mr. Charles Brent, Metallurgist, Rat Portage, Ont.
Mr. A. M. Hay, Dominion Gold Mining & Reduction Co., Rat Portage, Ont.
M. Leslie Hill, C. & M.E., Vancouver, B.C.
Mr. H. M. Wylde, Sec. Mining Society of N.S., Halifax.
Dr. Robert Bell, Geological Survey, Ottawa.
Dr. J. Bonsall Porter, McGill University, Montreal.
Prof. W. G. Millar, School of Mining, Kingston.
Dr. W. L. Goodwin, School of Mining, Kingston.
Mr. Russell L. Blackburn, Blackburn Mine, Ottawa.
Mr. J. B. Tyrrell, M.A., M.E., Dawson, N.W.T.
Mr. R. G. McConnell, Geological Survey, Ottawa.
Mr. A. P. Low, Geological Survey, Ottawa.
Mr. J. C. Gwillim, Geological Survey, Ottawa.
Mr. R. W. Brock, Geological Survey, Ottawa.
Mr. Archibald Blue, Director of Mines, Toronto.
Mr. J. Obalski, Inspector of Mines, Quebec.
Mr. J. W. Evans, C. & M.E., Sudbury, Ont.
Mr. James Johnston, Crow's Nest Pass Coal Co., Fernie, B.C.
Mr. A. E. Barlow, Geological Survey, Ottawa.
Mr. Theo. C. Denis, Geological Survey, Ottawa.
Mr. A. W. Fraser, Ottawa.
Mr. J. M. Clark, Q.C., Toronto.
Prof. Courtenay DeKalb, School of Mining, Kingston, Ont.
Mr. J. F. Higginson, Buckingham, Que.
Mr. W. F. Holland, Victoria Nickel Mine, Whitefish, Ont.
Mr. Eugene Coste, M.E., Prov. Nat. Gas. and Fuel Co., Toronto.
Mr. Wm. Blakemore, M.E., Montreal.
Mr. Feodore Boas, Montreal.
Mr. R. T. Hopper, Montreal.
Dr. Frank D. Adams, McGill University, Montreal.
Mr. George E. Drummond, Canada Iron Furnace Co., Montreal.
Mr. James T. McCall, Montreal.
Mr. C. E. Morgan, Northey Pump Co., Toronto.
Mr. Robert Jaffery, Crow's Nest Pass Coal Co., Toronto.
Mr. George MacDougall, Montreal.
Mr. A. W. Stevenson, Montreal.
Mr. A. W. Morris, Montreal.
Mr. S. J. Simpson, Jas. Cooper Manufacturing Co., Montreal.
Mr. E. W. Gilman, Canadian Rand Drill Co., Montreal.
Mr. H. W. DeCourtenay, Firth Steel Co., Montreal.
Mr. J. Stevenson Brown, Montreal.
Mr. J. Burley Smith, M.E., Montreal.
F. H. Hopkins, Dominion Wire Rope Co., Montreal.
Mr. James D. Sword, Rossland, B.C.
Mr. Thos. P. Bacon, New Rockland Slate, Co., Montreal.
Dr. James Reed, Reedsdale, Que.
Mr. Dwight Brainerd, Hamilton Powder Co., Montreal.
Capt. R. C. Adams, Montreal.
Mr. B. T. A. Bell, Editor CANADIAN MINING REVIEW, Ottawa.
And a party of mining students from the Kingston School of Mines and McGill University.

The proceedings opened at 10.30 on Wednesday morning. In the absence of the President, Mr. George E. Drummond was called to the chair. The minutes of the last annual meeting having been published in the Journal of the Institute were, on motion, held as read.

NEW MEMBERS

The following were elected to membership :—

Mr. Henry S. Poole, M.A., A.R.S.M., Mining Engineer, General Manager Acadia Coal Co., Stellarton, N.S.

Mr. Sydney B. Wright, Chemist and Metallurgist, Canadian Gold Fields Ltd. Deloro, Ont.

Mr. E. A. Daly, Mining Engineer, General Manager Dufferin Mines, Nova Scotia.

Mr. Arthur G. McNaughton, Mine Manager, Bluenose Gold Mining Co., Goldenville, N.S.

Mr. David G. Kerr, Mining and Mechanical Engineer, General Manager Cordova Exploration, Ltd., Marmora, Ont.

Mr. William Francis Little, Colliery Manager, General Manager H. W. McNeill Co., Ltd., Anthracite, N.W.T.

Mr. James Johnstone, Colliery Manager, General Manager Crow's Nest Pass Coal Co., Fernie, B.C.

Mr. Douglas John Gillon, O.L.S., Civil Engineer, Fort Frances, Ont.

Mr. E. R. Faribault, B.A.Sc., Geologist, Geological Survey, Ottawa.

Mr. E. Nelson Fell, A.R.S.M., Mining Engineer, Athabasca Gold Mine, Ltd., Nelson, B.C.

M. F. H. Clergue, Sault Ste. Marie, Ont., General Manager Lake Superior Power Co.

Mr. A. P. Turner, Canadian Copper Co., Copper Cliff, Ont.

Mr. McMillan, Mine Manager, Mikado Gold Mining Co., Rat Portage, Ontario.

Mr. Pengelly, Metallurgist, Mikado Gold Mining Co., Rat Portage, Ont.

Mr. W. H. Holland, Whitefiish, Ont.

Mr. Charles Meyer, Ottawa, Ont.

Mr. A. W. B. Hodges, Supt. Granby Consolidated Mining & Smelting Co., Grand Forks, B.C.

Mr. A. Mackenzie, Dominion Coal Co., Montreal.

Mr. E. A. Haggen, Assayer, Golden, B.C.

Dr. Carl Hoeffner, Hoepffner Refining Co., Hamilton, Ont.

Mr. John Patterson, Hamilton.

Mr. Walter S. Keith, Mining Engineer, Greenwood.

Mr. J. Walter Wells, Assayer, Belleville, Ont.

Mr. G. Herbert Dawson, Vancouver, B.C.

Matthew T. Hunter, Managing Director Wendigo Gold Mining Co., Rat Portage, Ont.

Robert Rogers, Managing Director Bullion Gold Mining Co., Rat Portage, Ont.

Alan Sullivan, Manager Anglo-Canadian Gold Mining Co., Rat Portage, Ont.

Dr. S. S. Scovil, Mine Owner, Rat Portage, Ont.

Mr. E. F. Kendall, Mine Owner, Rat Portage, Ont.

Mr. Paul Johnson, Metallurgist B.C. Copper Co., Greenwood, B.C.

Mr. W. T. Rodden, Hamilton Powder Co., Montreal.

Mr. D. M. Sexton, Canada Life Building, Montreal.

Mr. J. M. Clark, Q.C., Toronto.

Mr. G. S. McAvity, St. John, N.B.

STUDENT MEMBER.

Mr. M. M. Campbell, 68, St. Famille street, Montreal.

SECRETARY'S REPORT.

The SECRETARY submitted the following review of the operations of the Institute during the past year :—

"It is extremely gratifying to be able to congratulate the members upon the continued growth and success of the Institute during the past year.

MEMBERSHIP.

