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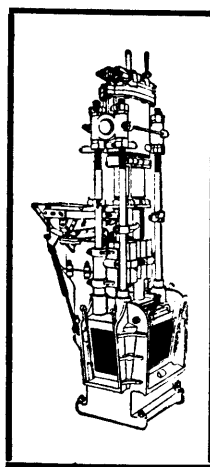
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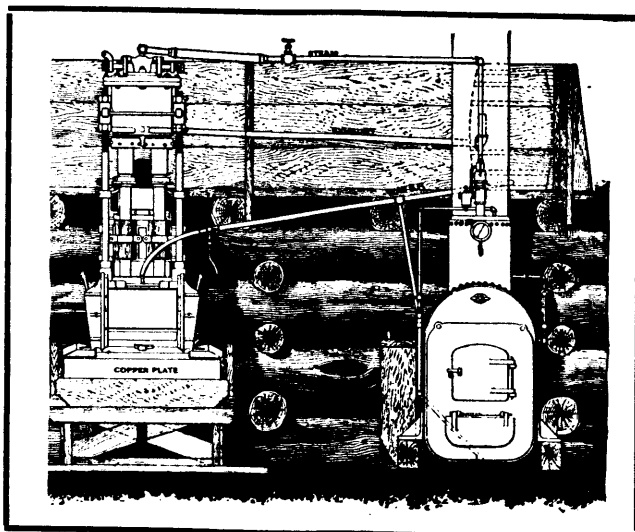
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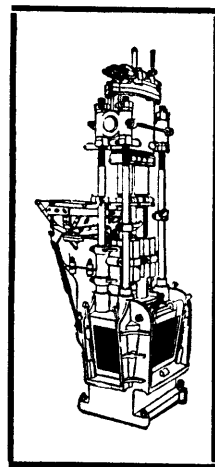
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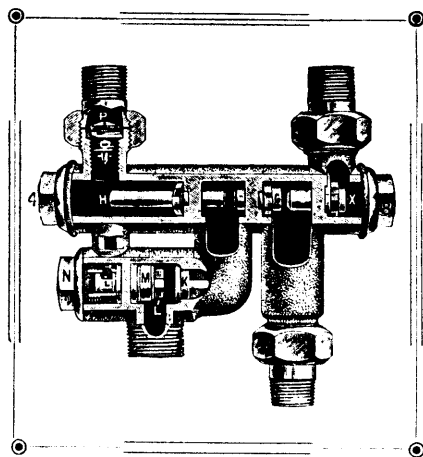
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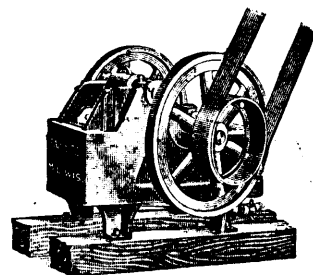
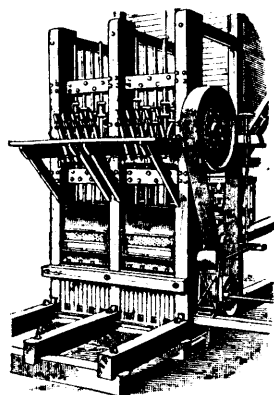
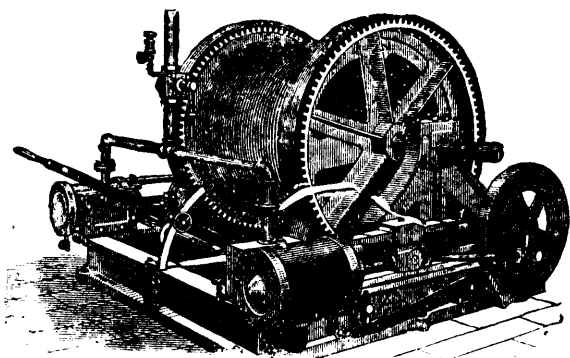
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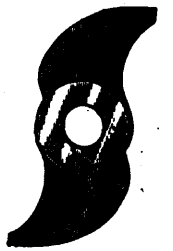
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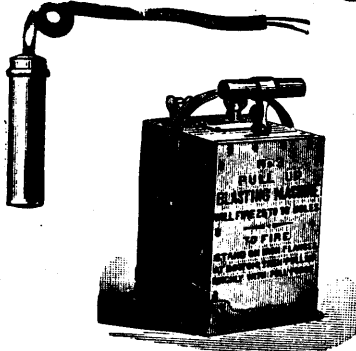
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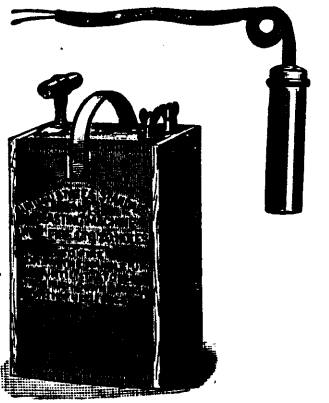
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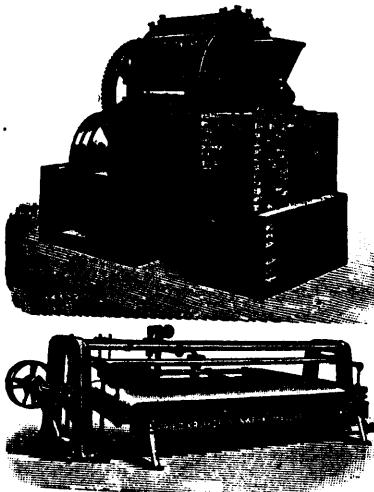


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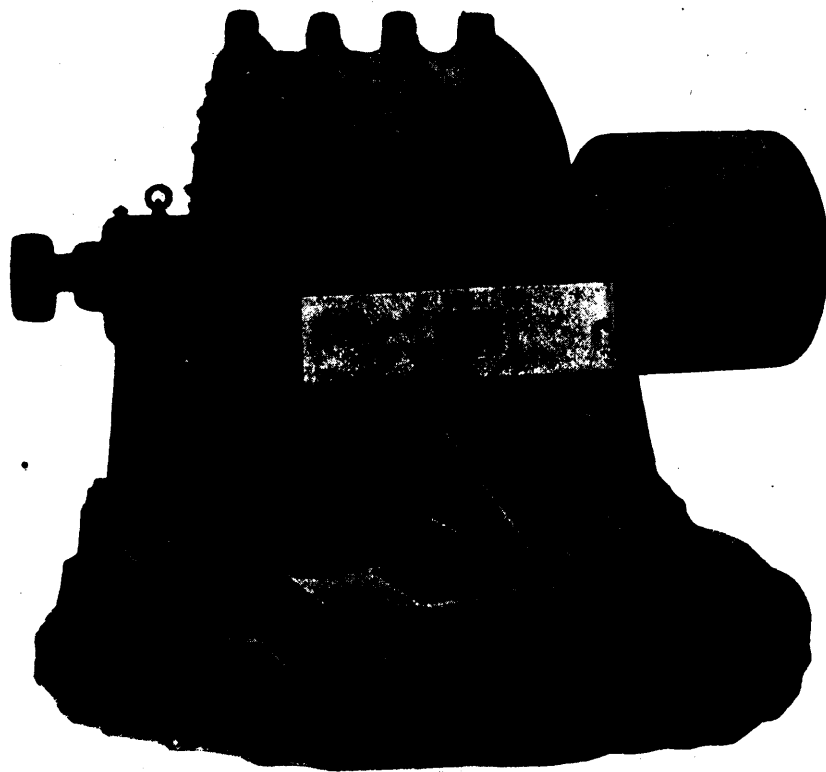
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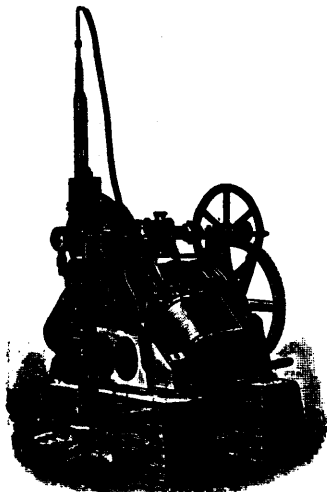
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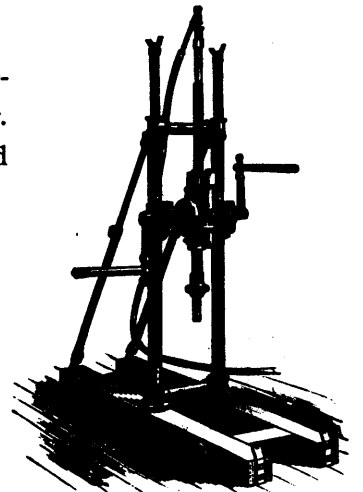
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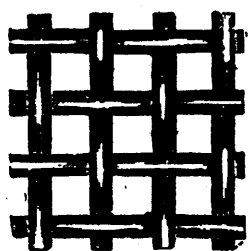
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Under the provisions of chap. 1, Acts of 1862, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one 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 quartz 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.

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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.

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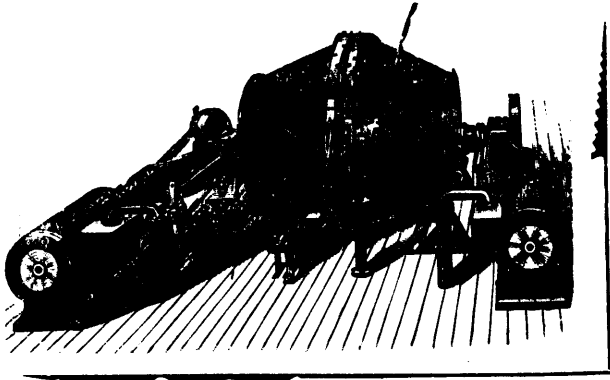
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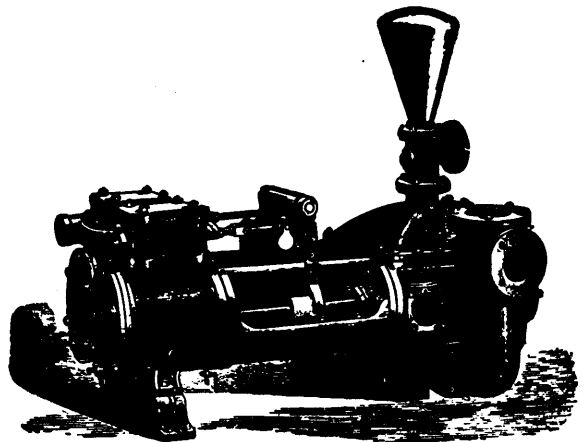
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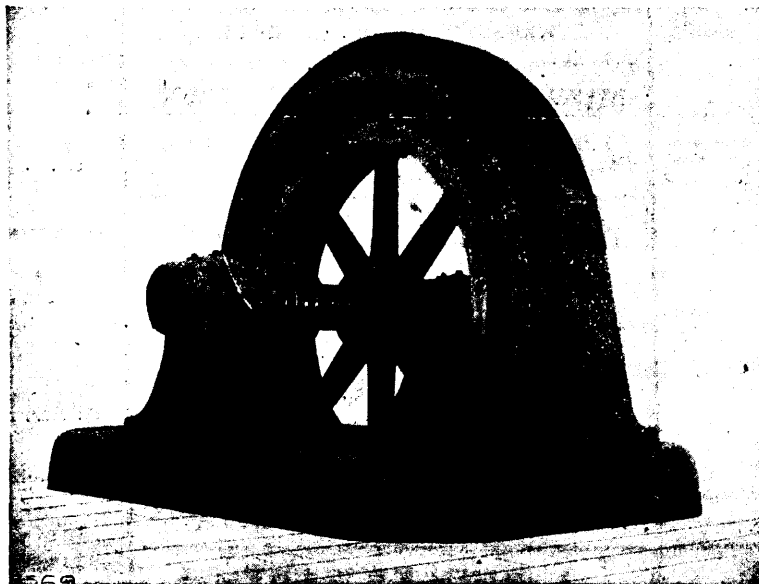
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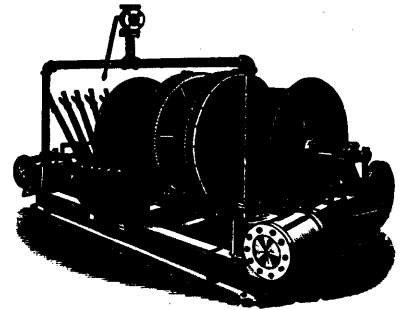
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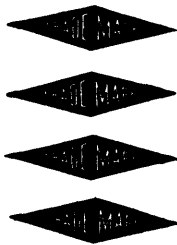
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NOVEMBER, 1897.

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An Epidemic of Mismanagement.

The Rainy River district has now been before the public in the role of a gold mining region for about four years. In that space of time the various newspapers of the district and of Winnipeg and Eastern Ontario, as well as Duluth and West Superior, have described enough bonanzas and rich discoveries to indicate the existence of a regular Eldorado, and these discoveries, if actually made and as rich as reported, would long ere this have settled down into steady dividend-paying mines, whose annual output would run up into the millions. Thus the Cripple Creek and Slocan camps, which were opened up about the same time as this western Ontario region, are now the centers of regular and profitable mining industries, and the expectations and predictions of early days have been in large measure realized.

How is it with the Rainy River district? Are there actually half a dozen or even two or three paying mines in existence to-day? Is the gross output a million or half a million, or even a quarter or an eighth of a million of dollars per annum? The report of the Ontario Bureau of Mines does not indicate it.

What then has become of all these marvellous bonanzas of incredible size and unprecedented richness reported by the presumably reliable and conservative newspapers referred to?

Do I hear it said that the district is remote from railroads? I grant it, but permit me, to point out in reply that Slocan Lake and Butte were more remote and inaccessible. They had no government wagon roads, no navigable rivers and lakes traversed by steamers in summer, and open to sleighing in winter. And yet these districts were developed by rawhiding ore down the snow buried mountains or by packing it for many miles on mules, and fortunes were made out of refractory ores of far lower actual value than we are told is the free milling, easily treated Rainy Lake ore.

Does some one say that the district needs capital? I grant it. But such great gold deposits as are reported to have been found here soon furnish the capital for their own development, if necessary by the hand mortar and arrastra; and where this is really possible capital is not slow in presenting itself, even for use in far-away Alaska.

As regards accessibility, climate, fuel, water and the cost of supplies and labor, the Rainy River district is more advantageously situated than the average western mining camp. What, then, are the reasons for its slow development? Perhaps some explanation can be found in a brief historical resumé of facts as they have come within the writer's observation.

The first gold discovery on Rainy Lake was made by Geo. W. Davis, on Little American Island in Minnesota in July, 1893. During

the early summer of 1894 a 5-stamp mill, the first one at Rainy Lake, was built to treat the ores from this mine. This mill was erected before the only shaft at the mine had reached a depth of 50 feet, and was located more than one mile from the mine, on the main land, at Rainy Lake City. For lack of ore, therefore, and because of the mistaken location of the mill, the mine was closed down on Sept. 24, 1894, after running for fifty-two days at a cost for mining and milling of about \$7 per ton. This failure was the first black eye that the district had received.

The next stamp mill to be erected was at the Lucky Coon mine, near the east end of Rainy Lake. Here also the plan was adopted of first building a mill, and then exploring and developing the mine to run it. The chief difficulties here, however, seem to have been lack of water and gold. The mill ran but a few days in 1895, and has since remained idle. This fiasco constituted black eye number two.

In 1894 considerable exploratory and development work was done by the so-called Lyle Company, on Dry-Weed Island in Rainy Lake. So far as the writer could discover there was neither quartz vein nor any other variety of gold bearing ore. Nevertheless, after sinking a shaft about 100 feet and running some levels to open up stoping ground, a fine modern 10-stamp mill was purchased and erected on the lake shore. Needless to say it ran but a few days, and the newspapers sagely reported that the mill was not adapted to the treatment of that class of ore; and that modern panacea for mining failures of whatever sort, the cyanide process, was invoked for the recovery of this evidently fine and very elusive gold. It may be remarked here that when gold is so "refractory" that it escapes the notice of reliable assayers, and can be found only by some new process understood solely by some of the parties interested in the mine, it is not an easy proposition to treat profitably. At any rate here was black eye number three, and not one success.

The next mill to be built was at the Foley mine. Here is the first mill at Rainy lake to be erected where it could be operated, and with a definite knowledge of ore reserves sufficient to pay for treatment, and extensive enough to keep the mill at work for any length of time. And even here the mill was built too soon. Money would have been saved in more ways than one if that mill had not been started until 1898. It is well known that only a portion of the mill has been run since the first few weeks, and that only half the time, owing to insufficient stoping ground in the mine.

Two mills have been built at Saw Bill lake, and both of them are, in the writer's opinion, wrongly located, at a distance from any adequate supplies of water. Here, much expense and many difficulties will be encountered, that should have been anticipated and avoided.

Similar difficulties are being encountered by other mills in the district, and other mines that might be mentioned are either already suffering from the effects of poor judgment in the selection and location of a reduction plant, or are planning for the installation of some experimental scheme that has not as yet an established reputation in this country.

It appears, then, that mining is handicapped in the Rainy river district, by the ignorance and inexperience of the mine owners and operators. Good ore, indeed, and in exceptionally large bodies, would be needed to pull the district alive through such an epidemic of almost fatal mistakes.

That there are gold quartz veins persistent in depth, and sufficiently well mineralized to pay for mining, and that the ores are largely free-milling, is true, as has been reported by the Ontario Bureau of Mines and the Minnesota Geological Survey. That the region is a series of bonanzas is certainly not true. From this fact, it follows that developments must be made economically, and by the aid of experience and the judgment of recognized authorities, rather than by the opinion of self-constituted and interested "experts," whose only knowledge of mining has been gained in the observance and perpetuation of the false methods so common in this unfortunate region since its discovery.

Incompetence and "fakism" have done their worst, and the Rainy river gold district is to-day in very poor repute among the active responsible mining men, whose capital and co-operation are so much desired. If development is to be continued and success attained at last, it must be by a radical departure from present practices. The prices of undeveloped prospects are too high; the country is over-boomed, and even official reports are not free from the "boom" contagion, while no reliance whatever can be placed on the ordinary newspaper accounts.

The Ontario Bureau of Mines could be of great service in this really critical juncture, by employing a corps of competent and recognized authorities on mining to make a thorough investigation and report on the whole subject. This report could be made to serve as a guide for the Bureau in lending aid and advice to the prospector and inexperienced mine owner. No longer would refractory plants be installed to treat free-milling ores; no more would mills be built where there is no gold, nor even quartz; no more would we have returns of six dollars per ton from ore that was previously said to average all the way from \$30 to \$1,000 per ton. Far better than spending government money on waggon roads for one or two favored mines, would be the acquisition of a report of this sort, which, coming from disinterested and competent men, would command the attention and confidence of the mining world.

Mining is but a matter of business, and its questions of profit and loss, as in any other line of business activity, are best understood by the aid of experience. A new district, be it ever so different from any other, is best and soonest understood and developed by those familiar with the peculiarities and difficulties that have been overcome elsewhere; while the novice, be he ever so honest, will inevitably make serious and costly mistakes.

If gold mining is to succeed and develop into a paying industry in western Ontario, it is absolutely imperative that conservative ideas and methods should at once be substituted for the inflated, bombastic boom atmosphere and plan of operations now in vogue. The infant industry will be slain by its own promoters, unless they realize their inability to cope unaided with the problems that are daily presented for solution.

HORACE V. WINCHELL.

Colliery Working and Management.*

Among the many publications of late on Coal Mining, no work on this subject of exhaustive character, that could be classed as an Encyclopædia, has yet appeared in the English language; nor does this latest addition pretend to fill the void. It is not even put forward as a student's handbook. It contains no digest of the many 'ologies that miners are supposed to understand something about. In this respect we certainly agree with the authors, as we believe that the desirable amount of abstract science required of mine managers in the present day, is to be obtained in better form in the several manuals specially devoted to the various sciences, that are called on to assist the managers of mines. Neither do the authors attempt to compete in the mechanical departments with such authorities as Percy and Hughes, and Pamily. Nor do they strive to meet the sensational incidents that embellish '*Underground Life*,' by Louis Simonin, and the equally suggestive illustrations, regarded from the standpoint of an Inspector of Mines, in '*Accidents in Mines*,' by A. R. Sawyer. Illustrations depicting the dangers that beset the worker, accompanied by a letter press of the style of the New York Calendar, aggravatingly terse.

The task which our authors gave themselves is set forth in their preface, to treat of the duties of a colliery manager, the oversight and arrangement of labour and wages, and the different systems of working coal seams. The successful working of a colliery, they say, implies the getting of the largest possible proportion of the workable coal in the best condition, at the lowest possible cost, and with the greatest safety and comfort to those employed. In order to attain this ideal, the method of working the seams should receive the fullest consideration, whilst the efficient organization of the colliery is likewise a matter of the greatest moment.

From this standpoint the authors proceed to state the experience and practice of the North of England. They show the daily routine of a colliery, the different classes of labour employed, and the system of wages in vogue in the northern counties, giving details that we do not remember to have seen in any other work. As an illustration of the thoroughness with which this part is presented, they append the 'cavilling' rules, the rights of the miners under various conditions, rights, which, if recognized at all in this country, remain among the unwritten laws. When they enter on explanations the authors do not content themselves with stating hypothetical cases, but take from actual practice, they give various forms of pay-bills, returns of produce and cost, rates of contract work and consideration. The examples being practical, further illustrate the wages earned and the cost of certain classes of work in the district in question. These will be found, even under the altered conditions experienced in Canada, to be of value for comparison.

That the authors are not insular in their reading, but have kept in touch with the growing powers in Canada, is evident by their quotations from the columns of the CANADIAN MINING REVIEW, and the Transactions of the Mining Society of Nova Scotia. These authorities they refer to when treating of Mining appliances, and the development of coal cutting machinery in Cape Breton. Having shown with what appliances coal is won, our authors enlarge on the various systems of mining that changed conditions of depth, thickness, cover and character of strata may seem to necessitate; and in this technical portion of their book they enter into competition with most of the writers of previous works of similar title. They illustrate freely, and in many cases very clearly, the methods of working, so that managers who may

**Colliery Management and Working* by H. F. Bujman, and R. A. S. Redmayne. 350 pages, with 28 plates, and other illustrations, including Underground Photographs. Medium 8vo, 15 shillings. Crosby, Lockwood & Son, London.

be compelled by changed conditions in their pits to modify their modes of working, will find these sketches very suggestive and helpful.

Mr. Bulman has long been known to readers of English mining literature in connection with the British Society of Mining Students, and Mr. Redmayne, in the Transactions of the Federated Institution of Mining Engineers, has previously shown his ability in the same direction under the caption—The Geology and Coal Deposits of Natal.

Asbestos and Asbestic.*

An interesting and valuable publication from the pen of Mr. R. H. Jones of London, England, on the subject of Asbestos, has just been handed us. This is a second edition, very considerably enlarged, of his book on the same subject, which appeared several years ago, and the present volume contains much new and valuable information, pertaining to the mode of occurrence, localities and general development of the asbestos industry, making a somewhat exhaustive treatise. It is beautifully printed, with numerous illustrations, shewing not only the various forms of the mineral, but also views of the localities where it is found, with many minor illustrations relating to the different forms of manufacture. It contains also several maps of the Asbestos district in Canada, among which is that of the Thetford and Black Lake areas, published by the Canadian Geological Survey.

Since the date of the former volume the search for Asbestos has been earnestly prosecuted, with the result that many new fields have been discovered, some of which appear to contain the mineral in abundance, and these will in the near future doubtless enter into competition with the celebrated mines of eastern Canada. There appears in fact to be a very widespread distribution of the mineral deposits, apparently of considerable magnitude and importance, occurring in Southern Africa, Australia, Siberia, Norway and at other places, as well as in the well known areas of Corsica and Italy, so that the monopoly held for some years practically by the Province of Quebec appears to be seriously threatened, provided the cost of placing these new deposits on the market is not too great.

The arrangement of the book is excellent. Beginning with the early history of the mineral, considerable space is given to its former uses and to the various theories concerning its supposed origin. The many varieties and forms of the mineral, as well as its peculiar properties, are well discussed; and this is followed by a description of the localities where the mineral has now been found. A slight mistake occurs in this connection where the author puts the Nipissing district in Yukon, but possibly he considers this as of small moment in a country of such magnificent distances as Canada.