"When the Institute was re-organised on its present basis, in March, 1898, our membership numbered 63; at our last annual meeting it had been increased to 193, while during the past year we had no fewer than 297 members, including 15 students, on our register. The distribution of this membership may be gathered from the following comparative statement :—

	1899.	1898.	Increase
Province of Quebec	77	66	11
" Ontario	68	44	24
" British Columbia	65	42	23
" Nova Scotia	16	16	—
" New Brunswick	1	2	—
North-West (including Yukon)	5	5	—
Newfoundland	1	—	—
United States	17	11	6
Great Britain	9	4	5
China	1	—	1
Honolulu	1	—	1
Spain	1	—	1
Died since last report	4	1	3
Address unknown	1	—	—
Struck off for arrears	15	—	—
Resignations going into force at 1st March	4	—	—
Student Members	15	2	—
Applications for Membership on hand	34	—	—

"(NOTE.—Since the above summary was prepared, it has been learned that three members, Messrs. Hamilton Merritt, J. E. Leckie, and Thos. Brown, are serving with the colours in South Africa.)

OBITUARY.

"Since our last annual meeting, the Institute has to deplore the loss of the following members by death :—

"Mr. James MacGregor, Mining Engineer to the New Vancouver Coal Mining and Land Co., Nanaimo, B.C., killed by an unfortunate accident in the pit.

"Mr. W. J. Nelson, Secretary-Treasurer of the Intercolonial Coal Co., Montreal, a gentleman widely known and highly respected in the Upper Canada coal trade.

"Mr. Maurice A. Bucke, of Kaslo, B.C., a mining engineer, occupying a prominent position in the profession, killed in a runaway accident in Montana.

"Col. T. J. Tuck, of Sherbrooke, one of the oldest members of the Quebec Association.

MEETINGS, PAPERS, AND EXCURSIONS.

"At our Annual General Meetings held in March, twenty-three papers were presented, and these, together with the discussions and proceedings, have been published in the second volume of our Journal, issued to members in July. Many of these papers have been reproduced in European and American technical journals and magazines.

"In September a party of the members enjoyed a most delightful and highly interesting excursion to some of the prominent mining districts of British Columbia, visiting the collieries at Anthracite, the Hot Springs and National Park at Banff, the Le Roi, War Eagle, Centre Star, Columbia, and Kootenay and other mines of the famous Rossland Camp, the Pelatin-Clerici Mill at Silica, the Smelting Works at Trail, and the Silver King and Whabasca mines and the Hall Mine's Smelting Works at Nelson.

"At every point touched by this excursion our members were received with the greatest courtesy and kindness, and in many instances with the most lavish hospitality.

"Through an unfortunate and greatly to be regretted misunderstanding, the party, as a whole, did not visit the celebrated Slocan district, where considerable trouble and expense had been gone to by the authorities at Kaslo and other points to make the visit profitable and enjoyable. Those members who did visit this district speak in the highest terms of their reception and entertainment.

"Smaller parties visited the Boundary District and Pacific Coast.

"Largely attended and thoroughly successful meetings were held at Rossland and Nelson, the papers and proceedings of which have been withheld by the Council, pending the publication of Volume III. of the Journal of which some 90 pages have been printed.

"Five meetings of Council, most of them held in conjunction with the Library and Executive Committee, were held during the year. There were also held four meetings of special committees.

CIVIL ENGINEERS' BILL.

"In accordance with the action taken at the Annual General Meetings, Mr Coste and myself appeared before the Private Bills Committee of the Ontario Legislature in opposition to the Bill concerning the practice of engineers promoted by the Canadian Society of Civil Engineers. The Bill was given the six months' hoist.

"Subsequently, I had several interviews with delegates from this Society in the hope that some compromise might be effected satisfactorily to the members of both organisations.

"On 3rd January, the Canadian Society tendered the following amendment to Section 2, clause E of the Act :—

"'Unless he is at the time of passing this Act, a member in good standing of the Canadian Mining Institute who is practising as a mining or metallurgical engineer; or a person engaged in the management or operation of mines or metallurgical works, until and for such reasonable time (not exceeding two years) as may be required by the Canadian Society of Civil Engineers and the Canadian Mining Institute to agree upon a basis of joint action for the advancement of the profession of Civil Engineers in this respect.'

"This Amendment was considered by a committee of mining and mechanical engineers, members of the Institute, who reported to the Council that, in their judgment, the time was not ripe for the introduction of exclusive legislation affecting the profession and practice of engineers in Canada. It was therefore referred back to Mr. Coste and myself to take whatever action might be necessary to defeat the Bill in Ontario or in any of the other Provinces.

CUSTOMS AMENDMENTS.

"Acting on behalf of our members engaged in dredging for gold in British Columbia and the North west Territories, I had several interviews with the Commissioner of Customs which resulted in an Order in Council being passed in June whereby gold dredging machinery and appliances were added to the Free List.

EXEMPTION OF MINERAL PROPERTY FROM MUNICIPAL TAXATION IN QUEBEC.

"I am also pleased to be able to report that in reply to representations made on behalf of the Institute a Bill passed its third reading during the present Session of the Quebec Legislature, exempting mining property from municipal taxation in that Province for a further period of ten years.

GEOLOGICAL SURVEY.

"The resolutions adopted at the annual general meetings concerning the value and importance of the work of the Geological Survey of Canada to the mining industries of the country, were duly forwarded to the Hon. the Minister of the Interior, and it is a matter for satisfaction that several members of the staff of that excellent institution have since received a more fitting recognition of their services by an increase to their salaries. There is also a likelihood of an appropriate grant being soon placed in the estimates whereby the Government will provide this Department with a safer and more commodious building for its work and the housing of its unsurpassed collections.

EIGHT HOUR LABOUR LEGISLATION.

"At our Nelson meeting a resolution strongly disapproving of and asking for a repeal of the Eight Hour Labour Law enacted by the Legislature of British Columbia, was unanimously adopted and forwarded to the Hon. the Minister of Mines for that Province

THE LIBRARY AND READING ROOM.

"The collection of books in the Library has been materially increased during the year, notably by the additions of the volumes necessary to complete our set of the transactions of the American Institute of Mining Engineers, various Telegraphic Codes, and a number of the best standard works of reference on mining and metallurgical practice. Many of our periodicals, exchanges, and magazines have been suitably bound, and a series of handsome cases provided for our pamphlets and loose literature.

ENQUIRY BRANCH.

"During the year I have answered numerous inquiries and given information respecting our resources and mining industries to visitors, and in some instances have furnished extended reports upon particular industries to Banks, Members of the Administraiion, &c.

GOVERNMENT GRANT.

"The work of publication and the maintenance of our Library has been greatly assisted by the grant of one thousand dollars given to us during the past two years by the Dominion Government through the offices of our good friend the Hon. W. S. Fielding, the Finance Minister, and I am also pleased to report that through his consideration the amount has again been included in the estimates for the ensuing year.

"The above briefly summarises the features of the work and operations of the Institute during the past year and is respectfully submitted."

MEMBERS SERVING IN SOUTH AFRICA.