An excellent description is given of the Italian deposits, and of the methods of mining in use in that country, which appear to be very different from those with which we are familiar in Canada, and the statement is made that the Italian mineral is a true asbestos or fibrous hornblende, and therefore anhydrous. In a list of analyses however, giving a composition of the Thetford, the Laurentian and the Italian mineral, the percentage of water in all the specimens is stated to be practically the same, shewing that the Italian asbestos is almost precisely similar to that from the Eastern Townships, and that therefore some portions at least of the mineral from Italy must be like the Canadian variety, viz. an altered serpentine or chrysotile.

Several chapters are devoted to the Canadian deposits, presumably on account of their great economic importance, both of the areas found in eastern Quebec as also those which occur in the Laurentian

rocks. The history of the several Canadian mines is very fully stated, and much valuable information given as to their gradual development. The cost of mining, the introduction of new methods in the working of the fibre and other points of general interest are included. Much attention is paid to the deposits at Danville, and to the discovery and development of the new material Asbestic, the manufacture of which is now being carried out at this place on a very large scale.

This new material, which is produced by crushing and separating the serpentine of this area, much of which apparently contains a very considerable percentage of fine or short fibre, is claimed to be a perfect non-conductor of sound and heat, and its use as a plaster in buildings is held to render these both sound and fibre proof. This property is a very important one, and will doubtless lead to a very general use of the material in all the better class of buildings, so that the development of this new industry should in time assume very large proportions.

A chapter is also devoted to the many other uses to which Asbestos, and the new preparation, Asbestic, can be applied, and the great fitness of these for many purposes in engineering work and for general scientific purposes, is pointed out. The increase in the variety of the uses to which these substances are now applied is marvellous, and the list of the various manufactures is a long and interesting one, some of these being of great economic importance, and such as come largely into daily use. Its superiority to mineral wool and infusorial earth as a non-conductor of sound and heat is pointed out, and clearly established. In regard to the new material, Asbestic, its usefulness would seem to be almost unlimited, and the future of the material assured.

On the whole, Mr. Jones has produced a very readable book, which contains a very large amount of valuable and useful information relative to this new industry, and it is to be hoped that the new material may realize all that is expected of it. There are many localities in Canada where asbestic can probably be manufactured, and there is apparently no reason why, if the industry should be profitable, much of the waste rock at the Thetford mines should not be treated as readily as the rock at Danville. The Serpentine of the Laurentian areas, north of the Ottawa, as well as at many other points in the great Archaean belt, are also available for the manufacture of this material, and already several mines have been opened for this purpose, and mills erected. Among these may be mentioned the area in Denholm, near the Gatineau River, from which a very considerable amount of asbestic bearing rock has been already shipped, and also the areas in Grenville, near Point au Chene, on the Ottawa, at which place a mill for the manufacture of this material has been erected, and has been in operation for some time. Whether the cost of the material can be reduced to such a figure as to compete successfully with the ordinary plaster with which we are all familiar, and replace it in general building operations, is a question for experiment; but the use of the material is increasing rapidly, and in view of the many advantages possessed by asbestic over the ordinary plaster, it is evident that for all the higher class of work its use is sure to become general. The result in this case will be the development in Canada of a new and important branch of industry, which will favorably affect several points in the Ottawa valley, as well as certain places in the asbestos areas of eastern Quebec.

With this number we increase the circulation of the REVIEW 1,500 copies.

The banks at Edmonton, N.W.T., are reported to have taken in about \$38,000 worth of Saskatchewan gold since the season opened. Taking it since last November, \$55,000 is a conservative estimate of the quantity of dust handled by them.

*Asbestos and Asbestic: Their Properties, Occurrence and Uses. By ROBT. H. JONES, F.S.A., with ten collotype plates and other illustrations. Publishers, Crosby, Lockwood & Sons, 7 Stationers' Hall Court, London, E.C. In Canada, The Drysdale Co. Limited, Montreal. Price 3s.

A Year's Progress at Rossland.

A considerable change has taken place during the past year in the condition of affairs at Rossland. Fifteen months ago, any mineral claim stake within one mile of the town had a market value. No matter if the lead consisted of but one or two red spots due to the oxidation of the included pyrites of the country, and then called "iron capping"; no matter if the ground were guiltless of a shot hole to demonstrate the existence of ore; no matter if the Le Roi vein must be twisted around at right angles in order to pass through the ground, or if the War Eagle lead described a curve resembling the Cissoïd of Diocles, and outcropped on the claim, no matter anything in fact, except that the prospective mine possessed enormous possibilities, and there was only needed development work at thirty dollars a foot to expose the hidden treasure. All requirements for the extraction of ore were fulfilled. The base of supplies was close at hand; transportation facilities, with the railroad but a quarter of a mile distant, were unexcelled; timber was plentiful; of water there was an abundance, and the smelter was only six miles away. Possibly there was a compressor plant close at hand, to which a pipe might be laid, and work prosecuted with exceptional vigor. These tantalizingly favorable conditions, naturally tickled the stock buyer, and so he bought stock. Investors thronged the hills, tenderly piloted by their guides, the claim owners, while stock brokers multiplied and gave birth to exchanges. The owner of the claim got his purchase price, the promoter got a moderate commission to pay him for his time and trouble, and everything moved along merrily, until the development work had exhausted the treasury stock; and then there was a watering. The consequence?—much disappointment. That was during the excitement, and the change that has since taken place, consists mainly in the unwillingness of capital to invest in property that cannot show some intrinsic merit. The excitement has abated, which is bad for the stock business, and the fancy prices of mineral claims have come slowly down to somewhere near a fair and substantial basis. Who is there to say that this change is not for the better? Fictitious values and wild-catting never did a camp any good, and now that the district is on its merits, it is being investigated by that class of investors which will best determine its real worth. Nor did it require an unusual amount of perspicacity to foresee such a culmination, and it would be more than unfair, now that the expected has happened, to generalize and make a sweeping condemnation; for the production of the camp was never so large as it is to-day, and there are many men of means who are watching it closely, and stand ready to put in large sums of money when they see they can have a fair bargain.

There are several properties—more correctly there are many properties—that have closed down within the year. There are several now working which have had but small encouragement, but in spite of all this, it cannot fairly be said that development work has been disappointing, or that it has reflected discredit upon the camp. To be sure, there has been many a pound of powder uselessly burned, and many a foot of ground broken with no result; but wherever there was any reason to expect good returns, there was little complaining. Rossland has not suffered more from pinched out veins, or loss of value, than other camps have suffered.

The Le Roi is sinking at the 600 feet level, though there is no stoping being done there just now. The hoisting is done from the skip shaft, which is not timbered beyond the 500 feet. Work was commenced on the projected vertical shaft. The Le Roi people have spent a great deal of money on improvements this year, installing the new forty drill compressor, the new hoist, and new bunk houses. That seems to indicate faith in the stability of their ore bodies. That

is a faith, which the camp as a whole, sincerely professes. Yet there would be nothing surprising, if the Le Roi ran out of ore in the shaft. The mine has already developed four distinct shoots of ore, with barren ground between; and there is no reason to expect any shoot to continue without end. There would be good reason to expect the finding of other shoots should one be lost. We have only to remember that the shaft was put down from the 40 feet to the 250 feet, in ore that would not ship, though the top stope produced \$80.00 rock.

The manner of occurrence of pay shoots in the camp is a little peculiar, from the fact that the appearance of the rock seldom gives any indication of its value. We have, in a vein, shoots of sulphide ore that may be barren, low grade, or of shipping grade. We may be running along in a shoot of barren sulphides and suddenly strike shipping ore, though no great change in appearance has taken place. It is for this reason, that such constant assaying is necessary. That is just what happened in the Monte Cristo. Work was started on a large body of sulphide ore, which assayed a "trace" or two, or three dollars; and the tunnel was continued seven hundred feet before good ore was found. The drift was not continuously in ore, as there was a fault in the vein of about a hundred feet, the faulted portion being located by two cross cuts. The vein then resumed its normal course, and after seven hundred feet of driving a pay shoot was encountered. Here the ore differed but little in appearance from the barren sulphides, being a mixture of massive pyrrhotite and arsenopyrite, with smaller quantities of iron and copper pyrites and marcasite. This encountering of pay ore, after several hundred feet of discouragingly poor rock, must doubtless act as a stimulant in exploring other bodies of sulphide, which carry little or no gold. There are several of these in camp: large, strong deposits of pyrrhotite and persevering drifting may yet disclose shipping values. This has evidently been the idea of several companies in doing work and low values, which are the rule rather than the exception, do not discourage so long as there is a deposit on which to work.

The closing down of the Columbia and Kootenay was somewhat of a surprise to the camp, as that mine had been looked to for large, steady shipments. Development work had been steadily pushed, and had opened up some very large bodies of ore on which considerable stoping had been done, and several shipments made. While some of the ore is of high grade, the great bulk of it is low, so that the present charges for freight and treatment are just a little more than it can stand. The vein is a large and strong one, and is scarcely disturbed by the large dyke of porphyrite that cuts through it. The mine has been under bond to Mr. Heinze, and as soon as that affair has been adjusted we will expect work to be resumed, for it is a promising piece of ground. The Iron Colt, its near neighbor, started in at the Alberta tunnel, already three hundred feet long, and drove three hundred feet cross-country, to meet the lead on which the shaft had been started. The lead was cut in place at a depth of three hundred and twenty feet, and showed a very large body of pyrrhotite, which is being drifted upon. This striking of a large ore body at that depth, speaks well for the permanence of Rossland veins. The cross-cut is being continued to meet another vein farther north.

The Poorman, in the region of high assays, has lately resumed operations, both in stoping and exploiting; and is demonstrating that it can produce good ore. Former development work scarcely did justice to the mine, as the main ore-body was neglected, and the tunnel run in many directions, following little slips and stringers that intersected the vein. Work on the adjoining War Eagle, under the able management of Mr. Hastings, has discovered large ore reserves. It has been the policy of the present War Eagle company to do but little shipping, and devote its energies to exploiting the ground

thoroughly, block out its ore bodies and then settle down to a steady output, keeping the development work well in advance of the actual extraction of ore. It is said on high authority, that next year the War Eagle will produce as much ore as the Le Roi is now raising.

The Josie has been sinking steadily and got some good ore on the 200 feet.

Over in the South Belt, the development of the past year has not been so satisfactory as was expected. The Crown Point was obliged to do a large amount of tunnel work to find the vein that was lost from the shaft. The vein has been found and is being explored for ore. There are several South Belt properties lying idle for lack of funds. The Gopher-Homestake, which is one of the most promising in that region, is under bond and closed down until the deal has been put through. The Lily May, has lately started work with air drills and driving their drift closer to the foot wall, exposed a fine body of ore which had formerly had been run over in keeping towards the hanging.

The Sunset, operated by a strong company, has shown encouraging results from development.

The O. K. is suffering from lack of ore and funds; and the mine and mill have been closed down for some months. The mine had never demonstrated the existence of more than one ore shoot, and when that was stoped out there came a sudden halt. The ground has not been thoroughly prospected and further work may yet reveal more ore.

Over on Sophie Mt., the Velvet, is showing up well. A shaft is sinking in a fine body of copper-gold ore, and a recent shipment to the smelter showed excellent grade.

The future of the camp, as has always been maintained, lies in cheap treatment. This, with a reduction in the cost of mining, is what Rossland must depend upon for future greatness, for the ore is generally of low grade, and the shoots of high value are few and far between. When we may mine ten dollar ore at a profit, then Rossland will show an exceptionally large production. As yet no method of reduction, other than smelting, has been attempted.

Mr. Webber is building a Pelatan-Clerici plant of twelve vats, to treat the low grade rock, but he will probably only handle the siliceous ore, as it is from that class that the best extraction is got. This siliceous ore is simply ore with a preponderance of gangue, through which is sprinkled the gold bearing sulphides. This ore will concentrate, though generally with some loss, due probably not only to the slimes formed, but to the presence of fine gold. There is also, the heavy basic low grade ore with scarcely any gangue. This is, of course, beyond concentrating and a very difficult product to handle, except by smelting. I have experimented with ore of this class by grinding to flour size, or slimes, and then treating the pulp with mercury; and have obtained an extraction of sixty per cent.

It may be that some scheme will be devised for treating the basic ore, and then the siliceous may be concentrated to enter this class.

GODWIN ORDWAY.

The many friends of Mr. William Blakemore, M.E., for several years prominently identified with the opening up and re-equipment of the various collieries in Cape Breton of the Dominion Coal Co., will be pleased to learn of his appointment to the position of general manager of the Crow's Nest Coal Co. Ltd., whose valuable coal areas in the East Kootenay district of British Columbia we referred to in our last lumber.

These coalfields are to be opened up immediately, and with a view to purchasing plant for their equipment, Mr. Blakemore sailed for Scotland, 13th instant. He goes out to East Kootenay again early in the New Year.

EN PASSANT.

To date over twenty papers have been promised for the Second Interprovincial Conference of Canadian Mining Engineers to be held under the auspices of the Federated Canadian Mining Institute, at Montreal, during the first week in February next. Among the subjects intimated for discussion since our last announcement may be noted: "On the Strange Singularity of Colour in Some Forms of Asbestos," by Ro. H. Jones, F.S.A., London, Eng.; "An Ideal Power Plant for the Working of Low Grade Gold Ore" by C. F. Andrews, Isaac's Harbour, N.S.; "On the Albertite Deposits of New Brunswick" by Mr. John Rutherford, M.E., Windsor, N.S.; "On the Progress of Mining in British Columbia" by Mr. W. A. Carlyle, M.E., Provincial Mineralogist, Victoria, B.C.; "On Western Smelting Practice" by Mr. R. A. Hedley, (Hall Mines Ltd.) Nelson, B.C.; "Notes on the Mineral Development of Nova Scotia" by Dr. E. Gilpin, Jr., Inspector of Mines, Halifax; "The Halsey Pneumatic Pump at Drummond Colliery" by Mr. Charles Fergie, M.E., Westville, N.S.; "Western Methods of Mine Accounting" by Mr. John E. Hardman, S.B., M.E., Montreal.

In order to facilitate discussion papers will be printed and distributed to members in advance of the meetings, and to this end contributors are requested to forward their M.M.S. to the Secretary, if possible, before the end of next month.

Arrangements are being made for a banquet similar to the imposing function held last year, to which His Excellency the Governor-General, the Premier, and other notables will be invited. This will take place in the Windsor Hotel, Montreal.

At a meeting of the Council of the General Mining Association of the Province of Quebec, held in Montreal on Friday, 12th instant, the following students were awarded prizes for papers contributed to the proceedings of that organization during the year.

First prize, \$30.00, to J. Walter Wells, School of Mining, Kingston, for his paper on "The Mispickel Ores of Deloro, Ont." The second prize was equally divided between W. H. Nelles Thompson, Quebec, and W. M. Ogilvie, Montreal, students at McGill University, for their papers on "Asbestos Mining and Dressing at Thetford, Que.," and "Gold Mining in the Yukon."

Intending competitors for the next competition in February are requested to intimate the titles of their papers to the Secretary before the end of next month.

The first campaign of the new mill of the Fern Gold Mining and Milling Company, Ltd., near Nelson, lasted from the 6th October to the 13 November, and included a period of 38 full days of 24 hours each. In this period 965 tons of ore were crushed, and 20 tons were shipped and sold to the Hall smelter at Nelson. The returns from the ore milled were:—\$11,995 obtained from the mill, and \$1,950, the estimated value of concentrates. The analysis of these figures (which have been given to us by the management) shows that the total amount received from six weeks work was \$15,145.00, an average of \$2,524.25 per week. The average duty of the stamps was 2½ tons per diem; the average yield per ton in free gold was \$12.43; the average yield per ton in sulphides was \$2.02; making the average value per ton milled \$14.45.

From these figures it is quite evident that the Nelson district has added a new producer of no small dimensions. It is sincerely to be hoped that this good record may be kept up, as it will furnish an impetus for the exploiting of the gold veins round about Nelson of which, for the last year or so, we have heard little or nothing.

The Reading Railroad Company has begun the work of reclaiming the great masses of anthracite coal buried in the mountains of coal dirt scattered all over the Schuylhill coal basin. During the season just closing, 50,000 tons of good coal were reclaimed from the coal dirt near Kalmia colliery alone. Kalmia colliery is now abandoned as a coal mine, having been worked out. It was one of the very best of the Reading Coal and Iron Company's properties in the west end, and its product was vast in the many years of its active operation. Now the company has turned its attention to reclaiming the coal in the drift mountains at the colliery. Suitable washing machines were put in, and quantities of first-class coal are being taken out of what was considered a great black mass of worthless dirt. There is no way of estimating the weight of these mountains of coal dirt in the three Pennsylvania anthracite coal basins, but they are valuable, especially where there is a plentiful supply of water. In recent years the discovery has been made that pea coal is a first-class fuel. They now take out and classify not only pea coal but buckwheat and rice as well. The company is able to make at least \$1 clear profit a ton on this washed coal, which would make \$50,000 clear profit on the Kalmia washery alone.

After ten months of constant service, the shaft of a winding-engine broke off short without having been subjected to shock or any unusual load; on the contrary, the accident happened while an empty cage was being drawn up. M. O. Pierart, who reports this circumstance to the *Echo des Mines*, in connection with the breakage of the piston-rod of the "Bruix," accounts for both fractures in the following manner:—All the forged parts of large engines—shafts, cranks, piston and connecting-rods—are made from steel ingots, perfectly sound and of excellent quality, as proved by the tests to which they are subjected. In order to prepare the ingot for the forging, which will give the necessary form, it is placed in a heating furnace; and sometimes this heating, in a very hot furnace, is effected too quickly, so that the outside of the ingot becomes overheated, while the inside remains at a comparatively low temperature. The too rapid dilatation, or expansion, of the outside sets up an enormous tensile strain on the inside, causing a cross-fracture thereof, accompanied by a characteristic noise, that of a two or three ton ingot resembling the report of a rifle shot. If, notwithstanding this fracture, the forging be proceeded with, the faces of separation will be brought together by the steam hammer, but not welded; and, when turned, the part will show no defect. Where, however, the fracture has taken place in the heating furnace, there is only an annular surface of adherence. The resistance is still sufficient; but the limit of elasticity is approached; and change in the molecular state gradually subvenes, so that fracture in all probability will ensue.

Mechanical haulage in the underground work of mines is a question which has received much attention of late. Many different systems have been recommended and adopted; and it is found that a system that is suited to one particular case may be quite inapplicable to another. Steam, compressed air and electricity all have their advocates, and yet none of these systems are entirely free from objection. Haulage by chains is not suitable in sinuous windings, owing to the difficulties the chains present; but for such tortuous passages Mr. George Heckel, of Saarbruck (as we learn from a contribution to a Belgium journal), has patented a system of mechanical haulage by endless rope, which permits of crossing the curves with comparative ease. He employs a steel rope, which starts from the station where the power is generated. This rope is placed along the galleries, above the line used for the empty trucks, then it is brought back to the station, passing

above the line where the loaded tubs circulate. Owing to a system of pulleys, which increase the adhesive force, the rope at the station is only wound round a single wheel, and thus wear is greatly diminished. When a curve has to be traversed, the rope is inflected over a large horizontal pulley, of the same radius as centre of curve, fixed to the walls of the gallery. There is nothing special about this pulley; it has a flat rim, and is flanged on both sides. On entering the curve the truck leaves the rails, and enters upon a cast-iron trough, which continues as far as the curve. This permits the trucks to run upon the flanges of their wheels in curves of very small radius, without running off the rails. And it is important to notice that by this arrangement the truck remains constantly attached to the rope. On leaving the flat-bottom trough, the truck gets on the rails again, and all this is effected without any aid from hand labour. An ingenious haulage clip is used with this system. It is a lever with a bend on its upper end, which bears against the rope. The traction of the waggon forces the upper bent end against the rope, into which it fits exactly, and the rope is held more firmly in proportion as the pull increases. We think, on the whole, that this system of haulage by wire rope, with the mechanical details necessary in its application, has not much to recommend it.

The French manufacturers of asbestos goods are supplied from four sources:—1. Canada, whence the asbestos is white, silky, very unctuous, having supple fibres from 5 to 25 mm. in length; of all varieties it is that which spins the most easily. 2. Siberia, whence the mineral is yellowish, some species being of a straw yellow. The fibre is less flexible, and more woody, but stronger, than the Canadian, which it resembles in length; large masses of long-fibre mineral being, however, rarer. 3. The Cape of Good Hope asbestos has a characteristic blue colour. It occurs in larger masses than either the Canadian or Russian, and its fibre is generally longer and stronger. In spinning or other manipulation, however, it is difficult to handle, a good deal of the fibre being reduced to powder. 4. In Italy there are different kinds of asbestos, but generally they are little adapted to spinning. There are some long silky fibres of little resistance, employed for gas furnaces; others are very short and fit only to make heat-retaining coverings.

Treatment of Battery Slimes.*

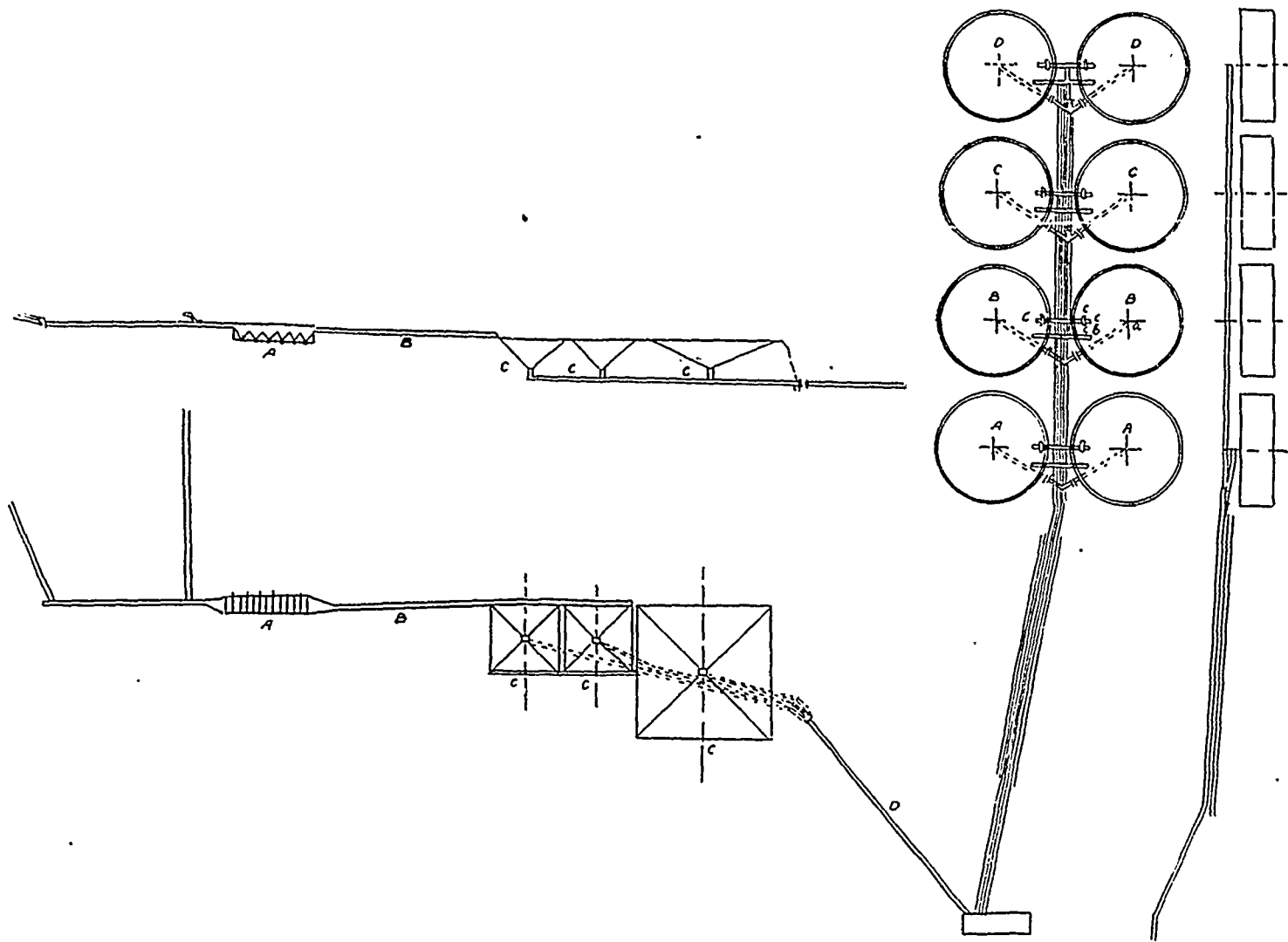
By JOHN R. WILLIAMS, Johannesburg, S.A.

It is about four years ago since I first started experimenting in a practical way, to arrive at a method for a profitable recovery of gold from our battery slimes, which, heretofore, had been allowed to run to waste. I found no difficulty in getting a very high extraction of the gold contents of the slimes from the main reef series in a cyanide solution, but every method of precipitation that I tried was met with failures on all sides. At first I thought this was due to the extreme weakness of the cyanide solution used, but on further experiments I found that increasing the cyanide did not help in any way, and was finally convinced that the comparatively large amount of salts of lime present was the cause of not getting precipitation. Although I, three and a-half years ago, obtained provisional protection for this process of slimes treatment, it was not until our esteemed colleague, Mr. Von Gernet, so greatly improved the Siemens-Halske method of precipitation, that I felt justified in asking Mr. G. E. Webber, then my general manager (who at all times so kindly supported me, but more especially in the faith he showed in backing me up in a process unknown and

* Paper read before the Chemical and Metallurgical Society of South Africa.

untried), for the necessary capital to build a plant to treat the slimes direct on coming from their tailings plants. This plant, viz., the Crown Reef Gold Mining Company (the first direct slimes plant to work on a practical scale in the world), has now been running for about twelve months, and has been fairly satisfactory; but necessarily, as usual in the starting of any new process, there were several little difficulties, and, small as they were, they took a great deal of time to rectify, causing a great deal of inconvenience from stoppages, etc. However, from the very first month, this plant has always shown a profit. I will now give you a brief description of the construction of this plant, and draw your attention to the diagram and blue prints before you. The slimes leaving the tailings plant run through the large sand separator "A," where any tailings can be separated. This however, has not been working for the last ten months, as it was found that the quantity of sands leaving the tailings plant was so small that it could be totally ignored. This piece of apparatus, however, I

feeding. After being mixed with the lime, the slimy water passes through the two settling pits, C C, each having the following dimensions: 20 feet by 20 feet, and 10 feet deep. Here, roughly speaking, 80 to 90 per cent. of the slimes are deposited; the overflow from these pits passing to the larger pit, which is 40 feet by 40 feet, and 10 feet deep, from which the water runs away practically clear. These pits come down to a point, forming an inverted pyramid. They are all separately connected with the suction of a centrifugal pump, which pumps the settled slimes into the eight treatment tanks, A, B, C, D. These pits get rid of fully 90 per cent. of the total water used in the mill, so we have still to pump into these tanks about 10 per cent. of the water with the slimes. These tanks are each 32 feet in diameter and 10 feet deep, having a conical bottom. These are arbitrarily divided into four series, thus tanks A, A are used for receiving the sludge or slimes, where they are allowed to settle, the effluent water being drawn off by slats on the side of the tanks, and then conducted



would point out, is something like a revolver: you may never require it, but when you do you want it very badly. To the slimy water flowing into the launder "B," sufficient lime (in the form of milk lime) is added to precipitate the slimes; which it does in a flocculent form. I will here add that regularity in the feeding of this lime plays a very important part; an excess is quite as bad as too little. I was so thoroughly convinced of this, that I consulted our well-known engineer, Mr. L. I. Seymour, who designed an automatic lime-feeder, a blue print of which, by his kind permission, I now place before you. This simple apparatus is the means of saving not less than £1,200 per annum in lime alone, and gives a far more perfect precipitation of slimes than could be possibly obtained by the old method of hand-

by a pipe into the larger settling pit, so that, in the event of it being turbid, it will get a chance of further settlement. Whilst one tank is being filled, the other will have been completely settled, and all the effluent water drawn off. It is then pumped into tanks B B, using a hose with a jet, through which cyanide solution is pumped to sluice it into the suction of a centrifugal pump, sufficient solution at the same time being added to fill these tanks; the strength of the solution is simultaneously increased so as to bring the whole up to .01 per cent. of cyanide of potassium. I have found on actual tests that practically 80 per cent. of the total gold in the slimes is dissolved in its passage through the pump. However, as will be seen from the construction of the tanks, further agitation is given by suction from the conical bottom

at "a," and charging over the top of the tank at "b," and also near the bottom through the three arms "c," two having the same radius as the tank, whilst the other throws across the diameter of the tank. This, we find, gives a very good agitation, and is kept up for a period of from one to two hours, when the slimes are allowed to settle, and the clear solution drawn off through a series of side cocks (these side-cocks I do not think nearly as convenient as the Rand Central's syphon pipes.) It is difficult to place these cocks in such a position as to enable the last inch or so of solution to be drawn off. Another objection is that a cock may be opened too low down, thus allowing slimes to flow with the solution, which is very detrimental to the satisfactory working of the precipitation boxes. Having drawn off all the solution, the residue slimes are pumped into tanks C C, where they are further agitated with a very weak solution of cyanide, and allowed to settle. These solutions do not pass through the precipitation boxes, but are used for the first treatment, in transferring from tanks "A" to "B;" sufficient cyanide at the same time being added to bring it up to the strength required. The slimes are then pumped into tanks D D, with very weak solutions, settled in the usual way, this solution being used for transferring from tank "B" to "C." Here I would like to draw your attention to what I will call concentration of gold in solution; thus, at the start of this plant the precipitation boxes had to take at the rate of seven tons of solution per hour per box, with the results that the precipitation was not at all satisfactory; whilst with the present arrangement the boxes have only about two tons per hour, but of a solution very much richer in gold. These assay now 60 grs., against 15 to 20 grs. by the old method. As this solution is allowed at least three times as long to pass through the boxes, precipitation is very greatly improved. Again, a well known point to you all is that the first 50 per cent. of gold can be deposited in a very small fraction of the time required for the last 10 per cent.—an example of which is given in the following test, obtained some two years ago, when Mr. Charles Butters kindly placed one of his boxes and gold solution at my disposal, so as to enable me to get the true capacity of precipitation boxes required for a plant of a given size.—

Originals—2dwt. 12gr. fine gold per ton.

No of Test.	Time.	After Precipitation.
1	3 hours	1 dwt. 4 gr.
2	6 "	20 "
3	9 "	12 "
4	12 "	8 "
5	15 "	4 "
6	18 "	2 "
7	21 "	½ "
8	24 "	trace.

Here it will be seen that in the first three hours 53 per cent. of the gold was deposited, whereas it took 21 hours to render this solution gold free. Another advantage of this treble treatment is that pumping over from tank to tank ensures a most thorough agitation, which is shown by the fact that it has increased the theoretical extraction from about 70 per cent. when using single treatment to over 83 per cent., the extra cost being only a fraction of a penny per ton. The clear solutions from tanks "B B" aforementioned are run into two settling or clarifying tanks, which are 15 feet in diameter by 5 feet deep. Here the solution is allowed sufficient time to settle any slimes that may have come with it, thus, while one tank is being filled, the other is settled, and passing through the precipitation boxes. These are four in number, of the following dimensions: 30 feet long, 6 feet wide, and 4 feet 9 inches deep. The iron anoids are placed at 6-inch centres, between which is placed a double wire frame, carrying on each wire three lead sheets cut into strips. The solution always passes

upwards through the compartments in the same manner as the well known zinc process. From these boxes solution flows into the sump "E," which is 40 feet in diameter and 12 feet deep, from where it is used over and over again. The cost of treatment for the months of April and May is shown at 3s. 9.05d. per ton, made up as follows:—

Management and European wages	9.44d
Kaffirs and food	3.29d
Electric light.	0.40d
Power	2.75d
Cyanide	5.51d
Lime	6.19d
Lead foil	1.75d
Oil and waste	0.89d
Assaying	1.26d
Sundries	0.63d
Royalty	4.77d
Maintenance—	
Labor	4.43d
Stores, including proportion of replacing centrifugal pumps	3.73d
	<hr/> 8.17d
	<hr/> 3s. 9.05d

The following are the results obtained for the same period:—

Tons treated.....	6.643
Assay value.....	5.32 dwts.
Assay value residues.....	0.892 dwts.
Theoretical extraction.....	83.646 per cent.
Fine gold recovered	1,067.16 oz.
Actual extraction.....	60.483 per cent.
Profit	£3,058 11s. 2d.

This profit is equal to a dividend on the capital of the company of over 15 per cent. per annum. You will notice there is a great discrepancy between the actual and theoretical extraction. This, I am of opinion, is entirely due to the difficulty in estimating the tonnage of slimes treated. The system adopted is to take the difference between the mill and tailings tonnage,—and call the difference slimes—giving the slimes plant credit for any stoppages when the slimes are run into the slimes dam. I am of opinion that the cost, 3s. 9d. per ton, is very low, considering that the average cost of previous working has been about 4s. 6d.; thus, the previous month the actual extraction was 17.2 per cent. above the theoretical, when a high cost of 5s. 5.6d. was shown. I have, however, refrained from giving averages over a longer period, because this plant incomplete until the beginning of April. No clean-up was made for the month of June, the system adopted being to clean up bi-monthly; but, as this company always issues very full and clear monthly reports, any of you sufficiently interested can see what this plant will do in the future. You will note that a large amount of the cost (6.19d.) is made up in lime; this, I would like to point out, is in a ratio, not to the slimes, but to the water. As the Crown Reef treats 75 to 80 per cent. of the product leaving the mill as concentrates and tailings, it leaves but a small amount of slimes; the same amount of lime would be sufficient to settle all the slimes had there been double or treble the quantity in the same amount of water. This company, with its mill, cyanide, and slimes plant, is now recovering fully 90 per cent. of the total gold contents of the ore, at a cost of under 6s. per ton. These figures, I am of opinion, our advocates of dry crushing and direct treatment will find very hard to compete against, both from a point of high extraction and low costs—therefore, maximum profits.

Notes on present Western Practice of Metallurgy Economically considered.

By W. B. DUBREUX.†

President Low has invited me to occupy a few hours in discussing with you some of the aspects of Western Metallurgy. In undertaking to comply with this invitation, I am in doubt as to what method will enable me to utilize your time to the best advantage. My task is both easier and more difficult, for the reason that you have already gone over so much of the subject; easier because it enables me to avail myself of the information you have already acquired; more difficult because I wish to avoid the repetition of what you already have at your command. The field from which I am to select my subject-matter is, however, very extensive, and one in which great activity prevails. Much of the recent progress has not yet been recorded in available form, and even in the recent metallurgical literature, there is much which needs the test of practical knowledge and additional experience before it is entitled to a permanent record. Moreover, apart from its technical side, Western metallurgy involves many factors contributing to success or failures which are hardly entitled to a place in the literature of the subject. It seems to me desirable therefore, to first occupy a portion of your time with some general considerations and afterwards to outline some of the more recent metallurgical tendencies and practice. After all, much that I shall say to you will probably have a familiar sound; for, although modifications of both processes and appliances are constantly being introduced, radical innovations are seldom made, and even then gain a foothold only by degrees. Economical considerations should furnish the motive for introducing variations in practice, and unless these stand the test of the balance-sheet, they have no place in commercial work. At the outset I wish to emphasize the fact that metallurgy cannot be mastered either in the class-room or with books. Together these will enable you to learn what processes are in use for the extraction of metals from their ores, and to obtain a knowledge of the various devices by which these processes are carried on; but that particular knowledge, so difficult to define, which I may term "the how" to do things, is something which you must acquire by actual practice. Do not, however, let the realization of this fact discourage you, for equipped with a general knowledge of the theory and practice of metallurgy, you can take up practical work under conditions which will enable you to grasp the details of practice rapidly and with intelligent understanding. There is no art to which the same reasoning does not apply. Theory must always be supplemented by practice. The doing of the thing always differs by indefinable variations from the description of how it is done, and new problems never comprise exactly the same factors as those already solved.

To illustrate: Suppose you were to go into a metallurgical works and take up your position near a blast furnace. After you had watched its operation for half an hour, you would conclude that the whole process was apparently a series of simple operations repeated at regular intervals. You would see the man at the top of the furnace charging the ore mixture, the calculations of which would present no especial difficulty. At the bottom of the furnace you would see slag being drawn off at intervals, and at other intervals the metallic products. The whole cycle of operations would proceed regularly and without interruption or miscalculations. If you were to go away after watching these operations for a short time you might possibly think that you had seen the whole of a blast furnace smelting. But suppose you were one of the staff of workmen actually operating this furnace, and you were compelled to spend eight or twelve hours a day in doing

these very things that you have already seen. Sooner or later, a time would come, when the furnace would begin to work irregularly and fail to perform its regular functions.

The assays might show that the slag contained excessive quantities of valuable metal; the melted products might become cold and fail to flow properly; tapping might become difficult; the charge might descend irregularly or become too hot on top. At such times as these, if you were one of the working staff, you would at once find yourself in a most valuable training school. The reasons for the special trouble would be determined, and you would assist in the application of the remedy, your scientific knowledge enabling you at the same time to understand the reasons for whatever action was taken.

In a few months, in all probability, almost all of the accidental difficulties which arise would have come up for a solution, and your knowledge of the same would have become comprehensive and available. There is nothing more necessary to the metallurgist, and nothing which gives him more satisfaction, than the ability to diagnose irregularities, and to correct them quickly and surely. There is nothing which so completely enables him to command the respect of his men and their best services as the ability to show them what to do and how to do it.

My advice to you, therefore, is to lose no opportunity to gain practical experience, and, wherever you are, make it your first business to learn how to do everything, and to be able to take the lead even under the most difficult and trying circumstances. The time which you spend watching ordinary commonplace operations, which are going on from day to day at any works with which you are connected, is never lost, and will give the most valuable experience which you can acquire. It will round out your theoretical knowledge, put you in touch with the little niceties of your profession, and give you that intuitive perception which can only come from close observation and practice.

As a rule, only a few metallurgists in the West are able to devote themselves to metallurgical problems pure and simple. It is only in the large custom smelting works that they are relieved from business transactions, and have only to concern themselves with the purely scientific side of the problems which come up for solution, and, of course, it is these great establishments which afford the best opportunities to make improvements, and to try experiments looking toward improved processes. Western metallurgy has for its object the treatment of ores produced in the great mountain region between the Western plains and the Pacific coast, which reaches from the Arctic regions down through the United States and Mexico. It may be truthfully said that the ores from all these regions come to one or other of the various metallurgical establishments in the United States, and, in addition to these, in the past few years large works have been established in Mexico and in the British possessions on the north. Ores of every possible description come to these works, but it by no means follows that these ores are all treated at the works nearest the mines which produce them. In nearly all of the smelting works of this country you will find that ores are constantly coming in from distant regions, owing to the fact of the particular works in question being able to pay a higher price than works nearer at hand. This is due to the fact that a given ore may supply a desirable ingredient for one locality and at the same time be undesirable or unnecessary at another.

A knowledge of metallurgy and metallurgical conditions is necessary for every mining engineer. The two professions of engineer and metallurgist almost invariably overlap in the West, especially in remote districts. The conditions vary so much even in localities near together, that the determination of the proper metallurgical treatment of any ore becomes a problem of the greatest nicety. Of course, where mines are within reach of large custom works; the metallurgy of the mine is of little importance, although the mine manager must know the value of

†School of Mines Quarterly for July.

ores from a smelter's standpoint, in order to so mine them as to obtain the best returns. But there are thousands of mines which are so far distant from metallurgical centres that the questions of transportation preclude the shipment of ores, except where the values are very high, and hence local treatment becomes a necessity. Those who are called upon to pass upon these problems and to carry out the plans ultimately adopted, must have not only a knowledge of general metallurgy, but of a thousand other things which are no part of metallurgy itself. In fact, there is very little information which will not, sooner or later, be found useful.

Suppose you were to consider the possibility of smelting an ore at a distance from the railroad in one of the Western deserts. One of the first requisites to determine would be the available supply of water. There might be available a stream which would contribute to water in the dry season and a flood in the wet. Storage reservoirs might therefore be a necessity, and this would involve extensive engineering knowledge. Long distance pumping might be a necessity from which would arise another set of problems.

There might be an underground current in the bed of the stream in the dry season which would furnish the necessary water, and this could only be determined by sinking wells. The available supply of timber and its suitability would be another factor, also the relative cost of coke, coal and charcoal. If fuel was to be brought in by rail, your knowledge of railway conditions might materially affect the rates of transportation ultimately decided upon. At the same time, the question of waggon transportation would determine an important proportion of the total cost of fuel, and, in addition, the cost of getting the product of the works to its destination.

It would hardly occur to you as a first experience that the fact of grass growing along the line of your waggon road, and being available throughout the year, might determine the question as to whether ore could or could not be smelted at the mine in question, or that the price of hay and oats might determine the amount of profit or loss. And yet, just such conditions as these are determining to day the profit and loss account of active mining operations. The reason of this is very simple. If grass is available for feed, freighting can be done with oxen, which are turned out at night to graze. If no grass is available, hay and grain must be fed, and the price of freighting is correspondingly greater.

The treatment of ores in the West comprises a few type processes upon which are based innumerable variations. Smelting, amalgamation and lixiviation, alone or in combination, are the general methods by which nearly all ores are treated. The selection of the method and its minor variations must depend on local conditions. In a general way smelting may be said to have superseded all other processes where suitable fuel can be obtained at a reasonable price, where transportation facilities are satisfactory, and where sufficient lead or copper can be obtained to collect the precious metals in the ores which are available for treatment. Many ores, however, require a preliminary concentration to provide a product suitable for metallurgical operations. The great advantage in smelting is due to the fact that the percentages saved are almost universally higher than by any other method and, therefore, as the ore increases in value the total saving becomes greater, and the disadvantage of freight charges, and perhaps even a higher treatment cost is overcome. For instance, the Cripple Creek district, in Colorado, produces large quantities of high grade ore running from fifty to several thousand dollars per ton, and also, immense quantities of so called "low grade" ore, averaging from ten to twenty dollars per ton. Although there are very large chlorination and cyanide establishments that are amply capable of buying the Cripple Creek ores, very little high-grade ore is treated in these, the smelters being

able to command the market, in spite of the fact the ores are essentially quartzose, and have to be provided not only with lead or copper for the collection of the gold, but also with a considerable amount of iron and lime for flux.

The smelting industry of the West comprises two distinct branches; namely, lead and copper smelting. In the first, lead is used as a collector of the precious metals, the conditions being such that the smelting of ores containing lead only has so far not proved commercially profitable. Owing to the fact that almost all ores of the precious metals carry some copper, the treatment of that metal has also become a subordinate branch of lead-silver metallurgy, and in recent years the copper obtained as a by-product has become an important item.

Copper smelting includes the treatment of ores which contain only copper, and also those which contain both copper and precious metals.

LEAD SILVER SMELTING.

Lead-silver smelting is an important industry in the West, and is carried on both by mining companies with their own ores, and by custom smelting works which purchase their ores in the open market.

Wherever the conditions are favourable this method has done away with the necessity for other metallurgical processes, except in the case of low-grade gold ores, these still being more economically treated by amalgamation or lixiviation.

Custom works are generally located at large railroad centres, where coal and coke are abundant and cheap, and where ores can be drawn from a large extent of country, thus enabling smelters to purchase ores of every variety, and in such quantities that the amount of barren flux added to make a smelting mixture shall be minimum. They offer great advantages to mine owners in that they purchase ores for cash upon an agreed basis and obviate the necessity for individual works at the mines. Moreover, there are very few mines the product of which is of such a character that it can be smelted by itself, the general condition being that large amounts of barren flux must be added, or the mining company must itself become a custom smelter, buying such ores as will suffice to make a smelting mixture when added to its own. As the metallurgy in both instances is carried on under practically the same conditions, I shall endeavor to give you a resume of the best smelting practice of to-day, and also to show you in what direction changes and improvements are being made, and to what ultimate results metallurgists are striving to attain.

In both custom and mine smelting works the first requisite is a sampling works of sufficient capacity. In order to accomplish good work it is absolutely necessary to know not only the value in precious metals of the ore which is to be treated, but also to have a complete analysis of its earthy or non-valuable constituents. Of course, in a private smelting works the only object in running the ore through the sampler is to determine its value and slag constituents. It is of the utmost importance that accurate and full details in regard to the ore be kept in books arranged for that purpose. In no other way can the metallurgist check the work that he is doing in his smelters, and in no other way can he so make up his ore mixtures as to obtain uniform slags. The ordinary form of book will show the ounces of silver and gold; the percentages of lead and copper, and, in additional columns, the silica, iron, lime, magnesia, baryta, alumina and zinc. The works should be charged with a total of the valuable constituents, even though the quantities are so small in some ores that they are not paid for, as is the case sometimes with small percentages of lead, copper, silver and gold. They are also credited with the amounts of valuable metals obtained, and, at convenient times, a balance is struck and the percentages of values saved is determined, proper allowances being made for values in by-products, flue dust and in furnaces.

Sites for smelters should be so selected, that there is ample room for the storing of ores in bins, and for making up large beds of ore by distributing each lot in a layer on the bed as it comes in. As the charges are taken by shovelling from the face of the bed, a very fair mixture is obtained, and the additional fluxes are added at the furnace, together with special kinds of ore, such as galenas and rich silver ores which may not be desirable to place in the beds. You will readily see that the analysis book showing the quantity of each lot of ore which has gone into the bed will furnish all the data necessary to calculate the total quantities of the valuable metals and the slag constituents, and that from these data the percentages of each per ton can readily be calculated. The metallurgist will then calculate the necessary additions to make whatever slag is desired.

There are certain type-slugs which are considered more desirable than others, but the metallurgist will find in practice that he can often only approximate these, his constant effort being to make a good metallurgical slag with the least possible addition of barren flux or non-profitable ores, the latter being ores purchased on a basis which either gives no profit or shows a certain amount of loss, in order to flux over ores on which the smelting charges are higher and from which the profits must be derived for both classes.

I shall only call your attention to a few points in regard to slags, as these have already been considered in your lectures and are discussed at length in your text-books. The best slags technically are not always the best commercially. Sometimes it costs more to make a good slag than a relatively poor one. In custom smelting the most refractory ores pay the highest charges, and therefore, that slag which will permit the use of the greatest amount of these ores is the most desirable up to the point where the losses in smelting balance the corresponding gain in smelting charges. Either lime, iron or silica may be expensive to flux under different conditions. Barite and zinc were formerly the bug bear of smelters, but are now permitted to a considerable extent, in fact, cannot often be avoided. There is ample evidence to show that barite diminishes the loss of lead in the slag, though it is difficult to say just why it does so.

Lead and silver smelting less than twenty years ago, was a very a very simple process as compared with the same process at the present time. Smelting was then carried on chiefly with surface ores already oxidized by natural causes and containing no deleterious ingredients. The furnaces were small, slags were easily made, and the smoke and dust was allowed to escape into the air. Very little matte was made, and large percentages of lead were used in the charge. At the present time the easily smelted surface deposits have been exhausted to a large extent; the ores have become complex and carry sulphur; lead ores have become scarce and in great demand, and the percentage of lead used to collect the precious metals has steadily decreased. The presence of sulphide ores also necessitates roasting furnaces. Large quantities of matte are made, and the treatment of this matte has itself become complex, because nearly all of the custom ores carry small quantities of copper which ultimately finds its way into the matte. This has brought about the introduction of copper-metallurgy into lead-silver plants, and there are scarcely any custom works of this character in the West which do not have appliances devoted to the metallurgy of copper. So far as the theory of smelting is concerned, to a very large extent your knowledge of it will depend upon your thorough acquaintance with the conditions under which slags are formed, and the chemical reactions of sulphur, oxygen and carbon with each other and with metals under metallurgical conditions.

These reactions are often obscure and complex, and present a wide field for investigation and research. Mechanical considerations at the same time introduce limitations to methods theoretically possible,

and hence it is only with an accurate knowledge of both theoretical and physical conditions that failures and difficulties can be reduced to a minimum.

Many ores require a preliminary roasting, and the method of doing this is therefore important. You are already familiar with the different types of roasters, so it is not necessary to describe these individually. In general there are the hand-roasters, which are long, straight, reverberatory furnaces with a fire box at one end in which the flame from the fire traverses the whole length of the furnace. The ore in these furnaces is fed at the cool end, ordinarily through a hopper in the top of the furnace, and is stirred by hand rakes, being gradually moved down to the hot end of the furnace, where it is discharged either through the bottom or from a side door. Mechanical roasters have been very extensively used in the last few years, but owing to the fact that lead ores require to be roasted as nearly sweet as possible, it has been found that their capacity is very much smaller when used for this purpose, and in many of the largest and most complete works hand roasters are not only now in use, but are being constructed in preference to mechanical roasters.

In some works large Bruckner cylinders, with a very slow rotation, are used with satisfactory results. Generally, however, lead smelters object to mechanical roasters on account of the greater construction cost, excessive repairs, and comparatively low capacity when a low percentage of sulphur is required in the roasted ore. In copper smelting the conditions are different, and mechanical roasters are extensively used.