The SECRETARY,—It will interest the meeting to learn that three of our members were at the present time on active service. Mr. Hamilton Merrit, of Toronto, was with Brabant's Horse, doing gallant work in South Africa. Mr. J. Edwards Leckie, of Greenwood, was serving as a lieutenant with Strathcona's Horse, and only that morning he had received a letter from Cape Verde Islands from Mr. Thomas Brown, an assayer, late of Nelson, stating that he was serving as a trooper with the 2nd Battalion Canadian Mounted Rifles, but hoped to return in time for the next annual meeting, when perhaps he would give them a paper on lyddite (laughter). As a slight recognition of the services of these gentlemen to the Empire he now moved that their subscriptions for the ensuing year be remitted. (Applause.)

The motion was unanimously agreed to.

THE LATE MR. HENRY BUDDEN.

The SECRITARY made a touching reference to the recent death of Mr. Henry A. Budden, for many years prominently identified with the coal trade of Nova Scotia. The late Mr. Budden took a keen interest in the work of the Institute, and would be greatly missed.

THE PROGRESS OF MINING IN CANADA DURING 1899.

The SECRETARY,—Coincident with a report upon the work of our Institute, it would perhaps not be out of place to present a few notes summarising the progress of mineral development during the past year. The following figures would approximately represent the net value of the output of minerals :—North-West Territories (including Yukon) $18,000,000; British Columbia, $11,000,000; Ontario, $8,500,000; Quebec, $3,000,000; Nova Scotia and New Brunswick, $8,000,000—or a total production, roughly speaking, of about $48,000,000—an increase of quite $10,000,000 over the previous year. (Applause). The following notes had been supplied by the courtesy of the officers of the various Departments of Mines :—

YUKON GOLD OUTPUT.

The Department of Interior reported : The total gold production from the Yukon territory for the calendar year 1899 as shown by returns to the Department is $9,730,636.19; and that of this $2,193,346.97 was exempt from the payment of royalty. The amount of gold exempt from royalty for the same period was $753,729.42. Large quantities of gold were however, known to have been taken out which was not reported to the Government

THE MINING INDUSTRY OF BRITISH COLUMBIA IN 1899.

In reviewing the progress of the Mining Industry of the Province for the past year, it may safely be said that, taken as a whole, the results show that there has been a very material and real advance.

In certain districts and in certain branches of the Industry, the results obtained have not been altogether satisfactory, but on the other hand, other districts and other branches have shown such a remarkable growth, that when a general average is struck, it is found that there is an ample margin of progress and advancement to the credit of the year.

The official statistics of production are not yet available, but from such figures as are, it is evident that this past year will show a material gain in the output of placer gold, lode gold, copper and coal, with a serious falling off in the output of silver and lead.

The most gratifying part of this summary is, that there is every indication that the increases are healthy and legitimate, that they have "come to stay" and grow up with us—while the decreases are illegitimate, because unnecessary and unhealthy, the result of that malady known here locally as the "labour trouble," and in no way attributable to the failure of any of the mines involved.

So much has been said about our "Labour Troubles," much of which is absolutely untrue, and such wide circulation has been given to these tales that it is probably best to give a summary of the conditions.

Leaving aside all artificial causes, the real source of the trouble is, that the growth of the mining industry in this Province has been so rapid that the demand for skilled mine labour has become greatly in excess of the supply.

The miners realised these conditions, and demanded the same pay for the decreased hours (eight in twenty-four) that they had received for the ten hours on the ground that they could do as much work in eight hours as they could in ten.

This the managers considered equivalent to a demand for more pay, and refused it.

Hence the dead-lock in many of our best minds, chiefly in the Slocan district, and therefore our decreased output in silver and lead, which gives the question its greatest importance.

As the matter stands now, the managements cannot get men locally at the old rate per hour, whereas the men seem to have been absorbed elsewhere, as they are not standing around idle.

Each side thinks it has the best of the argument; so far there has been no friction.

It looks as if a compromise would be effected shortly and sensibly, for as usual, the right is not all on one side.

Considering the Province by Districts and beginning with Atlin, this District managed last year to get shaken down into something like regular mining order, thanks chiefly to a firm hand at the head of affairs, and after the froth has been blown away, it is found that the district is all that level-headed men ever thought it was—a very snug little camp with plenty of gold in it; some placer workings, but for the greater part the deposit is so deep as to demand hydraulic plants. The output last year was good, considering all the drawbacks, and the outlook is distinctly favourable.

The indications are that quartz mining will be an important factor in the district, but it is of course premature at present to count on this until more development has been done.

Omineca and Cariboo, of glorious traditions of gold picked up by the pound lying around loose anywhere. It does not "lie around loose" now, by any means. When the old time placer miner got through, there was not much lying around loose, he took everything within reach he could lay his hands on; and they were good workers, were those old timers. We of today can't give them any points on placer mining. But, after all, their reach was limited to a few feet; today we have at our service longer arms—we employ giants and other far reaching contrivances. These cost a lot of money to buy and to haul on to the ground, and they consume a quantity of water, but it appears the former is as plentiful as the latter by the way it is pouring into the district.

There are some 30 to 35 strong companies working in the district now, the average cost of the plant of each of which when completed, will be in the neighborhood of $2c0,000.

These companies are only getting equipped and starting to run, yet their prospects are such that others are following them in rapid succession, and the indications are that Carboo will have "new days" quite as glorious as the "old days."

The year's output of these districts alone will be about $350.000.

The Coast District has of late been attracting a great deal of attention as a copper mining district. On the west coast of Vancouver Island and at various points on the mainland coast as far north as Skeena, and even farther, there have been some wonderfully fine surface showings of copper discovered, but carrying little silver and gold

The prospectors think these ore bodies run through to China, the capitalist is not so sanguine, and there has not been enough work done as yet to settle the question.

This year, however, the output of copper ores from the District has become appreciable, if not important, estimated at 6,000 tons.

As usual, the enterprising American has been investigating, before the Englishman and the Canadian (as they are called here) wake up.

The Vancouver Island Collieries, notwithstanding the fact that the Crow's Nest Colliery has taken their Kootenay trade, have again broken the record—the output is away up and the price of coal has been away up—so between the two they ought to have had a most prosperous year.

East Kootenay: Fort Steele Division has begun to feel the influence of railway connection, and two or three "producers" have been added to her list of mines—silver-lead and copper propositions.

The Crow's Nest Pass Coal Co. at Fernie, with its 800 employees, an output of 500 tons a day, and 200 coke ovens is also to be noted. But for all this, there was a threatened coal famine in the Kootenays this summer, which speaks well for the market, if it does not say much for the "get up" of the coal company and railroad.

Windermere Division is excited—she is a producer and hopes to "stay with it"—she has shipped a few tons of galena with good silver values, just to show what she can do, and has an array of partly developed properties up in the neighborhood of Toby Creek that look good enough to eat; whether or not they are only sugar coated remains to be seen. They are only about a year old and have not yet been proved with depth.

The ores are chiefly argentiferous galena with some copper ores, grey and yellow.

Golden Division, not to be distanced by Windermere, has some ore on the dump ready for shipment in the spring. She has had that in past years but it did not pay for some reason, but it is hoped this new discovery, with an exceedingly promising showing of copper ore will prove profitable. But it will have to be done on 14 cent copper, for 18 cent copper has passed away I am afraid.