So far as Western practice is concerned, the only furnace used for ore smelting, is the water jacket-shaft furnace. The great impetus to lead-silver smelting came with the discovery of the carbonate ores in Leadville. The first smelters used there were small round water-jackets. With the need for a greater capacity came the introduction of the rectangular furnace, the width being kept about the same and the greater capacity being obtained by increasing the length. Without carrying you through the various stages of development of the water-jacket furnace, I may say, that there has been a constant effort to get more capacity, and that at the present time metallurgists are still striving to build a furnace which will give a greater capacity than those at present in use. It has been found, however, that there are limits to the breadth of the furnace, which is the distance between the tuyeres, and also to the blast pressure. Furnaces have been constructed which exceed the present types in both these conditions, but the results have been such as to fix the breadth for the present at about 42 inches and the blast at 32 ounces maximum. The general type of furnace now constructed has an inside dimension at the tuyeres of forty-two by one hundred and twenty inches. Furnaces forty-two by one hundred and forty inches are running satisfactorily, and others are being constructed of the same dimensions. The ordinary practice is to make the height sixteen to seventeen feet from tuyeres, to top of charge. This is an advance of about four feet over the height of charge, which is still in use at many of the works, and is necessitated by the increase of blast pressure now used. Some new furnaces are now being made with a height of 20 feet. Sixteen ounces is almost a minimum blast pressure now, and from twenty six to thirty-two ounces is common.

Three types of rotary blowers are in use, and these are constructed so that pressure even higher than 32 ounces can be maintained if desired. Fan blowers are not used by Western smelters.

The general construction of furnaces has changed but little in the past few years, and from the drawings you will see that the type is one with which you are already familiar.

The increase in dimensions has, however, necessitated more massive construction, owing to the larger amount of material the fur-

nace is to contain. The foundations are of the best. The wrought-iron plate which forms the bottom of the iron enclosure for the crucible must be absolutely tight and rest solidly upon the foundation, preferably upon a layer of cement. Let me caution you here against using cast iron plates for the under part of the furnace, as a slight crack will admit of the passage or melted bullion down into the foundation. I have known cases where tons of bullion have found their way into the foundation of the furnace through a hole not larger than a nail hole, and when the furnace was taken down it necessitated the excavation through the foundation and down into the clay below for eight or nine feet, before the last of the bullion was recovered. Crucibles should be made of good fire brick, well luted together, so as to prevent as little absorption of bullion as possible. Generally the jackets rise to the height of the bosh only. Above this the furnace is constructed of brick. Some metallurgists have advocated the construction of the whole furnace of water-jackets. The only real advantage in this is the fact that zinc and other accretions forming on the sides of the furnaces can be much more easily barred off from iron than from brick walls. On the other hand is the liability of injuring the jackets in barring down, the necessity for increased water supply, and the regulation and care of the additional jackets.

The trick work is supported as before, on I beams resting on iron columns at the corners, or by a combination of I beams with arched steel plates (Colorado Iron Works). Recent constructions are very much heavier, and the brick walls supported are likewise much thicker, in some cases 34 inches at the bottom, the lining being of fire-brick with the ends forming the interior surface of the furnace. These massive walls resist the action of the heat, and are not liable to distortion.

Water jackets are used exclusively for the lower part of the furnace. These are made both of wrought-iron and of cast-iron. Wrought iron jackets are generally made so that a single jacket forms one side of the furnace, while cast-iron jackets are made in sections. Both constructions have advantages. In case of a leak a single cast-iron jacket can be taken out and a new one put in very quickly, without blowing out the furnace. The disadvantage of cast-iron is its liability to crack. This objection, however, has been overcome to a large extent by making the castings very carefully, so that the thickness of metal is uniform throughout, and changing the form of lugs by which the castings are bolted together, so that the strains will not break these off; consequently the use of cast-iron jackets has been increasing in the last few years. In some works cast-iron jackets have always been used to the exclusion of wrought-iron. The advantages of wrought-iron jackets are, that there is no possibility of cracking, that the whole side of the furnace can be formed of one jacket, and the life of the jacket if properly cared for is much longer than that of the cast-iron. If the water becomes low in the jacket and the iron becomes overheated, the sudden introduction of cold water will not cause a crack, and damages to the jacket can be repaired to a very considerable extent by patching on the inside. Very long jackets, however, become very much warped through the difference in the expansion of the inside sheet and the outside sheet, and a very decided bow in the centre is established, thus disarranging the interior shape of the lower part of the furnace. Of course, if the furnaces are built in inaccessible places, where it is difficult to replace jackets, one would naturally choose wrought-iron in place of cast-iron; but where foundries are available cast-iron is generally preferable, as a few extra jackets on hand will obviate the trouble which might come from a single jacket breaking down. The old style of jacket, and one which is still in use to a large extent, has for the admission of air a hole cast in the side of the jacket in which is inserted a galvanized iron tuyere-pipe. At best the nozzles

do not make a very close fit, and when they have been knocked around by the furnace men a few times it is impossible to make them air-tight. Melted slag also damages them to a greater or less extent. When it is desirable to lessen the pressure of blast or cut it off altogether on a particular tuyere, in order to allow the other tuyeres to melt away the slag obstructions, it can only be done by tying the sack so as to close it partly, or by taking out the pipe and blocking the tuyere opening. Of course in well regulated furnaces running under proper conditions, these things are very seldom required, but at the same time it adds very much to the convenience of the furnace to be able to do them without trouble when they are necessary. If it is easy for a workman to make any such temporary changes he will be much more apt to do them promptly. This has led to the introduction of a number of tuyere connections which supply such conditions to a greater or less degree. The general form of these is a cast iron box or pipe which is flanged and bolted by lug bolts to the side of the furnace, so that by loosening two bolts it can be lifted off.

This tuyere box is attached to the main air pipe by a canvas pipe or by a rigid iron connection. Personally I prefer the latter. The tuyere box is also provided with a valve either in front of the tuyere opening or in the upper part. Some forms have valves similar to a clack valve with two openings, one of which opens into outer atmosphere and is closed by the pressure of the air holding the valve up against the opening. In case the pressure is stopped suddenly the valve drops and closes the opening into the air pipe and falls away from the opening into the air. This is for the purpose of allowing the gas which always comes back into the air pipes when the blast is stopped, to pass into the outer air, and thus prevent the possibility of explosions, which are sometimes very serious unless proper precautions are taken. Another form of tuyere consists of one box carried around the furnace either in front of the tuyeres or above them and connected to the tuyere openings by close fitting connections. In many works to-day the whistle of escaping air can be heard in many places, and I have no doubt that the leakage from these sources, if measured, would astonish many metallurgists who consider their works are running very satisfactorily. It certainly needs but little argument to show that constant leaks through which air is blowing at about two pounds pressure, must use up in the aggregate a very considerable amount of power. Power costs money, and its loss through mechanical defects in construction is inexcusable.

Furnaces of the type I have described will smelt from sixty to one hundred tons a day, according to the character of the charge, together with the addition of a certain quantity of rich slags. These are added to recover their valuable contents, and also to make coarse material in the furnace which helps to keep the fine ore from packing and scaffolding, and forms interstices for the passage of the blast. It also performs another function which is not so well understood. By this I mean that although slag can not be melted without a considerable amount of fuel by itself, yet it is universally found that given a charge of ore running with the least possible fuel, a very considerable amount of slag can be added to the charge without necessitating any increase of fuel. The probability is that the slag being already properly proportioned and having been liquid, melts first and acts as a carrier for the unfused slag forming material in the charge. In other words it becomes first, let us say, more siliceous, in which form it is very corrosive as regards the bases in the ore, and combines with them when it again has a great attraction for silica. With a furnace of this class running under ordinary conditions, a number of products will be obtained, the disposal of which is a matter for careful consideration. By far the largest product is, of course, the slag. In the earlier smelting practice in this country the slag was tapped directly from the furnace into slag pots, which iron

were wheeled to the edge of the dump and the slag immediately emptied out. It was found, however, that in tapping directly from the furnace, a certain amount of metal was carried out in the current of the slag, and, in addition, when ores were smelted which contained sulphides, a certain amount of matte was formed which was also tapped out with the slag. When no matte was present the metal tapped out with the slag could generally be saved, to a large extent, by pouring out the liquid slag and saving the partially cooled shell adhering to the sides of the pot. As soon as the matte became a factor in smelting, it was necessary to allow the slag to cool in the pots, and afterward the button of matte found at the bottom of the cone of slag was broken off, and saved for subsequent treatment. This, however, rendered it impossible to save the shells, which were found to be of considerable richness, as the partially cooled slag on the sides of the pot prevented the small globules of matte and metal from settling. The next step consisted of having pots with a hole bored in the side above the height to which the matte ordinarily extended, and after the slag had sufficiently settled, it was tapped out through this hole, leaving the rich shell on the sides of the pot and the matte in the bottom. This process is used in many works to-day, but it has the disadvantage of making more shells ordinarily than are required as flux for the ore charge. Besides, it entails considerable labor in separating the matte, which is more or less mixed with the slag, and not in as good condition for retreatment. The most feasible way to separate the matte and make clean slugs is, by using a forehearth, and this device is now coming into extensive use in lead smelting. With the small furnaces formerly in use the forehearth was hard to manage, as it gradually crusted up, owing to the lack of sufficient hot slag to keep it heated up to the melting point. With the introduction of larger furnaces, especially those of 80 to 100 tons capacity, it has been found practicable to use forehearths, which collect the matte, and from which the settled slag overflows into pots.

With coppery ores I have used a forehearth to collect both the matte, slag and lead, and found it to work very satisfactorily, except for the disadvantages of cooling too rapidly, to which I have called your attention, and even then it worked more satisfactorily than the old method of separating the lead inside the furnaces. If lead furnaces could be constructed to run satisfactorily with a capacity of 200 tons a day, I have no doubt that the forehearth could make a very complete separation of clean matte and clean slags, and at the same time make long campaigns. I have recently seen in a lead furnace a forehearth after the Orford plan, being used, which, as you know, is a rectangular box divided by a brick partition, with an opening between the two compartments at the bottom of the partition. The matte and slag flow into one compartment and separates by gravity, and the matte rises in the other compartment and overflows from a spout about two inches lower than the slag spout, the slag flowing out from the spout in the first compartment. This was, however, supplemented by the addition of another pot to catch any small grains of matte carried over in the current of flowing. The best method of disposing of slag is by granulation in a current of water, which carries off the slag and deposits it at some point below the smelter. Where water is available this is very much the best method in use, and brings about a great saving in labour and cost. The slag is simply allowed to overflow from the forehearth into a trough with a rapid flowing stream of water, and is immediately granulated and carried away to any convenient point. Where water is not available the present practice in large works is to use the Nesmith slag trucks. As you know, they consist of two large pots on a truck, so arranged that they can be swung out to the side and dumped on the outside of the track. The track for this is placed along the edge of the slag dump, and is moved out as the dump extends. In some works the slag is tapped or poured from the

pots into these slag trucks. In others it is poured into very large pots, from which the slag is tapped from the side, and the matte tapped subsequently from the bottom. In others, the slag empties directly from the forehearth into the bowl of the truck. The ideal method for separation would be to have the slag flow from the forehearth into the water, or directly into large trucks, the matte being either tapped from the forehearth or allowed to overflow. In Rhodes' method the slag and matte from several furnaces are poured into a reverberatory furnace, which is in effect a heated forehearth.

It is found that even with the syphon tap for lead, a certain amount of lead often finds its way out from the slag tap into the forehearth, and this is obtained either with the matte or by tapping the forehearth at its lowest point. Of course, the most valuable product of the furnace is the bullion, so called, consisting of lead, varying amounts of silver, gold, and some copper, if copper is present in the ore. It is obtained by means of the well-known syphon tap, generally by dipping from the bowl, but in some works by means of a trough which swings over molds arranged on the circumference of a circle of which the trough is the radius. With this arrangement a number of moulds are filled at a time. Copper in lead ores in any considerable quantity often causes a great deal of trouble with the lead in the crucible, as it has a tendency to separate out in the form of a copper-lead alloy, which gradually cools and fills up the crucible, making it necessary to blow out the furnace and chisel out the crucible. As this alloy is very tough, it makes the process very expensive. For this reason smelters do not like to have their lead mattes run over 10 per cent. copper.

The principal part of the copper should go into the matte, which is a mixture chiefly of sulphides of lead, copper and iron. If this carries little copper, it is simply crushed, roasted and put back into the furnace, furnishing iron for flux, and giving up its valuable metals to the bullion.

In lead bullion carrying copper the copper is only paid for at the price of lead, and as it is worth three or four times as much, it is desirable to save it by itself. The present practice is to save the lead copper mattes until a sufficient quantity has accumulated; roast them with sufficient heat near the discharging door of the furnace to make them slightly sticky, in which condition they are turned out of the furnace and allowed to cool. This agglomeration is simply to prevent them from being blown out of the furnace as dust. The roasted matte is smelted in furnace with a shallow crucible, and with sufficient quartzose ores to flux the iron. If the proper mixture is made the lead will separate as bullion; the copper will combine with the sulphur left in the roasted matte, making a matte of from 45 to 70 per cent. copper, the iron combining with the silica and making a fusible slag. Twelve years ago I had to face the problem of the disposal of a very considerable quantity of these mattes, carrying a large amount of silver where shipment was impossible. I was able, by running a basic iron slag, to make a very rich copper matte, and to obtain a lead bullion carrying not over 5 per cent. of copper.

The last product of the furnace, and one which is very annoying, is the smoke and dust which pass out with the products of combustion. In custom smelting works the ore is almost all crushed to a very fine state for accurate sampling and for roasting, and the amount of flue-dust becomes a very considerable item and one that cannot possibly be disregarded. All well equipped furnaces therefore, are provided with dust chambers more or less extensive. These are of many and various types. Some are constructed of brick with hollow walls for cooling, with a total length of passages as much as a mile. Others are constructed of sheet iron with a V-shaped bottom, the whole structure being enclosed to prevent condensation of acid fumes by cooling. The bottom of the dust chambers is provided with openings, so that dust

can be drawn off at intervals into a car which runs on a track under the chamber. Another class which is used with very satisfactory results makes the final separation of the fume by filtering through cloth. One type of apparatus for this purpose is a house filled with long bags through which smoke is forced by a ventilating fan. These bags are shaken from time to time, in order to keep the pores from becoming stopped with dust, and the dust is taken out at intervals from the bottom of the sacks. A later invention than this consists of houses in which are sheets of cotton cloth stretched in tent-shape from the top. The smoke is forced through these, and the tents are beaten at intervals with rods moved by a lever from the outside of the building, the dust falling to the floor. The disposal of the dust has been a very annoying problem. In some places it has been made into bricks with clay or with milk of lime either by hand or by machine. In other places it is immediately put into reverberatory furnaces and heated until it slags together. The fume from the bag houses, however, is combustible, and after a sufficient amount has accumulated on the floor of the house, it is set on fire by throwing live coals on the surface at intervals. Apertures are opened to admit air and a gradual combustion takes place, sintering the mass together and forming a product something like coke, which is in the very best possible condition for treatment in the furnace. It has also been found that dust collected in the chamber, before the smoke reaches the bag house is combustible, and in some works this dust is simply piled in small houses with brick walls and set on fire. Air is admitted and combustion goes on until the whole mass is sintered together. Smelting has now become subject to so much competition that there is an absolute necessity for saving all the values possible in the ore. Metallurgists who are working on ores from their own mines are often too careless about their losses, but it is just as reprehensible to lose values when you are working on your own ores, and with much larger margins for loss, as it is when you are working on custom ores where you are in competition with other skillful metallurgists.

I have used a method of blowing in lead furnaces, which I think has sufficient novelty to merit a description. It starts the furnace off in good condition, and with ordinary care gives very little trouble:

The crucible is heated with cordwood, and as soon as the walls are fairly hot, a 2-inch pipe bent at an angle is inserted through the breast to the bottom of the wood fire and air is blown in. The crucible is filled with cordwood, and as soon as it is blazing well, several bars of bullion are shoved in on a plank and tipped off on the wood. This bullion melts and runs down through the hot fire to the bottom, becoming red-hot. This process is continued until the crucible is full of lead, when the fire is raked out and the lead thoroughly stirred up from the bottom and skimmed. The crucible and siphon are then full of red-hot lead, perfectly clean. Brands and wood are then put back on the lead to form a support for the coke and to kindle it; the breast is put in and the furnace filled with coke to about 18 inches above the tuyeres; then light slag charges and coke to the top of the jackets; then charges, part ore and slag and finally normal ores charges to the top.

A light blast is turned on until the slag begins to show at the slag taps, and it can then be raised gradually to normal pressure. In this way the fusion zone is kept from rising, and the furnace starts off with cool walls and a cool top. If lead makes too slowly and shows a tendency to cool in the well, a few bars can be dipped out and charged into the furnace again.

With this hasty survey we must leave the subject of lead-silver ore smelting. You cannot fail to realize that neither methods or their limits are yet well defined.

The aim of the best metallurgists may be summed up in a few words:—

1. The largest furnaces compatible with good work.
2. Slags which will permit the largest amount of refractory and hence profitable ingredients.
3. A perfect initial separation of slag, matte and bullion by automatic appliances, with mechanical handling of the slag.
4. Economical treatment of lead, copper mattes.

The Metallurgy of Gold.

(Excerpted from an address by Mr. Charles Butters, before the Chemical and Metallurgical Society of South Africa).

Let us for one moment look over the development of the metallurgy of gold. The occurrence of gold in placers, and the ease with which the bulk of it was covered by washing; later, the crushing of quartz in the battery and the winning of the fine particles by the beautiful process of amalgamation, all so simple that for many years there was really no metallurgy of gold. Gold miners became educated only in the system of collecting free gold, for the reason that the bulk of the production of gold was, and is, by amalgamation, and only such ores as gave up their gold freely by simple crushing, was sought for and worked to any extent. The process of collecting such gold was one of concentration by means of amalgamation, and as the concentration was carried further another product was the result, being the concentrated pyrites of the value of from 3 to 5 oz. of gold per ton. Now, to obtain this gold, or a higher percentage of it than could be extracted by further crushing, certzin and many processes were studied. This was most practically worked out by Plattner with his chlorination process, and up to some ten years ago amalgamation and chlorination were almost the only practicable means in use for winning gold in the gold mines of the world. The idea of re-handling the whole of the products after concentration had been resorted to came almost in direct opposition to the recognised methods of winning any metal. In the recovery of all metals successive concentration is the method of procedure, and even to-day the metallurgists of Germany, are very much averse to agreeing to the fact that it is not the best way of finally treating all the stuff which has been crushed. It has always been more or less known that large losses of gold take place in the pulp by concentration, but as these sands and slimes were usually allowed to be washed away in rivers the loss went unnoticed until, in the Transvaal, on account of its topographical condition, the slimes and sands were necessarily retained or conserved in dams. These accumulations being assayed and valued, showed plainly that something must be done to obtain their contained value. Concentration having reached its limits, another form of concentration was resorted to by the chemists in the shape of the introduction of the solution methods. Of these methods, brought forward by various chemists, those of dissolving in cyanide and chlorine are the only ones in effective use on the Witwatersrand to-day. There has been a great deal of study given to the use of chlorine as a dissolving agent, but its use is very limited in comparison with that very easily handled solvent, cyanide, so that I am prepared to state that cyanide is slowly but surely displacing chlorine on the Witwatersrand for all purposes. I have no doubt that upon these fields eventually the use of chlorine will be discontinued; and having been among the first to be connected with the introduction of the chlorination process in this country, I have rather jealously guarded the interests of chlorine as a solvent. I must admit now that, given equal preparation of material for the use of the solvent, the same percentage of solution of precious metal in the materials treated can be obtained as well with cyanide as with chlorine. And with the application of recent methods for the recovery of the gold from these solutions, as high a percentage of extraction can be obtained by the

cyanide as with the chlorination process. Continuing the work of recovery by solutions, we get first in dissolving the gold in the solution a new material of less value per ton than it was in the material to be treated. Generally speaking, it may be said that for the sand treated it takes from a ton to a ton and a-half of solution to dissolve the gold, while in slimes from four to six tons of solution is used to dissolve and wash out the gold, and it is in connection with this solution, varying in value from $\frac{1}{2}$ dwt. up to 10 dwt., that the metallurgical chemist is presented with the last problem in concentration which he must apply to his operations—viz., the concentration of gold from the liquid. For this operation we have at present only two processes acting successfully—that of zinc precipitation and that of electric precipitation on lead foil or shavings. The chemicals and substances that could be used as solvents in the work of dissolving the gold from the material, are not more varied than the number of precipitation processes which may be employed for its ultimate recovery or concentration from the liquid used as a carrier; but, of all solvents, cyanide has proved itself the most generally useful and serviceable. On the ultimate recovery of the gold from its precipitated form in a zinc box many able papers have been written, and the operations of precipitation and its recovery are so well known that it is not necessary to go farther into this question. The operation of the electrical precipitation process is less known, and I hope to give a paper at some future date on the subject. Speaking further in relation to the solution of gold, one member of our society, Mr. W. A. Caldecott, has made a new discovery in the past year. He will read to you a paper on the subject shortly. Mr. John R. Williams has successfully carried out, at the Crown Reef slimes works, a system of concentration of the gold in the solution before precipitation.

As I look forward to the future, I ask myself what are the possible lines upon which metallurgy will make improvements for the treatment of our auriferous material. It strikes me that with our present mechanical methods for the continuous collection of sands and slimes, and the almost complete separation of the water and the immediate re-use of that water for crushing, there is no reason why the attempt made by the African Gold Recovery Company at the old May battery in 1892 should not be revived. That is the crushing by means of a dilute solution of cyanide. The concentrates caught from this, as well as the sands, would at once be under treatment, and the solution of the gold in the slimes would have taken place by the time they had separated from the final spitzkasten. The total volume of liquid used would be no larger than the volume of solution now used in the slime works; and as the actual solution now in use in the slimes works is only .005 per cent. in cyanide, or a value of 1.6oz. of cyanide, equal to about 1d. per ton, besides 20z. of lime per ton, equal to a value of a fraction of a farthing per ton. The cost of this solution would not preclude its use. The value of gold in the first wash could be kept to a certain point by the constant precipitation of a certain volume of this solution daily. By this means a much larger final wash could be utilised on the sands and on the slimes, which would mean a more complete extraction. No more water washes would be thrown away, and in the case of very poor ores the preliminary amalgamation could be done away with if desirable, and what free gold there was could be caught in the concentrates and washed down over a single plate after cyaniding. A direct method of this sort could be worked out in connection with electric precipitation, which would be a strong competitor of the direct system of dry crushing. In one case you have the separation of the slimes, which makes that portion of the pulp a little more costly to treat, but you have the direct advantage of less cost of crushing to the same degree of fineness. The direct dry crushing method brings up the cost of crushing when you

crush to the necessary degree of fineness, although it is a fact in some cases with the surface ores crushing can be left as coarse as $\frac{1}{4}$ -inch screen; but in nearly every case we have experimented on in this country, as soon as the pyrites are met with crushing to a fineness of between 200 or 400 mesh screen becomes necessary, and to crush dry quantities of low grade ore down as fine as from 200 to 400 mesh is, I must say, very troublesome and costly. One can well understand that at the time the African Gold Recovery Company tried the direct wet process, that the difficulties in the way of mechanical separation of the liquid were practically insurmountable at that time, but to-day, with our spitzkasten and collecting vats, there should be no reason, with properly constructed works, why all the solution should not be properly taken care of. This leads me to the idea that the methods which we are developing for the extraction of gold from ores can also be made use of in a similar way for the extraction of other metals. For instance, in the metallurgy of copper and lead and silver many ores permit of a very poor concentration result. Solution methods may also be applied to the sands and slimes resulting from these operations. Various solvents will be worked out which will tend to give a higher ultimate extraction from these metals than is now obtained from concentration alone. I might mention that there is now being worked out a process for the direct treatment of low-grade copper ores without concentration, the solvent being regenerated by electricity. And also another solution process for the extraction of zinc in lead ores of Broken Hill, in order to prepare the lead ore for the smelter to extract the 25 per cent. of lead, and the 25oz. of silver that would still remain in the ore.