Rossland has done herself proud. Last year she produced 111,282 tons, worth $2.470,811, this year she mined 180,300 tons, worth $3,211,400, an increase of 62 per cent. in production, and 30 per cent. in value.

The producers are the same old standbys, with Centre Star added. The rest of the properties seem contented to even be in such company, for there are no new producers.

Rossland has held her head so high, she has been above the fog of the "Labour Troubles" but she has had to stand on her tip toes to do it. Whether she will get tired of this unnatural pose remains to be seen.

Slocan Poor Slocan, the brightest of our jewels, is sulky; she wont even smile; she has the "Labour Trouble" badly The output last year was over 30,000 tons, valued between 2¼ and 2½ million dollars. This year the output is estimated at 18 000 tons, worth 1¼ million, and her mines are just as good and better than they were last year or the year before, for they had a lot of development work last winter.

Nelson has jogged along in her steady old way—never brilliant but reliable—she too, has had a touch of the prevalent malady, or she would have done better.

The Boundary, the latest addition to the family. She has been expected for some time, but it required the railway to bring her to life. She can't walk yet, but crows very loudly, and is, taken altogether, a promising youngster.

The ore bodies are big, too big—they are low grade, quite how low it is hard to say, it is impossible to sample them. Nothing but the smelter test will settle what the average assay of output of any of the mines may be.

There is no question about the ore, it is there and easily mined, but the life of the camp is in the hands of the metallurgist, and it needs the best obtainable; the question of the cost must not be counted.

Several of the mines have considerable ore on the dump, but none have shipped, nor can they afford to until they have the best of railroad and smelter facilities completed.

The following figures have been officially reported to the Institute:

HALL MINES SMELTER.

	Ozs. Gold	Ozs. Silver	Lbs. Copper	Lbs. Lead
Quarter ended 31st March.....	329	96,583	299,771	.....
" " 30th June	1,122	190,781	143,109	1,243,921
" " 30th September	1,550	272,249	777,044	339,963
" " 31st December.	1,389	113,093	288,844	506,666
	4,390	672,706	1,508,768	2,090,550

CANADIAN PACIFIC SMELTING WORKS, TRAIL.

	Ozs. Gold.	Ozs. Silver.	Lbs. Copper.	Lbs. Lead.
Quarter ended 31st March.....	5,827	14,827	305,599	Nil.
" " 30th June.....	11,661	27,388	587,242	Nil.
" " 30th September..	15,976	31,048	760,398	Nil.
" " 31st December..	18,754	28,147	925,478	Nil.
	52,218	101,410	2,578,717	Nil.

CROW'S NEST PASS COAL CO.

The output officially reported was—

Tons of Coal Mined	116,200	of 2000 lbs.	each.
" " Sold.....	69,819	"	"
" " To Coke Ovens...	43 065	"	"
" " Used by Company	3,316	"	"
" Coke Made.....	29,658	"	"

Made up as follows:—

Tons of Coke Sold in Canada	23,377
" " " United States.....	5,750
Tons on hand at close of the year	531

MINING IN ONTARIO.

The area of mineral lands sold and leased in Ontario last year was 98,307 acres, and the revenue from sales and rentals was $150,975. In 1898 the area disposed of was 68,440 acres, and the revenue derived was $97,962. The statistics of mineral production for 1899 are not quite complete, and returns have not been received for salt, silver, sewer pipe, and graphite. As far as completed they show values of $8,051,309, and wages paid for labour of $2,737,490, the number of employes being 9,477. When the full returns are received, they will make up a production of not less than $8,500,000, or 17 per cent. more than in the previous year. Structural materials of stone and clay show a total value of $3,936,681, oils and gas $2,075,339, metals $1 984,681, and miscellaneous minerals $54,512.

THE YEAR IN QUEBEC.

The output of minerals from the Province of Quebec, except in one or two instances, will show little change from previous years.

Asbestos.—The shipments of asbestos of all grades amounted to 17.019 tons, and 8,534 tons of asbestic. Prices steady and demand increasing.

Pyrites.—The output of pyrites at Capelton was 38,778 tons, of which 23,578 tons were shipped, the balance being utilized locally at the chemical works.

Pig Iron.—Charcoal pig iron to the extent of 7,094 tons was made at Radnor and Drummondville.

Ochre.—The production of ochre at Three Rivers was 1,430 tons.

Chromite.—The shipments of chromite from Black Lake amounted to 1,980 tons, 445 tons of which were concentrates.

Mica.—The shipments of mica in Ottawa County exceeded $150,000. Prices good and market strong.

Felspar.—About 3,000 tons mined in Ottawa County.

Petroleum.—In the Gaspe Oil Field a refinery has been built and over 20 miles of pipe line laid

Gold.—Prospecting on the Gilbert river country yielded 272 ozs. of a value of $4,896.

Copper.—Some mining was done at the old Acton mine, near Sherbrooke, and 100 tons of high grade ore were won from Harvey Hill.

Phosphate.—A number of sales were made at improved prices, and the outlook for this mineral is distinctly better.

Graphite.—The mills near Buckingham resumed operations at the end of the year and an improvement in output may be looked for in 1900.

The net value of all minerals will be about $3,000,000.

PROGRESS IN NOVA SCOTIA.

In many respects the advance in mining in Nova Scotia last year was highly encouraging. In coal mining particularly progress has been most satisfactory. The local sales were, as far as can be learned at this moment, 2,664,794 tons, an increase of 527,386 tons over the shipments of the pre-

ceding year. This increase was due to a larger demand in every market reached by provincial coal. The trade up the St. Lawrence for the first time passed the million ton mark. The starting of the New England Gas and Coke Works, at Everett, Mass., assisted somewhat the sales of the Dominion Coal Company, the largest producer, but the effect of this large enterprise, now fairly under way, on the coal trade of Cape Breton will be more apparent next year.

The establishment of the Dominion Iron and Steel Company at Sydney, Cape Breton, opens another large and unexpected home market, amounting to some 800,000 tons annually. The projected establishment of factories to handle the pig and steel made at Sydney, will still further increase the demand for coal. The collieries in Pictou and Cumberland Counties also shared in the general prosperity. The future of the coal business seems assured for the next few years.

In iron and steel making there has been little novel to be noted. The production of iron ore, principally by the Nova Scotia Steel Company, amounted to 18,000 tons. About 30,000 tons were imported by the Company, and also smelted. The Mineral Products Company commenced the manufacture of ferro-manganese at the furnace of the Charcoal Company at Bridgeville, Pictou County, but operations were discontinued in the fall. At Londonderry nothing was done, except at the pipe foundry. In Cape Breton some prospecting was done on various iron properties, but the determination of the Dominion Iron and Steel Company to use Newfoundland ores has discouraged local men.

In gold mining the production fell off, being about 28,000 ounces, compared with 32,165 ounces in 1898. A number of the mines, notably in Guysboro County, Moose River, Montague, South Uniacke, and Leipsigate and Brookfield were worked profitably. There were a large number of mines bonded, and not worked, and others were held by their owners for sale. This lessening of mining work was due, I presume, to the unusual number of enquiries made for gold speculation purposes.