Now, gentlemen, I think that the methods, chemical and metallurgical, developed on these fields will lead to a complete revolution in the metallurgical methods for the extraction of metals. The study of solvents and their regeneration, coincident with the precipitation of metals either by chemical or electrical energy, will gradually be extended from gold and silver—first, probably, to copper, then zinc, nickel, and possibly aluminium and other metals, so that we in this country are not doing merely a selfish work, but are perfecting methods and means by which the mineral resources of the whole world may be affected, and if we cannot compete in the markets of the world to-day with any of the products of the Transvaal, except that of gold, let us hope that we may be able to show such methods and models of work that the world may copy them, not only for gold, but for other metals as well. And may I add that I think it is the earnest wish of every member of our society that, while we are "beating our brains out" against the natural difficulties of the extraction of each grain of gold that we win from Mother Earth, our paternal Government will assist us as much as may be possible in removing the artificial difficulties that in the nature of things here surround our industry? We would most respectfully point out that although a grain of gold more extracted means 2d. per ton, on the other hand 2d. per ton off the working costs is the same as an extra extraction of a grain of gold. And if our Government can only realize this, and they could see their way to grant such reforms as would reduce the working costs by .45. per ton, that would have the same effect so far as profits are concerned. As if we, as metallurgists, could extract that last 24 grains of gold left in our residues! In other words, our Government can, in effect, do what to us is impossible—that is, give us our long-wished for 100 per cent. extraction. May they do it!

Mica—Its Uses and Appliances.

The recent formation of the Mica Manufacturing Company in London, to acquire the mineral rights of mica properties in the neighborhood of Ottawa, Canada, directs attention to the general uses and

appliances of this interesting and useful mineral, or rather group of minerals.

The name mica signifies to shine or glitter—from this conspicuous characteristic which it possesses; and the word micas is applied to a large class, or group of finely foliated minerals, of a pearly lustre, and transparent and translucent, tough and elastic. The distinguishing features are their brilliant lustre or glitter, and the readiness with which they can be split or cut, to any desired thickness, into laminae or leaves, or transparent plates. These laminae can also be cut or divided with the aid of an ivory or steel knife, and, so thinly, that the sheets or plates reach only to the thickness of $\frac{250}{1000}$ part of an inch. Another remarkable property of the micas, besides their distinct cleavage in one direction, is their great elasticity and toughness. It is equalled in this respect by very few materials; and, in the combination of the two, elasticity and toughness, mica is probably excelled by nothing natural or artificial.

The group of micas can be classified in two divisions: Muscovite, or bi-axial, and magnesia, or uni-axial mica.

Muscovite, or bi-axial mica, is, in colour, amber, black, brown, white, silvery white, red, violet, gray and green (green and black being the usual tints), with pearly, metallic lustre. It can only be fused on thin edges before the blow-pipe, and has very tough and flexible leaves. It consists of silica 46.3, alumina 36.8, potash 9.2, peroxide of iron 4.5, fluoric acid 0.7, and water 1.8. Muscovite mica varies in hardness from 2 to 2.5, and in density from 2.8 to 3.

Magnesia, or uni-axial mica (also called biotite), is, in colour, brown, reddish, yellowish brown, olive green, grey, with pearly lustre. It whitens in the blow pipe flame, and melts on thin edges. Its hardness and density are identical with muscovite mica; and it is also so tough and elastic that it can be split or cut into sheets of extreme tenacity. In magnesia mica, a certain proportion of magnesia replaces alumina, which is present to the extent of about 15 per cent. Magnesia mica is generally found in limestone.

Other names given to micas are the fuchite, a green mica, containing chrome; plumose mica, in which the scales are arranged in a feathery form; and rubelland, which is a name given to red mica. Granite is composed of crystals or crystalline masses of mica, quartz and feldspar.

Mica is often confused with talc. But it differs from talc, in as much as it affords thinner folia, and is elastic, and has not the same greasy feel. Then again, talc will yield to pressure or indentation, while mica is nearly as hard as calcspar.

Mica is sometimes found in plates, two or three feet in diameter, and perfectly transparent, in which state it is well adapted for use as a substitute for window glass. Its common use in this way in Siberia has procured for it the name of *muscovy glass*. It was formerly much used in the Russian navy, on account of its elasticity, rendering accidental explosion by percussion or concussion well nigh impossible. Mica ground in a mill increases vastly in bulk, and forms a loose mass of scales, not unlike bran. In this form, it is largely used in a mica powder as an absorbent of nitro-glycerine, its peculiar elasticity rendering explosion impossible, whilst it does not interfere with the power or energy of the nitro-glycerine when exploded by a fulminate or other similar device. Mica, coarsely pulverized, is found to be an excellent roofing material, to which use it is also applied in the same manner as slate. It is also used in pulverized form for calico printing, and for decorating porcelain and glass ware. When finally ground and reduced to powdered form, mica has a slippery and greasy character, and makes a good lubricant for railway axles, bicycles, etc., and for all machinery requiring high speed. It keeps the bearings free from heat, even at the greatest speed, and in the form of axle grease

for railway cars, etc., it meets all requirements. Scrap or refuse mica, which has hitherto been regarded as valueless, is now used as a most efficient covering for steam boilers and pipes, on account of its non-conducting quality. Mica is also very largely used for electrical machinery, its insulating power being superior to that of any other substance. It will stand the highest test of heat, and is infusible, tough and non-combustible. In this use, the Canadian mica, more generally known as amber mica, being of amber colour, is the most in demand in Canada and the United States. Mica is generally applied to marine compass dials, being highly superior to cardboard for the purpose. It is also used in the lettering of fancy signs; and, when very clear, affords a better protection to photographs than enamel. It is artistically applied in the manufacture of lamp shades. With the aid of chromo-lithography, exquisite pictures are printed on sheets of mica, three or four of which are tastefully joined together, and form a really beautiful design. The whole group of micas afford a world of interest to the microscopist, as they frequently contain, between the layers, microscopic crystals of minerals, some of them forming specimens of wonderful beauty. Mica is also used for chimneys for lamps of all descriptions, and for asbestos and other stoves; also as a substitute for glass in spectacles in protecting the eyes in various mechanical operations; and, again, as a substitute for glass in silvered reflectors, in places where it would be exposed to heat, as in head-lights, etc. Mixed with varnish, mica is used as a coating for wall papers, and in bronzing statuettes and other plastic articles. It is also applied, coloured or metallised, to the decoration of churches, rooms, shops, frames, and other ornamental and useful purposes. From its unalterable nature, it preserves the gilding, silvering or colouring from deterioration, and, from its diaphaneity, the articles so treated will not lose their original brilliancy. They are, moreover, further preserved, by the appliance of mica, in a state of perfect cleanliness, and from the action of all smoke and dust and the marks caused by insects, all such deterioration being easily removed by washing.

The value of mica depends upon the size of the sheets and their transparency, the clear, ruby-tinted mica being the highest in value, and the cloudy gray the least valuable.

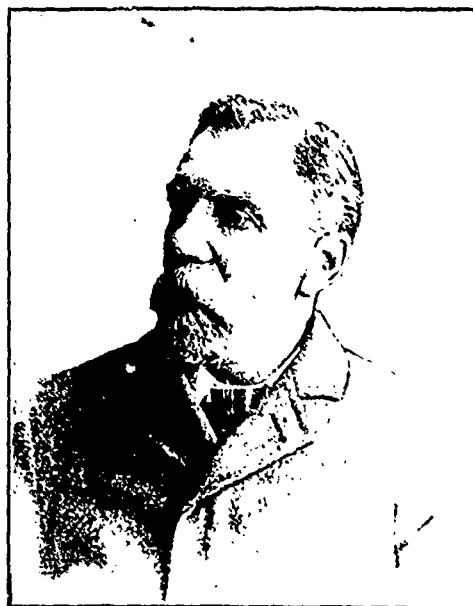
Such are the general uses and appliances of mica, though its usefulness is by no means exhaustively treated. Its properties have been found, of late years, to be so many and so varied, that there appears to be at the present time a large and probably increasing demand for mica, not only in Canada and the United States, but also in England and throughout Europe. The Mica Manufacturing Company propose to extend its operations to the wider field which now seems to be open, and more especially to direct attention to, and increase the sale in England and Europe, of the Canadian amber mica for electrical purposes.

SMELTING PROGRESS IN BRITISH COLUMBIA.—It was not very long ago that the entire mineral product of British Columbia came to the United States in the form of ore. Smelting works were erected in the province a little later, but the silver-lead and the copper matte were still sent to the United States for refining and further reduction respectively. Now, however, British Columbia is beginning to turn out its product in a higher state of completion. The Trail Creek works have installed a refinery and are now shipping gold in fine bars, while the Hall Mines, Limited (Silver King mine), is converting its product into blister copper, which is going directly to Wales. Incidentally it may be remarked that this company has one of the largest smelting furnaces in operation on this continent. With the entrance of Vivian & Sons into the British Columbia ore market, and a freight rate on \$8.50 per ton from Vancouver to Swansea, American ore buyers will have to look sharply to the business.

CANADIAN COAL OPERATORS—COUNTY OF CAPE BRETON, N.S.



MR. E. WILKINSON, Sydney Mines,
Underground Manager, S. M. Colliery,
General Mining Assn. Ltd.



MR. JAMES FRANCIS
Colliery Engineer, General Mining Assn., Ltd.



MR. THOS. J. JOHNSTONE
Underground Manager
Caledonia Colliery.



MR. G. W. GREENWELL,
Underground Manager
Old Bridgeport Colliery.



MR. A. MCFACHREN
Underground Manager
International Colliery.



MR. A. MACDONALD
Underground Manager
Gowrie Colliery.



MR. A. J. SCOTT
Underground Manager
Dominion No. 1 Colliery.



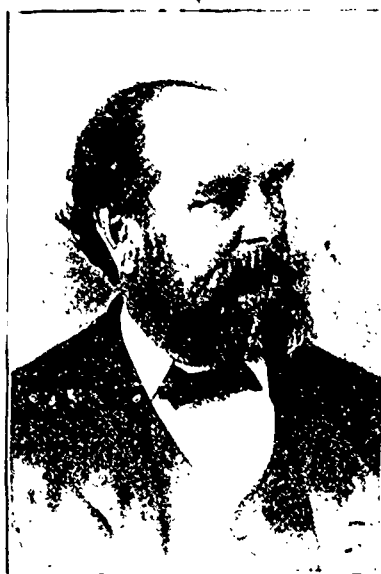
MR. NORMAN MCKENZIE
Underground Manager
Reserve Colliery.

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CANADIAN COAL OPERATORS—NOVA SCOTIA.



MR. CHAS. FERGIE, M.E.
Gen. Man., Intercolonial Coal Co.
Westville, N.S.



MR. H. A. BUDDEN
Montreal.
Man. Dir., Intercolonial Coal Co.



MR. J. P. NELSON
Montreal.
Sec.-Treas., Intercolonial Coal Co. Ltd.



MR. JAS. MAXWELL
Westville.
Mine Manager, Acadia Colliery.



MR. HENRY S. POOLE, M.A., A.R.S.M.
Gen. Manager, Acadia Coal Co.
Stellarton, N.S.



MR. J. T. BURCHELL
Owner,
Cape Breton Colliery.



MR. J. F. BLEDSOE, M.E.
Alberni.



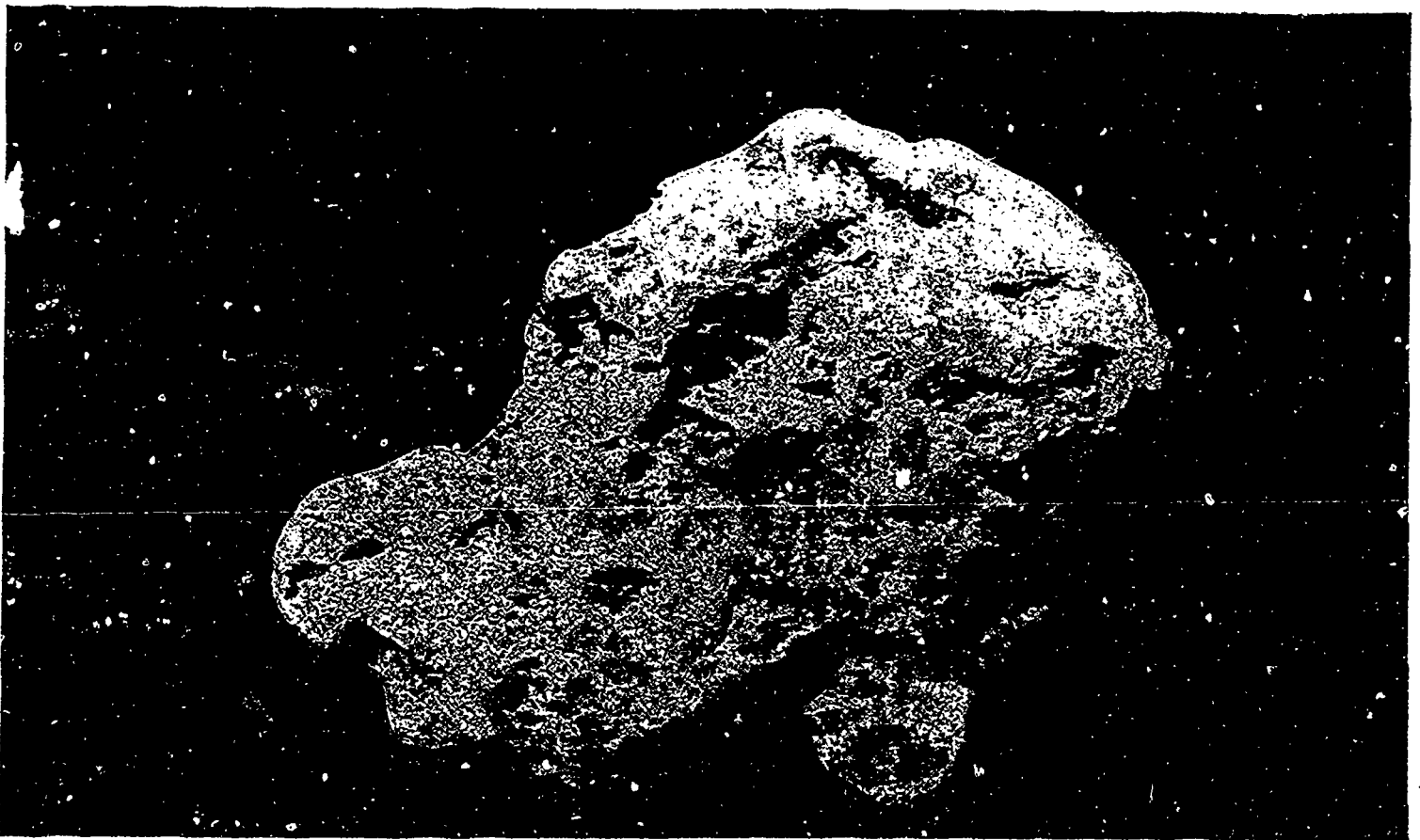
DR. E. GILPIN, JR.
Deputy Com. and Inspector of Mines
for Nova Scotia.



MR. B. CONNORS
Underground Manager,
Victoria Colliery, Cape Breton.



The "McDonald" Nugget, weighing 45 ounces, 12 dwt., found on the De Lery Concession, Lot 16, Beauce, Province of Quebec.



The "St. Onge" Nugget, weighing 42 ounces, found on Lot 12, St. Charles Concession, Gilbert River, Beauce, Que.

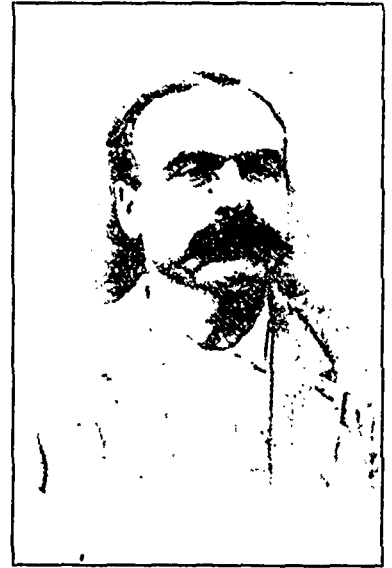
CANADIAN COAL OPERATORS—CUMBERLAND COUNTY, N.S.



MR. C. HARGREAVES
Man., Cumberland Ry. and Coal Co.
Springhill, N.S.



MR. J. R. COWANS, Gen. Manager,
Cumberland Ry. and Coal Co.
Springhill, N.S.



MR. M. BLUE, Springhill,
Underground Manager
No. III Slope.



MR. JAMES BAIRD
Lessee, Chignecto Colliery,
Maccan, N.S.



MR. WM. LORIMER, Springhill,
Underground Manager
No. II Slope.



MR. ROBT. ARCHIBALD, C. & M. E.
General Manager, Canada Coal & Ry. Co.
Maccan, N.S.



MR. WM. MATTHEWS, Springhill,
Assistant Manager,
Cumberland Ry. & Coal Co.

CANADIAN COAL OPERATORS—BRITISH COLUMBIA and NORTH-WEST TERRITORY.



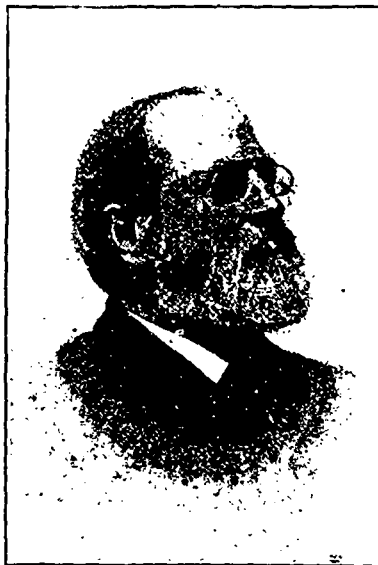
MR. O. E. S. WHITESIDE, B.A. Sc.
H. W. McNeill Co. Ltd.
Anthracite, N.W.T.



MR. ELLIOTT T. GALT
Lethbridge, N.W.T.
Man. Dir., Alberta Ry. & Coal Co.



MR. W. F. LITTLE
Manager, H. W. McNeill Co. Ltd.
Anthracite, N.W.T.



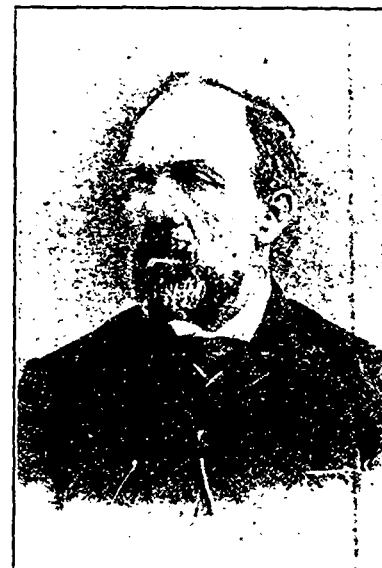
MR. S. M. ROBINS, Nanaimo, B.C.
General Manager
New Vancouver Coal M. & L. Co.



MR. W. D. BARCLAY
Lethbridge, N.W.T.
Manager, Alberta Ry. & Coal Co.



MR. WM. BLAKEMORE, M.E.
General Manager,
Crow's Nest Coal Co. Ltd.



MR. THOS. MORGAN, Nanaimo, B.C.
Underground Manager,
New Vancouver Coal Min. & Land Co.

CANADIAN MICA MINES.



- (1) Lake Girard, Ottawa County, Que.
- (2) Big Pit, Blackburn Mine, Templeton, Ottawa County, Que.
- (3) Wallingford Mine, Templeton, Que.
- (4, 5) Surface Works at Lake Girard Mine (Mica Mining Co.) Ottawa County, Que.
- (6) Engine Room at Lake Girard Mine.



MR. R. H. JONES, F.S.A.
Author of Asbestos and Asbestic
London, England.



MR. H. H. PRINGLE
Manager,
Regina Gold Mine, Rat Portage, Ont.



MR. H. R. BELLAMY
Analytical Chemist
NELSON, B.C.



H. HARRIS, A.R.S.M., F.G.S.
Vancouver, B.C.



MR. P. NEVILLE
Deputy Inspector of Collieries for Cape Breton.



MR. WM MADDEN
Deputy Inspector of Collieries.
Pictou and Cumberland Counties, N.S.

CANADIAN COAL OPERATORS—COUNTY OF CAPE BRETON, N.S.



MR. JOHN JOHNSTONE
Manager, Caledonia Colliery
Dominion Coal Co. Ltd.



MR. R. H. BROWN
Old Sydney Mines
Gen. Man., Gen. Mining & sm. Ltd.



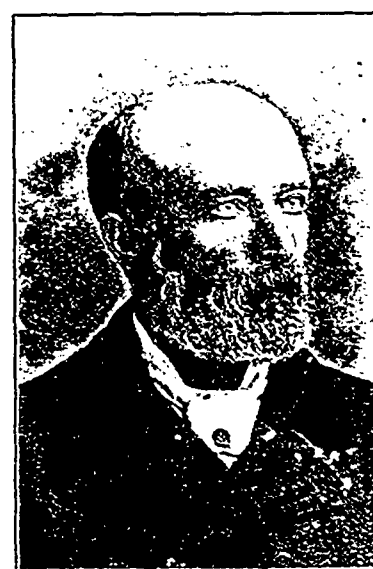
MR. W. PENN HUSSEY
Broad Cove Coal Co. Ltd.



MR. J. G. S. HUDSON
Manager, Glace Bay Colliery
Dominion Coal Co.



MR. W. D. ADAMSON
Underground Manager
Glace Bay Colliery.



MR. ROBT. RONSON
Manager, Old Bridgeport Colliery
Dominion Coal Co.



MR. THOS. J. BROWN
Manager, Victoria Colliery
Dominion Coal Co.



MR. JAMES McVEY
Manager, Reserve Colliery
Dominion Coal Co.



MR. P. CHRISTIANSON
Manager, International Colliery
Dominion Coal Co.

Our London Letter.

LONDON, 13th NOVEMBER, 1897.

Canada and Canada's mines certainly cannot complain at the treatment meted out to them during the year now drawing rapidly to a close, for it is no exaggeration to say that both have, throughout the year, engaged the earnest attention of all Europe. Ontario's mineral resources had been taken for granted without any show of excitement; British Columbia's claims had been accorded only a luke-warm reception. And then came the Yukon-Klondyke rush, and with it a wonderful display of interest on the part of the public in Canadian mining matters—an interest which has been kept alive by the steady stream of sensational cables regarding the marvellous riches of the far northern gold field, mostly, it may be noted, emanating from New York. Already thirty-three companies have been registered in London to carry on mining transport or trading companies in Klondyke, and about a third of these have already appealed to the public. Many of them have composite titles, apparently in order to enable the managers to, if necessary, slant up shop in Klondyke, and toddle down to Kootenay or Cariboo. Although this feverish excitement about the Yukon is to be regretted in the best interests of Canadian mining, it must be admitted that it has done much to call public attention to the mineral potentialities of the Dominion, and should render the task of raising capital in Europe for the development of your mines far more easy than might have otherwise been the case. It was certainly responsible for the inauguration of a market for Canadian mines in the London Stock Exchange, for although this is nominally known as the "B.C. market," it is understood that those constituting it do not intend to limit their operations to B.C. only, but propose to include and deal in Canadian mines generally. At the present moment there is not a big business doing in Canadian mining shares, but it is firmly believed in well informed quarters that the spring will witness a revival of the activity in promoting companies for the exploitation of Klondyke, and may even see a real boom in Canadian mines. It is certainly significant that financiers of the calibre of Whitaker Wright and Horatio Bottomley should exhibit such a keen interest in British North American mining matters. One would have thought that West Australia would have engaged all their attention; but apparently this is not the case, and the former is so keen on B.C., that he has already formed a huge company, with a capital of £1,500,000, which is to do great things in the Kootenay, and possibly elsewhere. The great financial Horatio is, I know, very keen on Canadian mining, and I hope to interview him for you at an early date. In another direction we have the Transvaal goldfields, whose £1 shares stand in the Stock Exchange to-day at £5, and its Cassiar concessions. When West Australia and Kaffir groups, such as these, begin to desert their native pastures for fresh grazing grounds, it is obvious that there is more than mere sentiment behind the enthusiasm which has been shown in Canadian mining matters in the present year. It may be taken for granted that firms like those I have mentioned, not to speak of a host of other good names, who have already signified their friendliness to Canada, do not depart from their beaten tracks without having first of all satisfied themselves that there is every probability of a golden reward attaching to their enterprise. You will not forget that the sagacious "Barney" Barnato himself hoped to be largely interested in British Columbia, and had, indeed, an agent representing him and his interests in that province at the time of his sensational suicide. Everything points to increasing interest being shown in the developments of the mining fields of the Dominion, and it is highly probable that the hundred or so Canadian mining companies which were born in London will be largely augmented early in the new year, by the inception of numerous concerns, formed to acquire and work mining properties in all parts of the vast territory, known under the comprehensive definition of British North America.