The presence of bodies of manganese ore of good quality and apparently extensive, was proved in Lunenburg County. Sample cargoes were sold readily, and it is expected that the railway now under construction in that district will afford a cheap transportation. The amount of coke increased to about 58,000 tons, partly on account of the inclusion of the coke made in the by product ovens of the Halifax Gas. Co. The production of plaster, grindstones, barytes, limestone, tripolite, etc., was about as usual.

During the year 1899, following explorations carried on during 1898, copper mines were opened at Wentworth, in Cumberland Co., and at New Annan, Colchester County.

The ores met are various copper sulphides in hard shale and sandstones, in places rich, in others much disseminated. These mines are owned by the Copper Crown Company, which has completed the erection of a smelter at Pictou. The Company report that in addition to the product of their own mines, they will receive ore from the numerous exposures known in Colchester, Pictou, and Antigonish Counties. In all probability the Inverness copper lead districts will furnish supplies, as there seems to be a large amount of ore in the Cheticamp district.

Should the supplies at present visible suffice to keep the smelter at Pictou in operation, there is no doubt that prospecting will be encouraged, and copper mining take its place as one of the regular mining industries of the Province :—

As all the figures for the calendar year are not available, Mr. Gilpin gives the following for the fiscal year ended September 30th, 1898 and 1899. As the production, except in the case of coal, is regular, they will, not inaccurately, show the calendar year production :—

	Year Ending Sept. 30, 1898.	Year Ending Sept. 30, 1899.
Gold.....Ozs.	31,104	27,772
Iron Ore * †.....Tons.	31,050	16,169
Manganese Ore †..... "	75	100
Coal Raised † ..... "	2,281,454	2,642,333
Coke Made † ..... "	42,000	55,484
Gypsum †‡	131,000	140,000
Grindstones, etc §	38,000	50,000
Limestone †.....Tons.	24,000	32,000
Barytes.....	.....	335
Tripoli and Silica.....	.....	893
Copper Ore.....	.....	400

* Not including imported ore. † Ton of 2,240 lbs. ‡ Amount exported. § Value in dollars.

On motion of Mr. Wm. Blakemore, seconded by Mr. J. Burley Smith, the Secretary's Report was unanimously adopted.

VOTE TO PATRIOTIC FUND.

The Secretary moved, seconded by Mr. Burley Smith, that the sum of $250 be appropriated from the current year's income as a subscription to the Canadian Patriotic Fund. He also reported having received $100 each as a subscription to the same Fund from the Acadia Coal Company, and the Canadian Copper Company. The vote was passed unanimously.

TREASURER'S REPORT.

The Secretary, in the absence of the Treasurer, reported the receipts during the year to have been $3,581.42, and the disbursements $3 096.55, leaving a cash balance in hand of $484.87. Mr. Stevenson's statement in detail would doubtless be available for inspection by the afternoon session.

The report was adopted.

The meeting adjourned at one o'clock.

(To be continued.)

A VALUABLE NEW EXPLOSIVE FOR CANADA.

Liquid Oxygen and Ozone Company of British North America.

The above Company has recently been organized in Boston, Mass., for the purpose of putting into practical use some scientific discoveries which have been recently perfected by Professors Dewar and Lennox, Chief and Assistant Chief Chemists of the Royal Institution of Great Britain. The exalted standing of the Royal Institution and its Professors in the world of science, gives this Company a firm foundation for its claims.

That which is of special interest to the mining community of Canada is the fact that the liquification of oxygen in commercial quantities has been perfected. It is well understood that oxygen, combined with the proper nitrogenous material, makes the most powerful explosive for blasting purposes known to physics. It has the especially valuable property of expanding in all directions, thereby shattering large bodies. This feature is of great importance in coal mining, as it prevents the breaking of coal into small particles. It also absolutely eliminates the danger which is at present incurred by the handling of powder or dynamite, as it cannot explode until fired by an electric spark, or, if preferred, by an ordinary fulminating cap, which is applied only the instant before the cartridge is inserted in the hole. This, the parent Company, will control all processes and patents in British North America.

Another important feature for miners, which is controlled by this Company. is an air compressor, which will do equal work with any other compressor of American manufacture; and at one half the expenditure of horse power.

The Company is preparing to establish a large factory in Canada, in which all their compressors and liquifiers will be manufactured. Their first machines are being built under positive guarantee as to capacity by Messrs. Lennox, Reynolds & Fyfe, Limited, London, England.

There are already under way negotiations which will probably lead to one of the first plants being set up in the immense coal districts of Cape Breton.

For some months, or until its Canadian works are producing machines, the Company will only be able to take care of two additional contracts, each of which must cover a group of mines, so situated that a central plant can supply each group with the necessary explosives. A most liberal and straightforward contract is issued, in which, at its own expense, the Company agrees to erect a plant, and furnish the explosives ready for use—and at a price ranging from 10 to 15 per cent. less than that which the mining companies are today paying. The explosives can be easily graded in force from the highest per cent. dynamite at present in use down to common black powder, and equal, if not superior, results positively guaranteed, as against the explosives now in use. The Oxygen Company takes the burden entirely upon itself, and the miners are not put to any expense whatever.

Until May 1st, the General Manager, Mr. W. E. Cook, will remain in Ottawa, and will be pleased to receive and answer any communications with regard to the above, and would also take pleasure in personally looking over any group of mines where the owners of same think they can come together on a proposition of this kind. After May 1st, the Company can be found at its offices, which are being prepared, in Boston.

LAKE OF THE WOODS.

The Mikado is to the fore with $14,000.00 as the result of two weeks' work. As the usual *monthly* output has been about $14,000.00, it will be interesting to know the cause of this doubling of the product of our celebrated mine.

Wen igo.—Sinking is making good progress in both shafts, a large force of men being at work. The main shaft is now down 75 feet, and the second one 40 feet. The vein is the full width and the gold values are good. A sample of the gangue from the bottom of No. 1 shaft shows a considerable percentage of sulphides of iron and copper. This is what is known as the Gagne property.

Nino.—This was the Pritchard-Moore-Scovil property, near Caribou Lake, and about five miles north-east of the Virginia Co's property. The Great Granite Gold Mining Co. have now an option on the property, and already have a shaft down 40 feet on the principal vein, and are driving an adit into the face of a hill on another vein. The veins are in granite, and the quartz from both assays remarkably well. A boarding camp, office, assay office, stable and blacksmith shop has been put up ; a separate sleeping camp will shortly be built. Mr. Reynolds is superintendent.

The Triggs.—The sawmill at the mine cut all the lumber used in the erection of the present buildings, and since that has cut a good many thousands of feet more. It will shortly be in operation again producing lumber, boards, scantling, beams, &c., in preparation for the stampmill that is in contemplation. Work is being vigorously pushed in the two shafts and in drifting both ways at the 100 foot level.

Gold Panuer.—Everything is lively here. A lot of machinery has been taken to the mine lately, it being the intention of the management to put up a 15 stamp mill this summer.

Lizzie Mine (Virginia Co.)—S. H. Brockunier, the general manager, who went south at the close of navigation, has returned, and it is understood that a stamp mill will be put up this summer.