The accompanying table will give some idea of the interest that has already been aroused in Canada's mines. I have made the list representative, and although not all those quoted in it can be said to possess "a free market" in the London Stock Exchange, quite a number already change hands daily, notably B. C. Developments (not the Association), Hall Mines, Dundees—who have, I believe, a London register—Fairview, Gold Explorers of Canada, Lillooet and Fraser River, Mikado (Ontario), Waverley, Recordia and Vancouver Syndicates, Regina, and poor disappointing Galena. The dredging companies have not so far been taken very seriously, and the delays in getting to work, as described at the meeting of the Golden River Quesnelle and other companies engaged in the same branch of mining are not exactly encouraging.

Kootenay has a number of friends in this city, and will probably attract a large amount of capital from England, especially if Colonel Payton and United States Senator Turner succeed in placing the LeRoi on the London market. That's what Canada wants badly, the introduction to the British public of several really good Canadian dividend paying mines, which, by their steady interest yield, would concentrate the attention of the investor, and lead him to freely subscribe for less developed, but perhaps equally promising propositions.

Recent features in the market have been the rig in Recordia syndicates, which were forced up to £5 for the £1 share, by those at the back of this moderately capitalized company; and the heavy slump in Vancouver syndicates, following the dire disappointment experienced at the delay in opening up the Galena mines, afterwards accentuated by Mr. Comiskey's doleful utterances at the meeting of the syndicate. Then Hall Mines have been fluctuating sharply, because it is not yet certain whether the company, even if it pay a dividend to the ordinary shareholders, will be able to satisfy the expectation of the shareholders.

Among the finance and development companies, B.C. Development Association (the Skagway Pass people) have not been much cheered by the news regarding their route, and suggestions for alternate and more attractive trails, to run right through Canadian territory to the Klondyke. The B.C. Development Co. (not to be confused with the Association) is understood to have done very well over the Fairview flotation, and both its securities and its offspring's shares are well held. Lillooet and Fraser river mines have been very dull, and I am anxious to hear what Mr. Horne Payne will have to say to the shareholders when he next meets them. Poor Galena became practically unsaleable with Vancouver syndicates some time ago, and

even London and B.C. Goldfields slipped away. On the other hand, Ontario properties have been firm, and the Mikado—now a producer—is being held for better prices. There is not at present a market for Canadian Pacific Exploration shares, but the news regarding the company's Porto Rico group is very encouraging. The Tupper Co's have not set the Thames on fire, but I hear that Sir Charles has decided, very sensibly, on some drastic changes in the programme of the new Goldfields of B.C., which may prove to the advantage of both Sir Charles and those who invested their money owing to his connection with the concern. The real original Goldfields of B.C. are going along satisfactorily, and their first offspring, the Waverley, is expected to be a shipper by Christmas. Ontario, Limited, has attracted a certain amount of support, but Invicta's are dull, and I think the premium on Duncan mines was a little premature. Big Valley Creek seems a hopeless district. The Dawson City Transport and Trading Co. was also quoted at a premium, but I do not think these very transparent efforts deceive the public now-a-days. They might have done, say fifteen years ago, but the investor is shrewder and more wide awake at the end of the century than he was even in the days of the first Kaffir boom.

At the goldfields meeting Mr. Grant-Govan referred to the formation of another subsidiary concern, the Tangier, which had been underwritten to the directors and their friends to the extent of £25,000. No prospectus has been issued, and only £25,000 was offered. Altogether £53,000 has been offered, so that the issue has been subscribed more than twice over. The property acquired is next the Waverley, at Albert Canyon.

Although perhaps a little out of place in a purely mining organ, it seems necessary to refer to the increasing attention paid to all classes of Canadian securities, government, railway and commercial. Canada can claim the honour of having been the first British colony to dare to place a 2½ per cent. loan, and the success which attended it shows how deep-rooted is the faith already created in the minds of English capitalists, regarding the brilliant prospects before the Dominion. Hudson Bay shares have been quieter, but are still held for a big rise by staunch supporters.

There have been several meetings this month. At the Vancouver Syndicate Mr. Comiskey had a dismal tale to unfold about the Galena mines, and the disappointing results attending the opening up of this largely over-capitalized property. The presence of zinc was reported to be the latest disturbing factor. The shares fell to 6d., afterwards recovering to 2s. 6d.

Much more cheerful was the meeting of the shareholders of the Goldfields of British Columbia and the Waverley Mine, Limited, convened to hear an account of the pilgrimage of Mr. Grant Govan and Col. Anstey, to Albert Canyon. Mr. Govan waxed eloquent, and backed up his statement by some splendid samples of ore taken from the Waverley. Mr. Grant Govan, who left for Scotland for a month's holiday to-day, assured me that he firmly believes that in the Waverley member of the Albert Canyon group his company has another Broken Hill Proprietary mine.

At the Golden River Quesnelle meeting, the Hon. Forbes Vernon (B.C.) on Wednesday explained the difficulties attending the opening up of a river dredging plant. Adverse weather conditions seem to have hindered this company considerably so far, but let us hope that the next time British Columbia's representative in Europe has to face a crowd of not over friendly shareholders, he will be able to tell a more cheerful story.

Joint stock enterprise has been less active, and the promoter is now waiting for the turn of the year before launching a hundred prospectuses, many of which are already in type to my own knowledge, and all of which identify themselves with Canadian mining. Among recent issues was the Dawson City (Klondyke) and Dominion Trading Co. Limited, which, with a capital of £600,000, was brought out at the end of October. The chief feature of the prospectus was the indecent way in which the promoters exploited the advisory board, consisting of Turner, Porley and Boscowitz. The *London Statist*, probably the leading financial weekly organ in this country, severely censured this system of exploiting government officials, and pointed out the way in which such practices were likely to mislead the English public. I believe the response of the public was very poor; certain it is that one of the London directors, General Sir Michael Biddulph, tendered his resignation before the company went to an allotment.

British Columbia has, so far, obtained the doubtful credit of introducing a lot of wild cat companies this year to the notice of the investor. The latest was the B. C. Exploitation and Gold Estates, Ltd., which, with a capital of £200,000, proposed to imitate the Golden River Quesnelle Co. Ltd., and which started by imitating its prospectus most beautifully, a fact which was sufficiently proven by the energetic *Financial News*, a journal which has done more, in conjunction with one or two other leading organs, to educate the country on Canadian affairs than all the rest of the press combined. This company was not taken at all serious, and was somewhat roughly handled.

Two other companies brought out by one group, were the Duncan Mines, Limited, capital £150,000, issued 50,000, a prospectory development, mining and agency company, and the Queen Bess Proprietary Company, Limited, capital £120,000, in shares of £1 each, 66,667 of which were offered. This company proposed to acquire a group known as the "Queen Bess claims," situated in the Slocan. In this case we had a parent and its first offspring appealing for the support of the public cheek by jowl. We fancy that the whole thing was rushed, because it was afterwards found necessary to make certain corrections by post in the prospectus of the latter company. These companies were really brought out by the Dominion Mining, Agency and Development Company, which is represented in British Columbia by Captain Duncan, and in London by a Mr. C. S. Drummond.

One of the features of the month was the arrival of Colonel Peyton, and United States Senator Turner, who are staying at the Hotel Cecil, and whose object is the sale of the famous Le Roi Mine to an English company. The arrangements are not complete; but I need hardly point out that if such a splendid dividend payer were placed here it could but assist in the popularising of Canadian mining enterprise in Europe. I believe that the price asked is \$750,000 to \$1,000,000. Let us hope that the vendors will demand at the outset that this property is not over-capitalised, as has been the case in other companies, doomed at the outset of their career in order to gratify the avarice of the promoter.

Another feature was the exhibition by Mr. McGarvey, of Toronto, of a large quantity of Rossland auriferous ores. The show attracted much atten-

tion, and I several times found large crowds with their noses glued to the windows, evidently believing the exhibits came from the Klondyke.

In an interview which I had a few days ago with Mr. Hedley Chapman, (the President of the Georgia Gold Mining Company of B. C.) he lamented the indifference shown by English machinery manufacturers in pushing their wares in Canada in general, and British Columbia in particular. Mr. Chapman is staying at Trowbridge. You will remember that he succeeded in persuading Mr. Chamberlain, at the beginning of the year, to draw attention to the same subject, by addressing a pointed letter from the Colonial Office to the Glasgow Chamber of Commerce. Mr. Chapman fears that the enterprising Yankees will gain a firm footing while the lethargic Britisher is flitting with this most important question.

Very little interest was shown in the reported discovery of another Klondyke, the news came from a Tacoma correspondent, and was received very quietly. The first Klondyke was so thoroughly boomed in the European press that the public were not ready for a second one. One Klondyke is enough in one year for the solid British investor.

Among recent publications concerning the various Canadian mining regions, I must mention Colonel Harris' "Direct Route through the North-West Territories to the Pacific Ocean." Colonel Harris has his own pet theories upon the subject dealt with, and illustrates them by means of a map. You will, perhaps, remember that this was the gentleman who tried to float a company last year, which bore his own name, and proposed to work a section of the Fraser River.

Another useful very useful publication, is the "Review of Ontario's Resources in Field, Forest and Mine," which has been sent to me by the Agent of the Ontario Government at Liverpool, Mr. Byrne. This will help to bring Ontario prominently before those most likely to benefit her, and hitherto kept back from arriving at a decision owing to lack of information of a reliable character. Equally useful is the report for 1896 of the Ontario Bureau of Mines, just published (November 12). Surely seeing that British Columbia's mining record to the end of 1896 was in the hands of the writer, so far back as March last, Ontario should make an earnest endeavour to be a little more prompt, especially at an epoch making period like the present. What Europe is craving for at the present moment is more light. At present the information regarding your minerals is not easily get-at-able. This should be placed in better hands than those of interested parties. Each Provincial Government should make it a point of being earliest and most exhaustive in its production of reliable statistical information. Good maps are also wanted, and should be on sale at some general resort of those interested in Canadian matters; while of course, all official information should be distributed gratuitously, and through other channels than the official representatives of the various Governments.

I am glad to be able to tell you that definite steps are being taken to form a Canadian Chamber of Mines in this country. This is a project which will recommend itself to every true friend of Canada. I hope to send you fuller particulars next month.

There are a lot more subjects I should like to deal with individually. For instance, the proposed route from Vancouver or a C. P. R. point to Klondyke; the boom in Canadian railway securities; the new Canadian mail service, recently fixed up on the Beaver line; the comments on the lack of judicious advertising of Canada's resources, so as to interest European capitalists, and those seeking openings for their capital and energy; the question of the advisability of Government officials allowing their names to be flaunted at the head of gaudy prospectuses; and the *Times'* comments on the "extraordinary renewal of interest in the Diamond Jubilee year" in Canadian matters generally; but space is limited, and I must draw this long letter to a close, reserving several points referred to briefly above for fuller discussion in a later letter. C. W.

THE RUSH TO KLONDYKE.

As evidence of the interest displayed by English financiers in the Yukon, I have prepared a little list of the companies registered this year (and many already formed) up to the middle of November, the primary object of whose creation is the exploitation of the now famous gold fields.

	Capital
Dawson City (Klondyke) and Dominion Trading Co. Ltd.	£600,000
Steamship "Yukon" Co. Ltd.	7,000
Klondyke and Yukon Mining Co. Ltd.	10,000
Old Klondyke Pioneers Mining, Trading and Exploration Co. Ltd.	12,800
North-Western Pioneers, Ltd.	27,000
Ten Million Acres Syndicate, Ltd.	10,000
Yukon Gold Pioneers, Ltd.	100,000
United Goldfields of Alaska and British Columbia, Ltd.	
North's British Columbia and Klondyke Syndicate, Ltd.	10,050
Klondyke Gold Reefs Exploration Co. Ltd.	100,000
Klondyke-Yukon Prospectors, Ltd.	2,000
Klondyke Prospectors and Financiers, Ltd.	30,000
Columbia Klondyke and Alaska Goldfields, Ltd.	
British Flag Klondyke Gold Enterprise, Ltd. (Guarantee)	
British and Californian Klondyke Exploration Co. Ltd.	
British Klondyke Mines and Finance Co. Ltd.	100,000
New Klondyke Goldfinders, Ltd.	15,000
Klondyke and Columbian Goldfields, Ltd.	100,000
Klondyke and North-West Territory Exploration Co. Ltd.	60,000
Yukon Goldfields, Ltd.	100,000
Yukon Placer Mines, Ltd.	2,000
Yukon River Gold Mines, Ltd.	1,000
Klondyke Goldfields, Ltd.	1,000
Klondyke Exploration Co. Ltd.	2,000
Klondyke-Yukon and British Columbia Goldfields, Ltd.	100
Klondyke, Ltd.	2,000
Klondyke (British Columbia) Gold Exploration and Trading Co. Ltd.	100,000
Klondyke Proprietary Goldfields, Ltd.	1,000
Klondyke Mining, Trading and Transport Corporation	250,000
Klondyke-Yukon Exploring Syndicate	25,000
Klondyke-Yukon and Stewart Pioneers, Ltd.	200,000
Klondyke Pioneer Syndicate, Ltd.	25,000
Klondyke and Yukon Gold Traders Syndicate, Ltd.	

COMPANIES.

The Recordia Syndicate Limited.—An extraordinary general meeting of the Recordia Syndicate, Limited, was held in London last month, under the presidency of Mr. W. A. Bromwich, for the purpose of considering a proposal to sell their undertaking to a new Company.

The Secretary (Mr. A. Powles) having read the notice convening the meeting.

The Solicitor read the draft agreement proposed to be made between the Syndicate and the trustee on behalf of the new Company.

The Chairman said. The notice which our secretary has just read explains the principal object of our meeting here to-day. I believe that our articles of association provide the directors with power to sell the assets of the Recordia Syndicate without reference to the shareholders at all, but this we did not wish to do; we want you to know everything that has been done, and to sanction what we are about to do. The Recordia Syndicate, as most of you remember, was formed in the early part of this year for the specific purpose of sending out Mr. Alfred Woodhouse to ascertain whether or not the reported statements concerning the vast mineral wealth of British Columbia would bear the close investigation of a competent mining engineer. Mr. Woodhouse, who has returned and is with us here to-day, will tell you the result of his visit, his impression of British Columbia generally, and what properties and options he has secured for us. After you have heard what Mr. Woodhouse has to say, I think you will all agree that your directors are perfectly justified in the course they are about to adopt; that they are doing the very best thing for the Recordia Syndicate in selling the assets to a Company with a much larger capital than we at present possess, in order that these valuable properties may be fully secured, and so worked to our future benefit. We have every confidence in the new Company, and I may tell you that subsidiary companies are already in course of formation which, if successfully launched, will bring a large profit to the parent Company. I hesitate to make any prophecies, but there is every indication that our prosperity will continue. British Columbia undoubtedly contains a vast amount of mineral wealth, and as it becomes more and more opened up by railways it will become one of the greatest mining centres of the world, and I trust that this Company will reap the advantages of being early in the field. There is another point in favour of British Columbia which should not be overlooked; that is that British Columbia has the advantage of being a British Colony.

Mr. Alfred Woodhouse said he thought he would be able to show the shareholders that the time he had spent in British Columbia in their interests had not been wasted. He left this country for British Columbia early in April with Mr. Munns, in order to learn, by actual observation, whether the reported richness of the mineral wealth of British Columbia could be absolutely corroborated by practical inspection. After travelling through the principal mining centres of the West Kootenay district, he came to the conclusion that, although Rossland undoubtedly offered very great mineral wealth, perhaps the centre of greater advantages would rest more particularly in the Boundary district. He visited the Slocan district, a large tract of country carrying very strong lodes of argentiferous galena; and knowing the attraction auriferous deposits had for the public, who realise the doubtful future of the white metal, he decided to direct their energies towards acquiring interests in the remarkable massive deposits of auriferous copper found in the boundary district, and which deposits, when they had been developed, were found to rapidly increase in the quantity of gold contained as depth was reached. Nothing he could say could exaggerate the marvellous mineral deposits of that country, which at the present moment merely awaited the introduction of capital for their development. Mr. Munns and himself, acting on behalf of this Syndicate, made arrangements with Mr. Thomas Rickard, representing the Dominion Exploration Company, of British Columbia, and Mr. A. J. McMillan, connected with the British Columbian Mining Company, by which they were able to obtain interests in various options of great extent and value. As the Chairman had mentioned, it was proposed to merge—he would not say reconstruct—the present Recordia Syndic into a larger Company, because it had been conclusively proved that even with the small amount of funds at their disposal a great deal had been done, but many valuable opportunities had from necessity been neglected, owing to the fact that they had not the necessary money to avail themselves of them.

Mr. Rickard said he attended that meeting for the purpose of hearing Mr. Woodhouse's relation of the result of his visit to British Columbia, and he had been very interested in what he had heard. Mr. Woodhouse was evidently "dead smitten" with the charms of British Columbia, and as one who had had such an experience of mining as Mr. Woodhouse had had in different parts of the world, it was impossible that he should be otherwise than smitten. With every desire to be level-headed and careful in one's statements, he thought it was impossible to do justice to that country without speaking of it in the most superlative of terms. He thought this Syndicate was very much to be envied in the advantages Mr. Woodhouse had secured for them with very small commitments of capital. He believed that so soon as capital and proper means were brought to bear on the mines at Rossland that result would ensue, and Rossland itself was only a portion of an almost illimitable field. The ore was abundant, but they had not the concentrating machinery. There would be immense developments in the district west of Rossland, and among all the accounts that come to us through the British Press there was never a single doubt thrown upon the riches of those districts. It was significant of what was expected from that country that the Canadian Pacific Railway, who were people who did not make large commitments of several millions sterling unless they had well weighed probabilities, were hard at work at the construction of one of the most difficult pieces of railway over the Rocky Mountains that had ever been made. They were making a great loop from the eastern side of the Rocky Mountains over the Crow's Nest Pass, through Rossland and the boundary district, up to a point where they would join the railway already constructed by them. This loop would take in a region of country which was, roughly, 1,200 or 1,500 miles long.

The resolution adopting the scheme was then formally proposed by the Chairman, seconded by Mr. R. Emmett Large, and carried unanimously.

The proceedings then terminated.

Gold Fields of B.C. and Waverley Mine, Ltd.—There was held last month at London, an informal gathering of the shareholders of the Goldfields of British Columbia, Limited, and the Waverley Mine, Limited, convened with the object of affording Mr. Ernest Grant-Govan, the managing director of the former, and Colonel Anstey, late R.F. chairman of the subsidiary concern, an opportunity of telling the proprietors of both companies what impressions they gathered of the properties of the Goldfields Company and of the Waverley during their recent visit to British Columbia. The Earl of Essex, the chairman of the first-named company, presided, and there was a crowded attendance, the services being very largely represented in the body of the hall in which the meeting was held, and the greatest interest was displayed in the proceedings, and maps, illustrating the position of the properties, were displayed on the wall. After a few introductory remarks from the Earl of Essex, Mr. Grant-Govan addressed the meeting, and confirmed all that has recently been published in the provincial press regarding the properties of the two companies. At the outset, he asserted that the real reason for asking the shareholders to meet the directors and returned voyagers, was to prove that the Board desired the fullest confidence of their proprietors, and felt that the best way so obtain it was to call them together to hear from Colonel Anstey himself an account of their visit to the province. He then dealt with British Columbia as a mining country, and emphasised what has been repeatedly asserted in these columns, viz., the favourable legislative conditions under which mining operations are conducted in the Pacific province, particularly when compared with South Africa and West Australia.

Mr. Grant-Govan said they had been reproached for not acquiring interests in Klondyke. Wisely, however, we think, the company has decided to let Klondyke severely alone, recognizing that although poor men may make money there, placer mining offers little attraction to joint-stock companies. Thence to the subject most interesting to the audience—the Goldfields own properties. The shareholders must not expect to hear of the acquisition of further properties as a result of Colonel Anstey's and his visit to British Columbia. All they had done in this direction was to secure the remaining fourth interest in the Olga, the company having acquired the other three quarters at the outset. What they had done was to decide the best way in which their capital should be expended in opening up the properties they had already acquired, which shows that the lessons learned by other companies of a more adventurous spirit have not been thrown away upon the Boards of the Goldfields and the Waverley. Mr. Govan then gave a few interesting facts about the great mineral belt in British Columbia, and went on to deal with the Albert Canyon group of properties which he acquired last year, and which was being rapidly connected with the Albert Canyon station of the Canadian Pacific Railroad, by a good waggon road—a road, the contract for building which had been arranged by Mr. John Grant, the hardworking and shrewd managing director of the Waverley. They had the fullest confidence in this group of properties, and were concentrating all their energies and financial resources upon them, and "he had little doubt but that they would make great mines of them in the early future."

But the speaker did not forget the properties of the Company situated up the coast. About 150 or 200 miles north of Vancouver they had fifteen or eighteen mineral properties, the nucleus of which was established in the Thurlow town site. There they had a townsite with hotels, trading posts, assayers' offices, the doctor's house, government offices, and all the business in the town belonging to the Goldfields of British Columbia, Limited, to whom also belonged the trading business that is there conducted. The eighteen mineral properties already referred to surround this townsite, and are reserved for further exploitation. It is, however, worth noting that when Mr. Grant-Govan and Colonel Anstey were there, ore assaying \$112 to the ton had been taken from the Blue Bell mine, a claim immediately adjoining one of their own properties. It was intimated to the shareholders, however, that several of these coast properties will, in the future, develop into valuable dividend-payers, while we understand that the company's trading operations are already assuming considerable proportions.

A lengthy description of the Albert Canyon properties followed. There are nineteen of these properties, and the Waverley was selected first for separate management. Early shipments are expected from this property, and if all that we are told by the two gentlemen who addressed the meeting be subsequently verified, the success of the company is assured. Mr. Grant-Govan has himself assured us that this mine is going to astonish Europe when it starts shipping, and has showed us samples of ore which certainly are magnificent metalliferous specimens, while Mr. Grant's advices about the property were most encouraging. Experts have verified these opinions, and have also spoken highly of the Tangier property, which was registered as a joint-stock company, and the capital for which is being privately subscribed by the directors and their friends and the shareholders of the Goldfields and Waverley companies. Mr. Pellev-Harvey, of Vancouver, the agent for Messrs. Vivian & Sons, of Swansea, has assayed some of the Tangier ore, and says that the specimens were of "excellent smelting quality"—a very important point, because there is no zinc in it—and worth £22 12s. per ton of 2000 lbs." Mr. Grant-Govan quoted remarks in the *Kirkstoke Herald*—a provincial contemporary—in support of his statements. He also referred to Mr. Otto Abeling's experiments in the matter of the concentration of the carbonates from the 74ft. vein of the Waverley. It is understood that these carbonates will concentrate seven into one; and as Mr. Grant-Govan in his letter said: "If this should prove to be so, then the value of the Waverley mine is almost beyond computation, as the company has such an abundance of carbonates now in sight." Mr. Abeling's reports will, of course, be checked by other experts. The company is now anxiously awaiting further tidings, which will decide whether the ore is self-smelting or concentrating. It is hoped that at least 1,000 tons of this Waverley ore will be shipped and consigned to Messrs. Vivian & Sons, of Swansea, this winter, and the company has the decided assurance of the engineer that "the value of the consignment will not be less than £20,000 sterling." The directors of the Waverley are already hoping that they will be in a position to pay a substantial cash dividend to their shareholders in the coming spring.

In conclusion, Mr. Grant-Govan said he would undertake to say that the Waverley alone can ship 1,000 tons per week for the next few years that will net the company £10 per ton profit. They had the Waverley, Tangier, Oldham, Montague, Detroit, and other properties, and he felt justified in

saying that the day was not far distant when the Goldfields of British Columbia would be recognised as "one of the most successful and dividend-paying corporations." They might say he was over-optimistic about mining operations. He should rejoice that "the Waverley for one was not a mine at all in the problematical sense of the word, but a sound and already proved investment." At which there was naturally much cheering, for it was a very encouraging speech, and full of promise.

Colonel Anstey followed, and practically covered the same ground; but while Mr. Grant-Govan's convictions portrayed themselves in the earnestness with which he treated his subject, Colonel Anstey, probably recognizing that a difficult task had been set him in finding anything novel to say after the first speaker's lengthy address, dealt in a measure with some of the humorous phases of the trip. But all the same, Colonel Anstey evidently spoke with a strong belief in the value of the properties of both the Goldfields of British Columbia and the Waverley. "He was no expert," he said, and "though by nature a sceptic, nature prompted him to go and see what their property really was." It is satisfactory to find that what Colonel Anstey saw has turned him from a mere sceptic into a strong believer in the future of the properties he inspected with his colleague. What chiefly delighted the gallant Colonel was the independent testimony as to the value of the Waverley, the company of which he is himself chairman.

After a few remarks from Mr. Grant-Govan about the Tangier, now being formed into an independent company, the meeting, which had been in a happy mood throughout, separated after hearty votes of thanks to the chairman and to the two speakers. Before departing, many of the shareholders present took advantage of the opportunity afforded them of inspecting the display of ores brought home from the various properties by Mr. Grant-Govan and his colleagues.

Golden River Qu'esnelle, Limited.—The report of the directors, to be presented to the shareholders at the second annual ordinary general meeting, on Wednesday next, at the City Terminus Hotel, London, states: Since the 30th June, a further sum of £5,500 has been sent out, making a total to date of £41,000. The directors are assured by the engineer in charge, in a report dated 1st Octo per last, that although the works are of a much more substantial and expensive character than originally intended, he is confident of being able to complete the whole work under the original estimate—viz., £16,000. The directors expected that the engineering works would have been completed and mining operations commenced, but a most exceptional season has interfered to prevent this being done. The prolonged heat of the weather during the summer months caused an excessive quantity of snow to be melted in the high ranges of mountain in the neighborhood of the Qu'esnelle lake. This, combined with an exceptionally heavy rainfall in the autumn, has been the means of keeping the water of the lake at a much higher level than in ordinary years, and delaying for some three months the falling of the water in the Qu'esnelle river sufficiently to allow of work being commenced on the dam. The greatest advantage will be taken of the short time left before the severe weather sets in, to test the richness of the river bed, but the Board fear it will be the spring of next year they will be able to prosecute regular mining operations. Mr. McGillivray has been actively engaged in making preparations to commence mining immediately the state of the water permits, and also in constructing a waggon road. As this road will be of public advantage, it is hoped the government will take it over and recoup the company for its outlay.

Tangier Mine, Limited.—Registered with a capital of £120,000 in £1 shares. Object: To adopt and carry into effect an agreement expressed to be made between the Goldfields of British Columbia, Limited, of the one part, and this Company of the other part, for the acquisition, by purchase or otherwise, of the Tangier mineral claim, extending to 52 acres, and situated in the north Kootenay division, and to develop, deal with, work, and turn to account the same in such manner as the company shall see fit; to carry on the general business of a mining, milling, smelting and metallurgical company, in all or any of its branches, as dealers in specie, implements, etc.; to establish and maintain hydraulic and electrical works, rail and tram roads, wharves, furnaces, sawmills, etc. The signatories are:

No. of Shares applied for		No. of Shares applied for	
The Earl of Essex	1,000	Major W. F. Anstey	1,100
Sir R. G. Head, Bart.	2,000	Admiral Sir H. F. Nicholson	200
Colonel H. Fludrer	1,000	Colonel A. Disney-Roebuck	250
E. G. Govan	2,900	Colonel E. Blakesley	200
Lord Aberlure	1,000	Mrs. M. Mulock	400
The Hon. G. Hill-Trevor	2,000	Major-General W. Osborne	
A. Matheson	2,000	Barnard	1,000
T. Callow Hole	1,000	Captain J. Strachan Bridges	500
Captain A. E. Whitaker	1,000	J. H. A. Branson	200
Colonel T. H. Anstey	2,900	Major Herbert S. C. Gordon	250
E. C. de Segundo	1,500	Lieut.-Colonel L. K. Scott	1,000
W. T. Williams	500	Mrs. H. T. Barney	100
A. Fairlie Allingham	500		
A. Rashleigh Phipps	500		25,000

The number of directors is to be not more than seven nor less than two; the subscribers are to appoint the first. Qualification, £500; remuneration, £200 each per annum, with £50 extra for the chairman. Registered office, 16, Copthall Avenue, London, E.C.

Mikado Gold Mining Co—The *Financial Bulletin* says: "This company was organized in 1896, with a moderate capital of \$45,000, of which, however, so far, only 36,000 shares have been issued. The development work effected since the acquisition of this property is highly creditable to the management. Three rich reefs have been discovered, but work so far has taken place on two only. The company has a new 20-stamp battery erected, which has been in operation since Aug. 9. So far 1,647 tons of stone have been crushed, which have resulted in return of 2,413 ozs. of gold, exclusive of the tailings, which will doubtless be treated by cyanide at a later period. It would appear from these returns that this company is at present earning a net profit of at least 100 per cent, upon its capital, and the officials of the company predict a much higher price for the shares. To-day's quotation is 3 1/4-3 3/4."

Information has been received of a further crushing, 320 ounces of gold having been deposited with the Imperial Bank of Canada on October 13. The 320 ounces of gold reported taken from the mine was the result of a crushing of 517 tons. The manager reports: "At present we are crushing the poor ore from the drifts which has been collected at the surface. This is the reason the clean up is not so good. As soon as we get on the stopes the production will be much better, as the ore above the drift is very good."

Petroleum Oil Trust.—Advices from Gaspé, Que., under date November 1st, report:—"Struck good show gas and oil well No. 28, amber oil district; promises to be a flowing well. Well No. 27, was the great gushing well recently discovered, producing 500 barrels per day."

The Hall Mines, British Columbia.—The results of this Company's smelting operations during a period of twenty-nine days ending October 20th, were 6,461 tons of ore smelted, yielding 543 tons matte, containing approximately 1251 tons copper, 155,350 oz. silver, and 58 oz. gold.

Ontario, Ltd.—In a circular issued to the shareholders it is stated that "in July the chairman proceeded to Canada and made a thorough inspection of the property. As your property contains such a large number (13) of lodes, all auriferous, but comparatively unproved, except as being traced on the surface, it is felt that work must proceed with caution to avoid mistakes as to the position of the permanent works. For the present, therefore, the expenditure has been limited to an amount consistent with thorough prospecting, and good picked men are employed in 'costeering' and trenching on the various lodes, with the result that good shows of gold have been found by pan tests at several places, and particularly at No. 5 reef, where an estimated average by panning of 19 dw's. of gold per ton has been found, the reef being 3 1/2 to 4 feet in width." The circular further states that "at present attention is being particularly given to No. 4 reef, which is fully 15 feet in width on the surface, with a very promising course of fine iron pyrites in the ore." The latest report from the mine, dated Oct. 18, states: "Depth of shaft is 11 feet. The average width of vein is 5 feet 6 inches. Both walls are well defined, and very strong. The quartz is well charged with pyrites. Result of assays will follow; have not yet received. Pans well roasted."

Vancouver and British Columbia General Exploration Co., Ltd.—An extraordinary general meeting of the Vancouver and British Columbia General Exploration Company, Limited, was held in London last month, for the purpose of considering the present position of the company. Mr. Comisky, who presided, said it would be remembered that after the formation of the company they were fortunate in securing two very good options, one of a property called the Reade and Tenderfoot, another known as the Galena. The Board paid more attention to the Galena farm than to any of the other properties, because they looked upon it as the most important property they had. Having secured a bond on the various properties forming the group, they to made considerable developments, and after some time decided that it was desirable to close the bond and purchase the property. Unfortunately, the property had not turned out well. The Board had done everything in their power to promote the success of the company, and the shareholders might rest assured that they would continue to do so. A vote of thanks to the chairman terminated the proceedings.

The Fraser River Consolidated Gold, Limited, was registered on the 15th of October, with a capital of £150,000 in shares of £1 each, to adopt an agreement with the British Columbia Venture Syndicate, Limited, and to acquire precious metals lying under the Fraser River within the boundaries of a certain property.

The Duncan Mines, Limited, was registered on the 16th inst., with a capital of £150,000 in £1 shares, to acquire and work gold mines in British Columbia or elsewhere.

The Canadian Minerals Company, Limited, was registered on the 15th inst., with a capital of £100,000 in shares of £1 each, for the purpose of acquiring and working mining properties in Canada.

The Ontario Gold Reefs, Limited, was registered on the 16th of October, with a capital of £100,000 in shares of £1 each, for the purpose of acquiring and working mines in Canada or elsewhere.

Cottonwood River (B.C.) Alluvial Gold Mining Company (Limited).—An extraordinary general meeting of the members of the Cottonwood River (B.C.) Alluvial Gold Mining Company, (Limited), was held in London, last month for the purpose of considering resolutions proposing to increase the capital £80,000, by the increase of 15,000 new shares of £1 each, to be called preference shares, to which certain rights and privileges would be attached. Dr. Baker, who presided, said the matter had been fully explained when they last met, and he would confine himself simply to moving the formal resolutions. In reply to questions the Chairman said, the present shareholders could apply for as many of the preference shares as they wished to take up. As they wanted none immediately, 2s. 6d. per share would be called up on application, and 2s. 6d. on allotment; but they would endeavor to spread the balance over as long a period as possible. Mr. E. W. Johns seconded the motion, and the resolutions were duly confirmed.

Ontario Lands and Oil Company, Limited.—The accounts for the year ended June last, show a profit of £4,467, and for the first time in the history of the Company, there is a credit balance (£69) to profit and loss. When the accounts were closed the number of wells being pumped was 248, as against 104 on the 30th June, 1896, and the production of crude oil in the year was 28,000 barrels, as against 23,823 in the preceding period.

Rossland Lime Co.—Capital £5,000. Registered October 6th, by Mayo & Co. 10 Drapers Gardens E.C. Object, to acquire, own, and work any lands, mines mining rights and leases, ores, mills, etc. Registered without articles of association.

Caledonian Exploring Syndicate Ltd.—Capital £5,000 in £1 shares. Registered October 7th, by E. Salmon Fort & Co., 12 Union Court, E.C. Object, to acquire, own, and work any lands, buildings, mining rights, etc., in Canada or elsewhere. Registered without articles of association.

British America Corporation Ltd.—Capital £1,500,000 in £1 shares. Registered October 7th, by Burn & Berridge, 11 Old Broad St., E.C. Object, to undertake and carry out all kinds of financial, commercial, mercantile, industrial, manufacturing, and other operations; as bankers, financiers, company promoters, underwriters, concessionaires, contractors for public and private works of every description; to purchase, take or lease, under-lease, grant or license or otherwise acquire under contract, concession or other assurance, lands, mines, and mineral properties whatsoever and to do all necessary and expedient acts and things, to acquire a legal title thereto; to carry on and conduct the business of raising, working, mining, and selling gold and other ores, precious stones metals and minerals; to acquire and turn to account land by clearing, draining, irrigating, planting, farming, or building thereon, and to acquire and turn to account any patents, patent rights, inventions, etc. The number of directors is to be not more than seven, nor less than three; the subscribers are to appoint the first. Qualification £500. Remuneration, £250 per annum for expenses and 50 per cent. of the net profits, divisible. Registered office, 15 Austin-friars, E.C.

North Western Pioneers Ltd.—Capital £27,000 in £1 shares. Registered October 9th, by E. Lee, 22 St. James St., E.C. Object, to undertake, assist, or participate in financial, commercial, and industrial operations and undertakings in Canada (especially the North-West Territory and British Columbia) Western Australia, South Africa, or elsewhere. Table A mainly applies.

Old Klondyke Pioneers Mining, Trading and Exploration Co. Ltd. Capital £12,800 in £1 shares. Registered October 11, by Lewy & Co., 28 Theobald Road, W.C. Object, to seek for and secure openings for the employment of capital in British Columbia or elsewhere. The subscribers are to appoint the first directors. Remuneration as fixed by the company. A. J. Wangold is the managing director.

Consolidated Goldfields of Ontario Ltd.—Capital of £100 in £1 shares. Registered October 13, by Mayor & Co. Object, to acquire and turn to account any mines, mining rights, etc., in any part of the world. Registered without articles of association.

Canadian Minerals Co Ltd.—Capital £100,000 in £1 shares. Registered October 15, by T. H. Baxter, Tower Chambers, E.C.

Klondyke and Yukon Mining Corporation Ltd.—Capital £10,000 in £1 shares (1,000 debentures). Registered October 15, by Wilson & Co., 1 Copthall Bldgs., E.C. Object, to enter into an agreement dated August 27, with G. R. Grey and to acquire, own and work any gold and other mines and lands in the Klondyke and Stewart districts, Canada or elsewhere.

Ontario Gold Reefs Ltd.—Capital £100,000 in £1 shares. Registered October 16, by R. D. F. Hill, 22 Great Winchester Street, E.C.

Colonial and General Investment Syndicate Ltd.—Capital of £50,000 in £1 shares. Registered October 18, by Williams and Neville, Winchester House, E.C.

Fraser River Consolidated Gold Ltd.—Registered with a capital of £150,000 in shares of £1 each, to adopt an agreement with the British Columbia Venture Syndicate Ltd., and to acquire precious metals lying under the Fraser River within the boundaries of a certain property.

Ten Million Acres Syndicate Ltd.—Capital £10,000 in £1 shares. Registered October 30, by E. Lee, 22 St. James Street, S.W. Object, to acquire, own, and work any lands, mines and rights in Canada (especially in the Northwest Territory and British Columbia) Australia, South Africa or elsewhere. The directors are to be appointed by the subscribers. Qualification £50. Remuneration £100 each per annum, and £200 for the chairman.

MINING NOTES.

(From our own Correspondents.)

Nova Scotia.

FOREST HILL.

This district is quietly making a record. The Modstock mine under the efficient management of Mr. W. J. McIntosh, has yielded 924 oz. of gold for the past four months ending 31st October. This quantity was won from 1,230 tons of quartz, with a ten stamp mill.

The McConnell mine adjoining the Modstock, recently opened, returned 339 ounces for two months ending 30th September.

GOLDENVILLE.

Returns for October show: Blue Nose Company, 185 ounces; Horschfeld, from the Stuart Hardman areas, 141 ozs. 11 dwt; and the New Glasgow Company, 105 ounces. Horschfeld has opened a new and promising lode on the Canada areas adjoining the Stellarton property.

CARIBOU.

The October returns from the Touquoy, show 140 oz., and the Elk 50 oz.

At the Guffey-Jennings mine (formerly the Lake Lode) the new shaft to tap the old lode at greater depth is being put down as rapidly as possible. The owners are showing not only pluck and enterprise, but faith in the gold mining resources of this Province.

FIFTEEN MILE STREAM.

The new Egerton Company has produced during the past three months 1,455 ozs. Over two years' work is blocked out on the leads now being developed.

SOUTH UNIAKKE.

Returns for the month of October from the Withrow mine, show a yield of 160 ozs.

MONTAGUE.

The Oland mine continues to yield very richly from the new lode, crushing about 20 inches of vein-stuff, yielding over four ounces to the ton.

New finds are reported from Seal Harbour, Liscomb and Tangier, all of which, however, have to be verified.

Perhaps the most interesting find ever made in the Province, is that at Whycoomagh, Cape Breton, where one lode measures nearly 300 feet wide, and another 150 feet wide, both on the same property. Assays have been made from these quartz veins giving gold from a trace to \$60 per ton. The people interested are of the best standing. They have now engaged a competent and reliable expert to examine and report on the property. Large quantities of auriferous gravels lie to the south adjacent to the lodes. The opportunities for operating these lodes cheaply are excellent. Nova Scotia may yet produce that which will eclipse an Alaska—Treadwell.

CAPE BRETON.

The following are the official returns, for the month of October, of the output and shipments of the various collieries operated by the Dominion Coal Company:—

	Output.	Shipments.
Gowrie.....	3,614	6,674
Caledonia.....	28,952	30,576
International.....	10,511	9,606
Dominion.....	32,776	31,089
Old Bridgeport.....	15,225	17,160
Reserve.....	34,764	34,654
Victoria.....	11,006	14,589
Hib.....	7,947	7,446
	<u>144,795</u>	<u>151,794</u>
Largest day's output for month.....	7,246 tons.	
" shipments ".....	7,062 "	
Shipments to Quebec for month.....	95,853 "	

PICTOU COUNTY.

The output of the Acadia Coal Company's pits will, for the year 1897, likely exceed that of 1896 by 15,000 tons; and probably total some 215,000 tons. Nothing worthy of note has occurred in the ordinary development and maintenance of the workings.

The Pictou County coal trade felt the depressed condition in the iron industry and the local poverty that followed in its train; while during the early part of the year it was aided by the protracted strike at Spring Hill.

A suit before the Supreme Court at Pictou, in October, promised to be of more than local interest, and to bring out the liability of a lessee for damages to the surface resulting from the operations of a previous lessee. The suit was brought by the town of Stellarton for subsidence of a road over workings made at least twenty-eight and possibly forty-five years ago, in the abandoned Dalhousie pit of the General Mining Association. No decision has yet been given, and as the defendants' counsel considered legal proof of the presence of workings beneath the road had not been presented, no rebuttal testimony was entered. So that the merits of the case from the standpoint of a lessee who may take property that has been operated by a previous lessee, did not come up.

At the Drummond colliery of the Intercolonial Coal Company the operations for the year have resulted most satisfactorily. There has been a good demand for coal and plenty of work for employees. The pay-roll disbursements have run from \$10,000 to \$20,000 per month. The works have been carried on in their usual regular, systematic manner, and there has been no serious mishap or fatal accident. The mine being splendidly equipped for all the demand that was likely in the spring to be made upon it, the only additions to the plant, with the exception of some new pit latches, has been one large size "Heine" Safety Boiler. This type of boiler gives good satisfaction. It is expected the output for the year will go a little over 200,000 tons, or an increase of 20,000 tons over that of last year. The prospects for the winter months are good, and preparations are already being made for a large and increased output next year. The old fan shaft is now being sunk to the 2nd seam, and which it is expected to tap in about three weeks' time. It will then be continued down to the 3rd seam, some 80 feet deeper. This shaft is 10 by 10 ft. in the clear, and will be used solely for ventilation purposes. It is intended to work the 2nd and 3rd seams by way of the present Scott Pit shaft, and with these works supplementing those of the Main Slopes the output will be increased to 1,500 tons per day. Work is being pushed forward with a view to having everything well in advance of next season's shipping.

CUMBERLAND COUNTY.

At Spring Hill the year's output has naturally been reduced by the two months' strike in the early part of this year, and the returns will, it is expected, not exceed 260,000 tons. Business at this colliery has, however, been somewhat better of late, and when No. II, Bank Head, is completed this month, the company will be in a better position to fill orders. The prospects for the winter months are reported to be good.

The output of the Canada Coal and Railway Company's, Joggins colliery, will, it is expected, show a considerable increase over last, the returns to date being reported at 72,289 tons. In a letter from the manager, we are informed:—"We would have had a much larger increase of output during the current year, but our developing operations were kept back by water, which we have now happily overcome by the connection of No. 2 Slope, where the pumps are situated, with No. 3 Slope by means of the 1,000 feet levels. This work occupied six months, and at the same time opened up a considerable portion of the seam, which will at once be worked, giving a considerable increase to our output. The workings have extended 300 feet during the year, and three new balances have been constructed. It is our intention to sink No. 3 Slope an additional 600 feet, which will give us a good hold of the level and pave the way for several years' work. As you are, I think, aware, the lower or 2,300 feet, section in No. 2 Slope, has been lying under water since the last strike, nearly two years ago. This section is being unwatered and will also enable us to increase our output, if necessary. This Slope will also be sunk probably 200 feet. Our equipment remains the same as when I last wrote you, but we propose putting in a new and much larger pumping plant in No. 2 Slope. We are presently doing the work with two pumps, and our object is to do the work in a more efficient manner with one."

(FROM ANOTHER CORRESPONDENT.)

Some more phenomenally rich strikes have been recently made. Notably amongst them we may mention the Touquoy mine, where 75 lbs. of quartz yielded 140 oz.; Renfrew, where three quarters of a ton yielded 86 oz., and the Oland, at Montague, yielded 165 oz. from only a few tons.

Messrs. Billman et al have, after a considerable amount of patient prospecting, struck some very good ore at Mooseland; 16 tons crushed recently yielded 41½ ozs. of gold.

The September returns sworn at the mines office amount to over 1,700 ozs. of gold, with several mines to be heard from. The principal contributors to this total are:—The New Egerton, 445 ozs. from 1,000 tons of ore; the North Brookfield, 349 ozs. from 972 tons; the Richardson, 203 oz. from 2,150 tons, 212 ozs. from 261 tons of ore, and the New Glasgow mine at Goldenville, 122 ozs. from 305 tons.

Mr. T. H. Heal has recently joined Mr. F. H. Mason, of Halifax, in the business of mining and metallurgical engineers. Mr. Heal is a graduate in mining metallurgy of the Royal School of Mines, London.

The Richardson Mining Co. propose putting in an additional 20 stamps, which will make in all 60 stamps, and will be the largest mill in the province.

We recently had a call from Mr. George Oland, who reports his property at Montague to be showing up excellently. The last clean up produced 165 ozs., and a considerable quantity of the best quartz was kept for specimens.

Mr. J. W. Hill-Catherine, who has been looking after coal interests in Cape Breton for English capitalists, has returned to England, but is expected to return to Nova Scotia in the new year.

A number of new finds are reported from different parts of the province and areas have been taken up. This year will probably prove a record for the number of areas taken up.

Mr. Miner J Foster recently showed us some fine specimens of gold bearing quartz taken from his property on the north dip of the anti-clinal, at Tangiers.

Development work has been re-started at the Philadelphia mine, North Brookfield, Queens Co. The famous fissure vein, now being mined by the North Brookfield Mining Co., runs through this property, and great things are expected.

The Mineral Products Co., under the management of Mr. Russell P. Hoyt, will shortly start smelting operations at Bridgeville. They intend making ferro-manganese from the deposit of wad manganese ore near Hillsboro, N.B. The ore has to be briquetted prior to smelting.

Messrs. J. R. Bishop et al are actively prosecuting the development of a huge lead of quartz near Whycoomagh, C.B. They have a steam drill at work, and have driven a cross cut 45 feet in length, and are still in the vein. Mr. Bishop informs us that they have met with several sights of free gold, and that a mill run of five tons of the quartz yielded over \$2.00 per ton. The quartz carries a considerable quantity of iron pyrites, and some arsenical iron pyrites.

Quebec.

The production of copper-pyrites by the Eustis Mining Company, and the Nichols Chemical Company at Eustis and Capleton, will, it is expected, be up to the average of former years. The Eustis Mining Company, in addition to their extensive operations at Eustis, have a few men working regularly on the Hepburn property. In the same district Mr. John McCaw is re-opening the old Assot Mine. Mr. James Morrow is also opening up a promising prospect, said to contain rich ore, in Shipton, near Danville.

The property and plant of the American Asbestos Company, sold by the liquidators last month, realized \$1,1,900, and was bought in by a German concern to be known as the "Frankfurter Asbest Werke." The mine, we understand, will be worked during the coming year.

Dr. James Reed has operated this year with some success the old Harvey Hill Copper mine, the ore in the dump going as high as 58 per cent. copper, and 6.31 oz. silver. Changes in the concentrating plant are contemplated.

The Asbestos Mines operated by the Messrs. King, the Johnson's Company and the Bell's Company, are working to their full capacity, and we are informed that no quantity of No. 1 and No. 2 grades can be purchased, the entire output having been sold.

At Danville the pits and factory of the Asbestos and Asbestic Company have been connected with the Grand Trunk Railway by a branch line lately constructed. 300 men have found regular employment during the season here, and the working plant, already extensive, has been increased by a new 20 drill compressor, an additional battery of boilers, and an extensive addition to the main factory building.

Chromite has been mined during the year in the neighborhood of Black Lake, mainly by Mr. P. P. Hall, the Coleraine Mining Company, Mr. Lambly, Messrs. L. Frechette & Co., and Mr. L. Carrier, the Coleraine Company having at date about 1,000 tons on their dumps, mostly, however, we are informed, of low grade. There is some talk of erecting a concentrating plant to treat these low grade deposits. A new deposit has recently been opened by Mr. Hall, on Lot B 26, of Coleraine, which looks very promising. Altogether, the shipments of Chromite for the year are expected to be about the same as last year, i.e. 2,500 tons.

Messrs. Ward & Ross sold recently to Frank Ross, of Quebec, a piece of land adjoining the property of the American Asbestos Company, containing asbestos and chromite iron. The price realised is reported to be \$3,100.

The shipments of Asbestos and Chromite by the Quebec Central Railway, from 1st January, to 30th October last, are reported to the REVIEW, as under:—

<i>Chrom.</i>	From Coleraine	42,560
	Black Lake	3,325,010
		3,365,600 Pounds.
<i>Asbestos.</i>	From Black Lake	998,550
	Thetford Mines	13,341,000
		14,339,550 Pounds

At Calumet Island, Pontiac County, progress is being made with the development of the zinc-blende property known as the E. half of Lot 10 and Lot 11, Range IV. A shaft is now down to a depth of 75 feet. About 250 tons of pure ore, and 100 tons of disseminated ore have been taken out to date, six carloads having been shipped to Swansea for treatment.

Mr. Leopold Meyer, who has a bond on the adjoining property (the W. half of Lots 9 and 10 and Lots 12 and 13) has a force of eighteen men at work on a galena deposit on Lot 12.