The Gold Estates Co.—This company have a mining camp at the southwest corner of Denmark Lake, and about 60 miles from Rat Portage, southeasterly. Mr. Alan Sullivan, C.E., is the company's manager, but Mr. Patterson, C.E., is superintendent at the mine. Mr. Sullivan is at present in Toronto. Mr. Kayll is accountant. Upon one vein a shaft has been snnk 100 feet. Sinking has been suspended temporarily, but drifting is going on at 60 feet, a steam drill being used. There is a steam hoist and pump. A small tug was brought over the several portages between the Lake of the Woods and Denmark Lake, and the boiler has been borrowed from this to run a small saw-mill, where lumber is being cut from saw-logs gathered around the shores of the lake. This vein was 7 feet wide at the surface, but at the 100 foot level has contracted to 2 feet, with well-defined walls. The gold values are very good, however, all the way down. This promises well for being a fine property when developed. Its geographical situation, somewhat remote as it is from the Lake of the Woods, is a little against it on the start, enhancing as it does the cost of supplies. Altogether, the outlook for gold mining on the Lake of the Woods has never been so good.

Chamber of Mines.—A Chamber of Mines has been formed with headquarters at Winnipeg, many of the foremost business men of that city and of Rat Portage being members, as well as a few outside men eminent in financial circles. It is confidently believed that the establishment of this institution will materially advance our mining interests, by legitimate natural advertising of our mineral resources and offering a medium to interested outsiders for obtaining trustworthy information regarding the same. The credit of the inception of the project belongs to Mr. Malcolm, late of Johannesburg, South Africa. Mr. Malcolm's services have been secured for the position of secretary to the new chamber.

J. M.

RAT PORTAGE, March 17th, 1900.

LARDEAU DISTRICT.

From Revelstoke and its immediate vicinity there is practically nothing new to report. Everything is extremely quiet and all seem anxiously waiting for the spring, when the various properties will become once more accessible. But south of us, in the Lardeau district, there is great activity, and indeed much work has been done all through the winter on those mines that have had the most development done on them; the Silver Cup, for instance, and more particularly the Nettie L., both of which have shipped a considerable quantity of ore to the smelter at Trail. The great drawback to the district is the lack of transportation facilities, which means enormously increased expense in handling the ore, insomuch that it is not worth while to move from the mine anything much under $35.00 or $40.00 per ton, and as may well be imagined there is a vast quantity of ore which will carry no higher value. However, the C. P. R. seem determined to extend their line through to Trout Lake at least, if not to Ferguson, this summer; and if that matter is accomplished, more especially if the Great Northern Co. also run into the same neighborhood, one of the greatest obstacles to mining development will be removed, and the output of valuable minerals should be very great. All credit is due to those who have so steadily persevered in spite of all difficulties through years of toil and not infrequently privation, in developing their claims and proving their value; the district being exceptionally difficult to traverse on account of the steepness of the hills and the dense vegetation, but there certainly does seem at present a very great probability of their hopes being amply realized.

In the case of the Nettie L., so frequently referred to in former editions of this REVIEW, it is very satisfactory to report that the long lower tunnel, about 600 feet in, has undoubtedly struck the vein that much nearer the surface has proved so rich, and in consequence ore is being extracted at a great rate. Here again, however, lack of good transportation is a great hindrance, though now that the prosperity of the mine is assured, it is likely that the management will proceed to build a decent road. A shipment of 100 tons was recently made to the Trail smelter, which turned out very well; it is hardly necessary to say that as fast as shipments can be made from the mine they will be forwarded to either Trail or some other smelter for treatment.

The Beatrice, the Silver Cup, and other claims have also been sending consignments of their mineral to the smelter, and from all accounts are very well satisfied with the returns given, so that this season ought to see the Lardeau district well through its long and dreary waiting for the recognition it so well deserves, and taking that foremost position to which it is entitled.

REVELSTOKE, B.C., March 16th, 1900.

The Bosun Mines (Limited).—Telegram from the manager reports that the February shipment will be 20 tons (the strike having terminated on the 16th) and that the mine is looking well.

LEGAL.

Heinze and the British Columbia Smelting and Refining Company *v.* R. B. Angus and T. G. Shaughnessy—On February 11th, 1898, Mr. F. Aug. Heinze signed an agreement with Messrs. Angus & Shaughnessy, by which all the shares of stock of The Columbia & Western Railway were transferred by Mr. Heinze and his associates to Messrs. Angus & Shaughnessy. MR. Heinze retained a one-half interest in any lands that might eventually be granted to The Columbia & Western Railway in accordance with THE Columbia & Western Railway subsidy act of 1896. In disposing of the smelter at Trail, however, neither the shares of The British Columbia Smelting & Renning Company, nor the charter of the Company were transferred to Messrs. Angus & Shaughnessy; only some of the assets of The British Columbia Smelting & Refining Company were transferred to Messrs. Angus & Shaughnessy, Mr. Heinze reserving large mining interests, saw-mill, water rights, etc. The agreement of Feb. 11th, 1898, stipulated that the fuel and stores of the British Columbia Smelting & Refining Company were to be sold by Mr. Heinze to Messrs. Angus & Shaughnessy, and it also stipulated that Messrs. Angus & Shaughnessy should purchase the fuel and stores of the British Columbia Smelting & Renning Company. As Messrs. Angus & Shaughnessy have refused to pay Mr. Heinze what he thinks he is justly entitled to, suit was brought on December 6th, 1898, in the Superior Court, Montreal. The suit has been inscribed and will be heard in the Superior Court, at Montreal, about May 1st, 1900. Suit was brought for $83,054.84, and amounts, with interest to date, to about $90,000.00.

The suit will be a very expensive one, as there are a large number of witnesses and experts, nearly all of whom will come from the west. The suit would have been heard sooner, were it not that Mr. Heinze, the plaintiff in the case, has been engaged in very heavy mining law suits, with the Anaconda Mining Company, of Butte, Montana, and the Standard Oil people, who control several of the large mining companies at Butte, Montana.

Mr. F. Aug. Heinze, who is now at the Hot Springs, Arkansas, on a vacation, will be in Montreal some weeks before the case is heard in the Court.

Messrs. Macmaster, Maclennan & Hickson are Attorneys for Mr. F. Aug. Heinze.

Smelting Operations In British Columbia.

That the early completion of two large smelters in the Boundary disdrict will have a most beneficial effect on the mining interests of the Province is a well recognised fact. While operating his smelter at Trail. Mr. F. Aug. Heinze paid for a very inferior quality of coke, $20.00 and $22.00 per short ton, laid down at the smelter, and all other supplies were correspondingly high owing to the fact that all these supplies had to be hauled by team for a long distance. With the completion of the Crow's Nest Pass Railway, and the opening up of the Fernie coal fields. it was expected that the smelter charges in the Province would be very largely reduced. The coke produced from the Fernie coal is equal, if not superior to, the best 72 hour Connellsville coke, and this coke is being laid down at Trail for about $6.00 per ton. With such cheap fuel and all other supplies correspondingly reduced in price, owing to improved transportation facilities, a very low treatment charge for the ores of the Rossland, Kootenay and Slocan districts should obtain at the Trail smelter, but we are informed that the lowest rate quoted to date is $6.00 per ton. The smelter of the British America Corporation at Northport, Wash., several months ago announced a freight and treatment charge on Rossland ores of $4.50 per ton, and this smelter is paying for American coke, inferior in quality to the coke received by the Trail smelter, $12.50 per ton. Owing to the fact that the Canadian Pacific Railway will not make a connection at Rossland with the Columbia and Red Mountain Railway. it would not pay the British America Corporation to use the Fernie coke at their smelter. When it is considered that the Northport smelter is paying twice as much for an inferior quality of coke to that used by the Trail smelter, it is apparent that the Trail smelter could afford to name a smelter rate considerably lower than $4 50 per ton, and pay the owners a handsome profit. There is no doubt that the policy pursued by the owners of the Trail smelter, in getting all they can from the mine owners, while being very profitable to the smelter owners direct, is a short-sighted policy on the part of the Canadian Pacific Railway, for if there is one thing that will develop the mines of British Columbia more than any other, it is that the mines be given the lowest smelting charge that will allow of a fair profit to the smelter. This is especially so of the mines in the Rossland district, where there are large quantities of low grade ore, which would readily be mined if the smelter rates were reduced. In the Slocan district, while there are many lead and silver properties that can stand heavy treatment charges, yet there are many more lower grade properties that will never be developed until the present smelting rates have been materially reduced, and the Canadian Pacific Railway, in maintaining its present high treatment charge, is killing the "goose that lays the golden egg." There is no reason why the lead bullion produced at Trail should be sent to the United States for reduction, unless it be that the Canadian Pacific Railway, which controls the smelter at Trail, desires to procure for itself the haul on the lead bullion out of British Columbia, through the United States, and back again into Canada. With the Canadian Pacific Railway in possession of the smelter at Trail, and the duty removed from refined lead, the Canadian Pacific Railway people occupy the same position in Canada, so far as the lead product is concerned, as does the lead trust in the United States. There will be no reduction in the price of lead paints, nor in any of the articles manufactured from the refined lead returned into Canada by the Canadian Pacific Railway people, although a reduction should be expected owing to the removal of the duty on refined lead by the Government. Until there is smelter competition and railroad competition in British Columbia we do not look to see the present smelter rates reduced. It

behooves the Government to do everything possible to foster both railroad and smelter competition in the Province. Every American operating in British Columbia is alive to the fact that a country so prolific of minerals and so ripe for development would, if in the United States, be very soon traversed by many different railways, which would result in the building of many smelters and refineries, and which would give to the prospector and mine owner the transportation and smelter facilities which can only come with railway and smelter competition.

J. E. E.

Rossland, 21st March, 1900.

COMPANIES.

Consolidated Cariboo Hydraulic Mining Co., Ltd.—From the second annual report issued by this Company we gather the following summary of the season's hydraulic work :—

Total time run.....	144 days, 8 hours.
Total quantity of water used.....	353,056 miners inches.
Total quantity of gravel, sand, clay, tailings, boulders and sliderock removed from both pits during season	1,952,535 cubic yards.
Value of gold recovered during progress of the season's work.....	$92,678 93

The condition of Hydraulic Pit No. 1 at the opening of the season made it impossible to wash more than a small portion of the high grade gravel from the main bank, until such time as the sluices intended for the removal of that body of gravel to the dumps were laid down permanently on the bedrock near the east rim and carried around the big bend of the channel; neither could the bottom gravel be worked to any great extent until the sluice cuts were extended and lowered to make grade for its removal to the lower system of sluices and the dumps. This condition made it necessary to remove immediately the remainder of the accumulations of tailings, boulders and sliderock from the old Chinese workings; also the remainder of the low grade gravel boulder clay, boulders and siderock from the Block 3-A on the north rim, and Block 3-B on the west rim, to make room for the safe and permanent installation of the sluices and the extension of the bedrock cuts. The whole of the boulder clay, sand and low grade gravel lying on the south-west rim in the Block 3-C, had to be removed to make possible the changing of the hydraulic plant from the bed of Dancing Bill Gulch, and to provide a safe place on the bedrock rim for its permanent installation and extension up the channel.

Many unexpected difficulties were encountered during the progress of the season's work which added materially to the cost thereof. The time consumed in the removal of these difficulties made it impossible to wash in Pit No. 1 more than 116 days 8½ hours, out of a possible 180 days. This explains briefly why the 110,000 miner's inches of water remaining in the reservoirs at the close of the season could not be utilized to wash about 500,000 cubic yards of high grade gravel from the main bank and the season's product could not be brought up to what was expected.

The Ymir Gold Mines, Limited.—A report covering the period from the incorporation of the company in August, 1898, to December 31st last, has been issued in anticipation of the first annual general meeting which was held Thursday, March 22nd. Although the company took over the mine on September 1st preceeding, it was not until the end of March, 1899, that milling operations were commenced, and the mine became revenue earning, and even then, owing to difficulties inseparable from the starting of new plant, several interruptions occurred, reducing the total working of the mill to a period equal to 172½ days, or practically six months' continuous working. The profit amounts to £20,031, which has been arrived at after writing off an ample amount from development account, all repairs, the preliminary expenses, cost of No. 6 tunnel (abandoned owing to the substitution of No. 10 tunnel) and after making reasonable allowance for depreciation. The quantity of ore handled during the period under review was 17,522 tons, and as the profit amounted to £20,031, after debiting all charges, the ore has realized a net profit of £1 2s. 10¼d for every ton treated. On account of the very large amount of ore blocked out and available for treatment, which Mr. Fowler in his report gives as 121,600 tons above No. 3 level on December 31st last, and further developments establishing the continuity of the vein at depth, the Directors lost no time in making speedy arrangements for doubling the mill and thus raising its capacity from 35,000 to 70,000 tons per annum. The duty of the mill has been as follows :—

Running Time for 40 Stamps					Tons Crushed.
March,	2 days	13 hours.			250
April,	16 "	6 "			1,700
May,	17 "	4 "			1,450
June,	21 "	14 "			2,017
July,	21 "				2,000
August,	Nil.				Nil.
September,	14 days	18 hours			1,550
October,	27 "				2,790
November,	29 "	5 "			2,942
December,	23 "				2,348
	172 days	12 hours.			17,137 tons.

Average crushing, 99¹₃ tons per 24 hours.

The record of the last three months shows much improvement, and as several changes have been made in details and precautions taken to prevent the recurrence of most of the minor annoyances, it may be expected that the second year of our operations will show much greater mechanical efficiency."

Molly Gibson Mine.—A recent report from the manager says: "The mine on the whole is looking exceedingly well, all the tunnels being in ore. What stoping has been done has given very satisfactory results, and the ore is holding out as well as I expected. About 35 men are now employed at the mine. We are now getting ore down at an average rate of three tons a day, and are shipping a carload a week to the smelter. Returns from the smelter have given us an average of $52 to the ton after deducting freight and smelter charges."

The Newfoundland Colonisation and Mining Company has issued a report for the two years ended December 31st, in which it is stated that nothing has yet been arranged with respect to mining rights, but that negotiations are still in progress. The royalty on the timber account suffices to pay debenture interest.

PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at $2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quarts crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at $19 an ounce, and on smelted gold valued at $18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones; five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.

SCHOOL OF MINING,

KINGSTON, ONTARIO.

The Following Courses are offered

1—Three Years' Course for a Diploma in

(A) Mining Engineering.
(B) Analytical Chemistry and Assaying.

2—Four Years' Course for a Degree in

(A) Mining Engineering.
(B) Chemistry and Mineralogy.
(C) Mineralogy and Geology.

3—Post-Graduate Course for the Degree of

Doctor of Science (D.Sc.)
For further information see the calendar of Queen's University.

4—Prospectors' Course.

The School offers to Mine Foremen, Assayers, Prospectors and Mining Men generally, Special Courses of Instruction beginning January 9th, 1900, and continuing eight weeks.

Next Session begins October 2nd,
. . . 1899 . . .

The School is provided with well equipped Laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. In the Mining Laboratory the operations of Crushing, Amalgamating, Concentrating, Chlorinating, Cyaniding, etc., can be studied on a large scale.

FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO

Dr. W. L. GOODWIN,

DIRECTOR

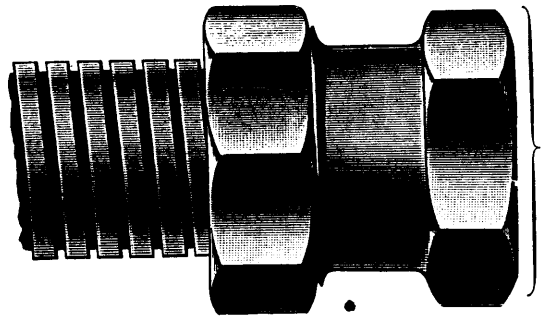
SCHOOL OF MINING, KINGSTON, ONTARIO

FLEXIBLE METALIC HOSE

THIS Hose is made entirely of metal; there is NO rubber in connection with it. It will therefore stand ANY pressure of steam. It is at the same time as flexible as rubber steam hose, and with proper care it will last many years.

This Hose is made in sizes from ¼ inch to 8 inches inclusive, and can be made to stand 2,000 (two thousand) pounds pressure to the square inch.

This Hose can be readily connected to Iron Pipe.



Screwed for Standard Iron Pipe Thread.

We supply for this Hose the usual Rock Drill Hose Connections, or any other special connections which may be required.

We have just introduced this Hose in this conntry, and miners who have seen it are taking to it like a mouse to cheese.

Write to us for catalogue and particulars.

We carry stock to 2½ inches diameter, and can import larger sizes.

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Steam Pumps, Pumping Engines and Hydraulic Machinery.

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Pumps Kept in Stock at Montreal and Rossland.

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For Railroad, Electric Car, Street Railway and Lumber Truck Service, Etc.

THOMAS J. DRUMMOND, General Manager.

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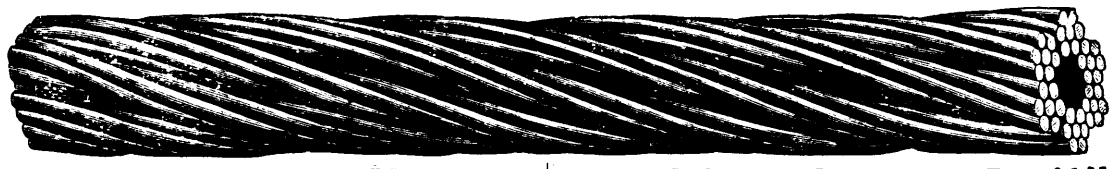

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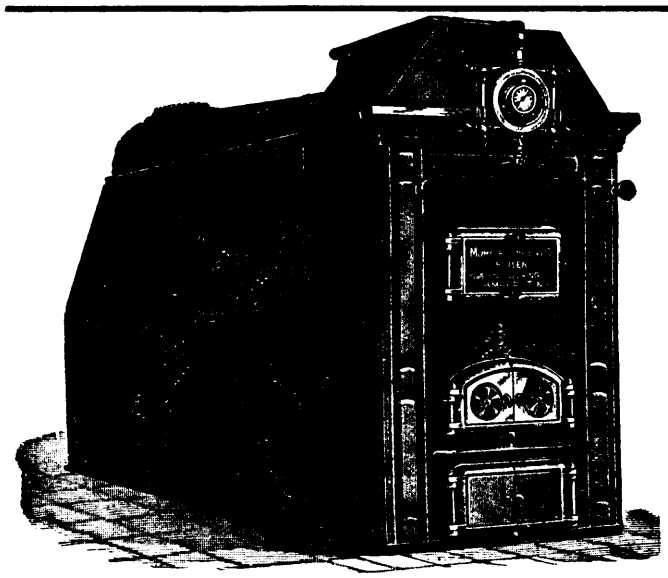

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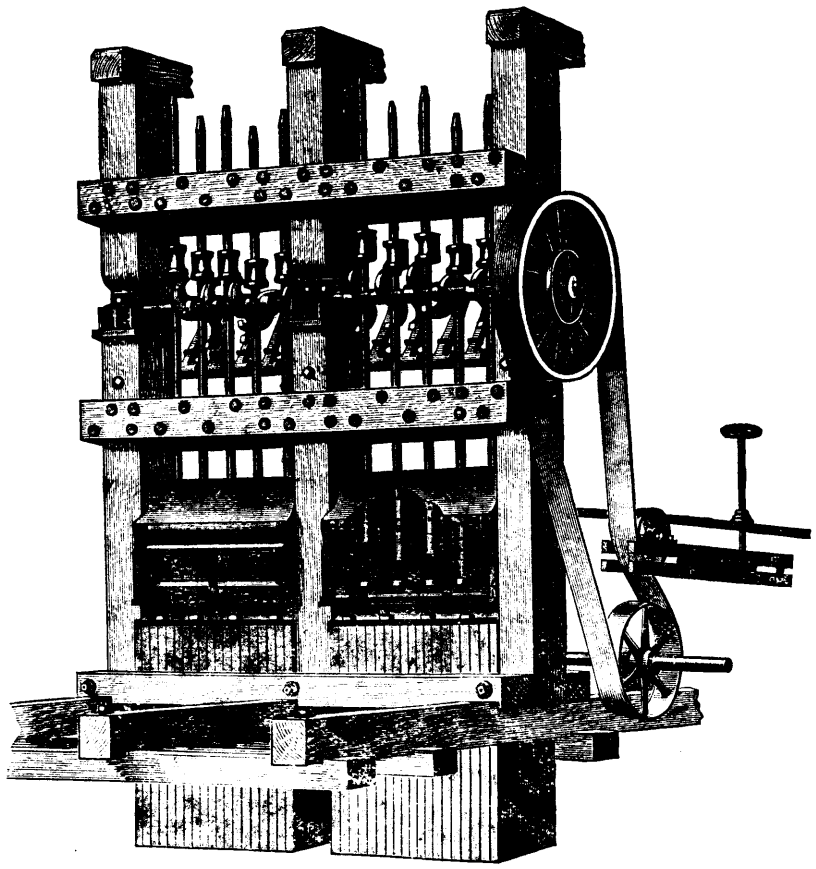

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