In Beauce, some washing has been done on the Gilbert, and on the Mill Creek, with good results. On the Gilbert, Mr. Ph. Angers is the principal of a small company, operating with the object of reaching the old works on Lot 15, DeLery Concession, by a canal and drift. About 25 men have been employed in this work, and it is expected to reach pay dirt by December.

On the DuLoup Mr. L. Gendreau has been sinking several testing shafts with the object of ascertaining the course of the supposed old channel of this river.

In the vicinity of Dudswell, several small parties of miners have been washing on the Kingsey, Row, Harrison, Big Hollow, and other streams, obtaining gold in small quantities.

By courtesy of Mr. Obalski, the genial Inspector of Mines for the Province, we are enabled to reproduce in this issue a couple of interesting photos, showing some of the nuggets found on the Gilbert. These are characteristic of what has been found in this promising gold field in the past, and of what may be obtained again by a little push and enterprise.

Up to 30th September last, there has been entered for export to the United States, mica to the value of \$48,756.93. These figures are from the Consul General's office, and only represent the entries through the Port of Ottawa.

It is reported, on what appears to be good authority, that the sale of the Wallingford Mica Property in Templeton, has been consummated, and we are informed that a substantial deposit has been made by the London people who have the deal in hand. The purchase consideration is said to be in the neighbourhood of £17,000 stg.

British Columbia.

WEST KOOTENAY NOTES.

In the Slocan, the Payne leads with a monthly production for October of 700 tons, the White Water 243 tons, and Slocan Star 240 tons, these three mines being far ahead of all others at present, although the Lucky Jim is expected to turn out large tonnage very soon for the Pilot Bay smelter.

The month of October exceeds all previous months in the value of production, being a value of \$867,758—over \$100,000 ahead of the next highest monthly output. In this connection it is interesting to compare the ratio of values of the four main metals—gold, silver, lead and copper. These values for the first week of the present month are: Gold, \$82,020; silver, \$134,454; copper, \$35,564; lead, \$29,995; a total of \$282,033.

The output from the Noble Five group since the formation of the present company has been less than generally expected. An extraordinary meeting of the stockholders was called for Oct. 30th to vote upon the raising of \$150,000 upon the property of the company in order to carry on work. At this meeting 780,000 shares were represented, this being 20,000 short of a requisite two-thirds vote. Hence the meeting was postponed until Nov. 25th; meanwhile the mine is closed down.

Another stock company which came forward with somewhat highly colored prospectus has come to grief. This comprises the Ibez group, about four miles north-east of White Water, and a couple of miles east of the Wellington group. These claims are sold to satisfy four judgments which amount in all to \$2,666.17. There are a few tons of ore on the dump. Also the Wonderful is in trouble over an exhausted treasury. Besides these there is little evidence against general prosperity and advance.

Amongst the properties in the Slocan which show promise of coming forward in the matter of larger shipments are, the Last Chance, into which A. W. McCune and Scott McDonald have lately bought; the Enterprise, Queen Bess, Mount Adams and Canadian groups, and the Arlington. Besides these there are many small properties developing well, many of which promise to pay their own way to becoming mines.

The greatest depths yet reached on West Kootenay veins are approximately: Slocan Star, 750 feet; Le Roi, 600 feet; Goodenough, 500 feet; all of which go toward proving a permanence of value in going down, also there appears to be very little variation in the nature of the ore bodies.

Nothing of much account is being done this winter on the Kokanee range. There are extensive deposits of rich galena, but so far the chief properties have been in dispute. These ore bodies occur along the summits of some of the highest mountains in the Selkirks, over 9,000 feet above the sea, and they are in granite.

Another vein is said to have been found on the Athabasca, which runs well in values. Nearly 200 tons of Athabasca ore have been already treated at the Hall mines smelter, giving an average of \$72 per ton. The British Canadian Gold Fields Co., which operates this mine, is now putting in a trail from Kootenay Lake to the Gold Wedge, another of their properties on Lemon Creek. This route may lead to the drawing of the Upper Lemon Creek ores out to Nelson by way of Six Mile Creek and the west arm of Kootenay Lake. However, the more natural road lies down Lemon Creek to the Slocan Valley Railway, some eight or ten miles. Before long, however, these gold ores may be treated on the spot, hence the matter of their transportation is not very important. The Alpine group is also served by way of Kootenay Lake and Six Mile Creek.

Rumors of smelter building continue. Rosebery is to have one put in by an English syndicate, which has bought into the townsite. Nakusp also claims a project of the same kind.

Robson appears to be most favorably situated, and it will probably be the site of a large custom smelter before very long. Points to the north of Kootenay River have less advantage in nearly all ways. From \$3.00 to \$5.00 will cover the cost of transport from Slocan points to Kootenay or Columbia River.

There will be but little shipment from the Lardeau District this winter. The chief producing divisions will be Slocan, Ainsworth, Trail and Nelson, the value of the silver mined being nearly equal to the combined gold, copper and lead values.

The rawhiding season promises to begin earlier than usual. There has been a heavy and continuous snowfall during the first half of the month. This will be of advantage by hastening the transition from packing to rawhiding, without the usual half-way stages.

J. C. G.

NELSON DISTRICT.

As it was hinted last month, the winter seems to have begun in earnest, and the snow which had been gradually creeping down the mountain sides and obliterating the gorgeous autumnal foliage, covered the streets of Nelson to a depth of 6 or 8 inches by the 9th of this month. A rapid thaw however, has left the streets bare again, but the hills now wear their permanent winter aspect.

Now is the time when the hardy (and not too truthful) prospector produces greasy specimens of ore from his pockets, which came from a ledge close to the town (or lake, or railway, as the case may be) and is of prodigious dimensions and incalculable value. A one-eighth of this claim can be sold to a cash purchaser for a mere song—say \$1,000—but the bargain must be concluded at once as so many others are anxious to get. By and bye, however, these terms will moderate, and \$500 will be accepted. And a little later when assessment must be done next spring, the whole claim will be offered for \$100, or so. Surely no one can begrudge the prospector every cent he can get, but a little more reason in his demands would greatly stimulate business and pay him better.

Everything has been going on very smoothly and satisfactorily for the last few weeks; the Hall Mines mine has been sending down larger quantities of much better ore than usual, and the Furnace in consequence has been working almost without a hitch, turning out much more matte than ever it has done before, in one day indeed 26 tons being produced in a 24 hours run. For the period ending September 30th, the Directors report as the result of 32 days work, that 6,210 tons of ore were smelted, which yielded 522 tons of matte, carrying roughly 50 per cent. copper; 270 oz. silver, and about $\frac{1}{10}$ oz. gold per ton. They have also declared a 7 per cent. dividend on the preference shares.

A large number of properties on Toad Mountain have been more or less developed during the past season, and many of them show most promising indications, very frequently in purple copper (which seems to pervade that locality) but also in auriferous pyrites and quartz ledges, though these are less frequent. Mention may be made of the "Morning," "Julius Caesar," "Shannon," "Irene" and "Starlight," all of which are showing up well, and most likely will prove valuable properties. The "Golden Star" adjoining the "Starlight" produced some specimens showing native copper, which is not very common about here.

Speaking of Toad Mountain, we must by no means forget the Athabasca group, which seems marvellously lucky in finding new and unexpected ledges on the claims, one being uncovered about the middle of October, some 300 feet above their present workings, which assays well in gold. Indeed the price paid by the Nelson Smelter for the Athabasca ore smelted by them has been often \$100 per ton, some of it reaching a much higher figure. From the report just published by the Management, it is evident that a very large amount of work has been done, and that "no stone is left unturned"—literally—to make the mine as successful as diligent and sensible operations deserve.

The old established "Dandy," adjoining the "Silver King," is now exhibiting a huge block of ore in town, weighing some ton and a half, containing high value in copper, silver, and gold. It is said the ledge can be traced 2,000 feet, and it is 5 feet wide.

Leaving Toad Mountain alone for the present, we hear of a very fine free milling gold discovery being made on Lemon Creek, the claim being named the Golden Wedge, and the gold is said to be so thick in it as to render assaying superfluous, which statement if correct speaks well for the ledge in question.

Rather more to the east, between Kootenay Lake and Windermere Lake, some very good finds are reported of ore, carrying 58 per cent. copper, with \$60 in gold and silver as well. It appears from the description given that it is a Purple or Peacock copper chiefly, but very little could be done this season owing to the snowfall and stormy nature of the district, next year, doubtless, will see much more work, unless the Klondyke excitement causes a stampede from West Kootenay. Such a thing is not likely however; certainly a few, very few, may try the new El Dorado, but the majority of men here feel well satisfied that they have a good thing in this district, and intend to stay with it; at any rate we have the advantages of a quite bearable climate, and are within the pale of civilisation.

At Ainsworth, that old established camp, things are looking very much better. The probable blowing in of the Pilot Bay Smelter has a most healthy effect upon the mining industry, the No. 1 mine shipping regularly to the smelter, while the Tariff and Highland are also very busy. The concentrator at Pilot Bay, has already started work, which augurs well for the blowing in of the Furnace at a reasonably early date.

At Woodbury Creek, near Ainsworth, a good deal of prospecting has been done this summer, and some very good assays of ore have been reported, particularly one of grey copper, as it is commonly called here, which is an unusual mineral so far in that particular district, but of course, may occur anywhere. The comparative closeness of Pilot Bay to the Ainsworth and adjoining camps, will of course, increase the value of any ore discovered on account of reducing freight charges, there being but a few miles of water to be traversed from one point to the other.

Many rumours have been going round for some time, with respect to the Canadian Pacific Railway building smelters on their own account, even if they did not operate them, the object of course, being to encourage smelting, and if we may trust Mr. Sussman, who is certainly the Canadian Pacific Railway expert in mining and allied industries, these smelters will be built. Nakusp seems a very likely place for one, and Robson also offers great natural advantages, but which place, if either, may be selected, is quite a matter of doubt so far. In any case, the establishment of smelters will be productive of a vast increase in the mines worked and mineral raised.

The exports from Nelson for the last week are valued at \$100,500, which is a pretty fair showing. There were 822 tons of ore, of which all but 25 came from the Slocan district, and was valued at \$75,000, and about 114 tons of matte from the Hall Mines Smelter, valued at \$25,500; whilst the value of the exports for the month so far, was no less than \$382,500. Surely this is a good record for a country supposed to be in its infancy, (and truly it is young yet!) and one that will be hard to beat, except perhaps by Klondyke next year, if any one lives to return from there.

A. H. HOLDICH.

COAST NOTES.

The owners and operators of the Coast mines, some of which are highly promising copper, gold and silver properties, are increasingly anxious for the early establishment of the proposed smelter and refinery on Burrard Inlet, Vancouver, provided that, as expected, it make facilities for the treatment of copper ores. The American smelters are mainly equipped for silver-lead ore, and when they deal with copper-bearing deposits, often fail to extract the metal to anything like the full extent, whilst also failing to utilize com-

pletely several valuable bye-products of copper ore smelting. This the Vivians of Swansea accomplish most satisfactorily, and their offer to take consignments of Coast ores—making large cash advances thereon as sampled—is therefore well received. But it is a very "far cry to Swansea," so that the miners of the Coast urgently call for copper treatment facilities at or near Vancouver. It is nevertheless hoped that the proposals now made by the Vivians of Swansea, and already accepted by several Coast mine owners, herald the early future establishment of a copper ore smelter and refinery in British Columbia by the great South Wales industrialists.

Meanwhile, though nothing authoritative transpires, it is hoped that preliminary negotiations are satisfactorily proceeding in London, England, with a view to the building and operation, with civic co-operation, of the proposed Burrard Inlet copper-gold and lead-silver smelter and refinery, ere the end of 1898. The want of this is increasingly urgent and retarding the development of good coast mines.

Promising reports as to the early stages of working on the Blue Belle and Dorothy Morton mines in the Shoal Bay, district of North Coast, are to hand, and it is hoped that considerable and satisfactory shipments may thence begin to be made continuously at any early date. There are other good claims in the district that should also make valuable shipments ere long. Those of the Gold Fields of B. C., Limited, are however, still really unproved, and the company's operations at Shoal Bay are at present confined to trading amongst a busy and increasing population of miners and prospectors.

There is considerable discussion on the Coast in regard to a hazardous prediction by Mr. Grant-Govan, recently made by him as managing director, to a meeting in London, England, of the shareholders of the Waverley Mines, Limited, a company which operates a well known mine of the same name in the Illecilliwaet district. The mine is in a very early stage of development, and has not yet even begun to ship. Its value is chiefly dependent on its silver lead, though its ores also carry gold. The Waverley is certainly regarded as a mine of considerable promise, and as such more likely than not to return fair dividends, in respect of an authorised capitalisation of £100,000. But it cannot at this early stage be regarded as a certain and permanent producer of the precious metals in enormous quantities. Yet Mr. Grant-Govan assured the English shareholders, that the mine could in 1898 and for several years continue to ship 1,000 tons a week, yielding profit of £10 a ton. This advance estimate of £520,000 profit per annum, would relatively to the company's capital, make it a veritable Goldconda, and place it as regards profitability, in a position equal, nay more than equal, to that of five such productive copper-gold mines as the noted Le Roi, of Rosslund. In fact, no such return has yet been expected or imagined, in regard to any single mine in British Columbia, good as many of them are, and there is a general feeling that if the Waverley returns a yearly net profit of £50,000 or £60,000 sterling, it will not only richly reward its shareholders, but also, prove itself an exceptionally good British Columbia mine, one of the best in fact in the Province. But such a very large assertion as Mr. Grant-Govan, based as yet certainly on inadequate premises, is greatly deprecated by the more cautious. Unduly large assertions have been made before of British Columbia mines to British investors, and when proven exaggerated, have much retarded the legitimate development of precious metal mining by English capital in the Pacific Province. It is generally held by Coast mining men, that Mr. Grant-Govan would do well to "go slower" in predictions as to the profitability of the output of even richly promising mines, when but in the first stage of development, and only about to begin shipping on a moderate scale.

A lamentable instance in point of the injury done by such "booming" is the extraordinary bad impression of British Columbia reports as to mine prospects, produced in London, England, by the case of the Galena Mines, Limited, of West Kootenay, which has earned no dividends, and failed as yet even to produce ore capable of profitable treatment, the deposits being refractory. Yet on the strength of reports that several hundred thousand dollars worth of ore were in sight and easily available for early shipment,—reports since proved quite fallacious—the Galena Mines, Limited, was, subject to altogether excessive promoters, and underwriters' profits, capitalised in no less than £530,000.

A conservative estimate of the realised 1897 output of the Bonanza and Eldorado Creek, places of the Klondyke, made by Mr. W. J. Jones, a well known and observant resident of Dawson City, places the approximate value at rather less than \$2,800,000, a goodly sum, but no wise approaching the estimates of boom correspondents of the Joaquin Miller type, who apparently multiply several times the Yukon's Gold yield.

The Board of Trade of Victoria and Vancouver, so too, the Municipal Councils of both cities, are now widely advertising the fact, that these British Columbia centres are far more convenient points of departure and outfit for the Yukon, than the American Pacific ports of Seattle and San Francisco, by reason of the intended special facilities to be afforded by the Canadian Pacific Railway, and other British Columbia transport organizations, and by the circumstance, that goods bought in Canada, pay no import duties on entering the Yukon. Moreover the Hudson Bay Company, which has big establishments at Vancouver and Victoria, is naturally credited with special knowledge of far northern outfit requirements. The same is the case of other British Columbia outfitters, some of whom have themselves been northern miners and prospectors in the past. Big orders are consequently being sent east and to England, respectively, for outfitting supplies required by Vancouver and Victoria traders, as although there is really little to justify an enormous rush of gold seekers to the Yukon next spring, so many throughout Canada, Australia, the United Kingdom and the States have become infatuated with the idea of northern gold seeking, that despite all warning, it seems certain that next spring no less than 50,000 people at a moderate estimate, will pass through British Columbia, en route for the Yukon. Already indeed, hotel arrangements are being made in the British Columbia cities, by letters and cables from England, that imply the coming, early next

year, of an advance guard of at least 5,000 British gold seekers. There will certainly, therefore, be busy times in British Columbia next spring, and as certainly be hard times soon afterwards in the Yukon. There, even if the highest rationally estimated five, or, as it may be, ten years' gold field of the Yukon were gotten, as is of course impossible, in one twelvemonth, viz., \$100,000,000, and then equally divided, a thing also impossible, there would not be met the average cost of travel, outfit and a season's living for at least 100,000 people who will be in the Yukon next season. The boom must and will prove cruelly disappointing to most of the adventurers.

N. C. SCHOR.

B. C. MISCELLANEOUS

The British Columbia *Gazette* has published a regulation to avoid forfeiture of mining properties owing to the lapsing of free miner's certificates in certain cases. The amendment is an important one, and went into effect November 15th. Under the past regulations a person holding mining properties would "absolutely" forfeit all his rights to them, if he allowed but a single day to elapse between the date of expiration and renewal. The new amendment states that a miner or company desiring relief against forfeiture through omission to procure a certificate must observe the following conditions:

1. Forthwith upon ascertaining the expiry of his certificate to obtain a new one.
2. At the time of obtaining such new certificate file with the recorder issuing the same, and post in the record office, a notice of his intention to apply for relief.
3. Within 30 days from such filing transmit to the minister of mines the following documents and fee:
 - (a) A statutory declaration setting forth the circumstances of such omission, with full particulars of the mining properties held by the applicant which would be affected with forfeiture;
 - (b) A certificate under the hand of the gold commissioner or mining recorder of each division wherein any of the said properties is situate, that notice has been posted, and that no records (other than those mentioned in the said certificate, if any) adverse to the applicant's interest in the said properties have been made by him during the time in which the said applicant was not in possession of a valid existing free miner's certificate;
 - (c) A declaration by the applicant, or his agent duly cognizant of the location on the ground of the applicant's properties, and the other facts affecting the case, that he has searched the records during the interval the applicant was in default, and that such claims do not (except as may be therein stated) conflict or overlap any of the properties of the applicant;
 - (d) The sum of \$5.

The minister of mines may thereupon give instructions for the alteration of the date of the applicant's free miner's certificate so as to conform with the date of the expiration of the lapsed certificate, and may also give instructions for such amendment to be made to the records affected as may be considered requisite, and any such relief may be partial as to properties in respect whereof relief is given, or so as to save adverse rights acquired during defaults of the applicant.

Ontario.

Mr. John F. Caldwell, owner of the Sultana mine, Lake of the Woods, favors us with the following details of the new plant recently installed:—

There has been very little mining done at the Sultana during the past season, owing to the changes made, both underground and on the surface. The old 10-stamp mill has been replaced by a very fine 30-stamp mill—up-to-date in every respect—and the mining machinery has also been entirely replaced with larger and more complete plant. The skid poles in the shaft have been replaced with skip timbers and steel rails. The piping for steam, water and air replaced with much larger and better piping, and a complete outfit of underground steel cars in all the levels, with new tracks of steel rails. A very fine shaft house and hoisting engine house has been built, the first over fifty feet high. The new hoisting engine is supplied with steam cylinders, 12 x 18, and the winding drums (two) are five feet in diameter and four feet long. The skips have a capacity of two tons each. We propose to operate this 75 horse power hoisting engine with air and steam; and when it suits us to use compressed air we propose to use it, being cheaper; but we can use steam if necessary, having pipe connection for both. The mill is supplied with a battery of three boilers, of about 100 horse power each, which also supply the hoisting engine. The engine room is equipped with a Corliss engine, a beauty, cylinders 14 x 36, a Rand duplex steam air compressor, class B, compound steam and condenser. The steam cylinders are fitted with Meyer adjustable cut-off valves, with indexes and pointers. Three (3) water supply pumps, 7½ x 12 x 6, with three inch discharges, connected with the lake by 4 in. galvanized pipes. One larger air receiver. A dynamo and engine. The crusher is a No. 3 Gates; capacity 10 to 20 tons an hour. The ore is fed to the stamps with challenge feeders. The 30-stamps are beauties (battery frames and timbers of British Columbia fir timber), about 900 lbs. each, and the mortars could not be better, with chrome steel tappets, cams and shoes. The guide boards are sectional, of a very late invention, an improvement on the Fargo, simple and enduring and convenient. The mortars are supplied with steel linings, ends and sides, and copper plates, front and back; also lip plates, electro-plated with silver. The pulp, after passing over the copper table plates, will pass through traps lined with copper plates, and on to vanners, of which there are six, one to each battery of five stamps. The vanners are six feet each in width, corrugated rubber endless belts, of latest pattern, and supplied with amalgam savers. The water for the stamps is supplied through a 3-inch pipe, which in turn passes through an 8-inch pipe, through which exhaust steam is passing, so that the water is heated without expense. The mill is heated with exhaust steam, and lighted with electricity; is covered with heavy corrugated iron, painted black red, and with white trimmings. The whole plant was supplied by the Jencks Machine Co. and the Canadian Rand Drill Co., Sherbrooke, Que."

A cablegram from the manager of the Mikado states the result of last clean-up was 350 ozs. of gold from 650 tons; 18 days' milling. Considerable improvement expected. Next clean-up, Nov. 16th. He is still dealing with low-grade ore referred to in his last advice.

The Mica Manufacturing Co. Ltd., is at present confining its operations to the Martha mine, near Perth. Mica of excellent quantity and quality is being won.

From the Sixth Report of the Bureau of Mines, being for the year 1896, published since our last issue, and to which we hope to refer at some length in a future issue, we gather some interesting, if rather late, facts, respecting the progress of mining in this province. During the period under review, there was an increase in the number of locations sold and leased of 218, in the areas of land sold and leased of 13,635 acres, and in receipts from sales and rentals of \$22,611. The total collections on account of lands sold and leased last year was \$55,581 (not including \$5,006 of rent money paid on lands previously leased), and during the last few weeks of the year there was paid in a further sum on lands applied for of \$28,436. The largest receipts were in the months of November and December, and as evidence of the continued briskness of operations, it may be stated that the receipts on account of mining lands in the first three months of the present year, exclusive of a special deposit of \$20,000, have been \$72,387. These transactions, we are informed, relate to crown lands only. There have been large investments in patented lands, but no attempt has been made to procure a list of them.

The total mineral production of Ontario during the year 1896 is estimated by the Bureau to have been of a value of \$5,235,003.

Of the beneficial influence exerted on the exploration and development of iron-ore deposits by the operations of the Hamilton Blast Furnace Co. at Hamilton, the Report says:—"The opening of this furnace having established a market for ores of good quality, prospectors have been actively employed in searching the province for them. Magnetic ores are plentiful in some eastern counties, but a number of the properties which have been worked yield an ore too high in sulphur for the production of a high grade of iron. Hematite and specular ores are preferred by the superintendent of the furnace, and it is stated that valuable discoveries of these ores have been made in the townships north of Lake Huron, back of Bruce mines. These deposits are being explored and developed, and it is confidently expected that during the present year large supplies for the furnace will be procured from that quarter. In the eastern counties, hematite ore is not known to exist in large quantity, or very generally, but there are a few deposits where ore of this class has been found of a fine quality."

Respecting statistics of the production of nickeliferous pyrrhotite, the Bureau reports for the years 1892-96, the following quantities of ore raised and smelted at Sudbury, and the per cent. of metallic contents in the smelted ore:—

Year.	Ore Raised, Tons.	Ore Smelted, Tons.	Per cent. of metallic contents in ore smelted.		
			Nickel	Copper	Cobalt
1892..	72,349	61,924	3.36	3.19	.1007
1893..	64,043	63,944	2.21	2.38	.0800
1894..	112,037	87,916	2.92	3.14	.0721
1895..	75,439	86,546	2.67	2.73
1896..	109,097	73,505	2.67	2.51

The next table gives the comparative statistics of the industry for the same period:—

Schedule.	1892	1893	1894	1895	1896
Ore raised	72,349	61,043	112,037	75,439	109,097
Ore smelted	61,924	63,944	87,916	86,546	73,505
Ordinary matte	6,278	7,176	10,410	12,525	9,753
Bessemerized matte ..	1,880	452	1,470	103½
Nickel contents	2,082	1,653	2,570½	2,315½	1,918½
Copper contents	1,936	1,431	2,748	2,365½	1,868
Cobalt contents	8½	19	3¼
Value of nickel	\$ 590,902	454,702	612,724	404,861	357,000
Value of copper	232,135	115,200	195,750	160,913	130,660
Value of cobalt	3,713	9,400	1,500
Wages paid	339,821	252,516	311,719	209,960	247,151
Men employed	690	495	655	444	485

In the five years the total quantity of ore raised from the mines has been 432,965 tons, and the quantity smelted, 373,835 tons.

A Canadian Chamber of Mines.

A meeting was held in London, England, last month, with the object of establishing a Canadian Chamber of Mines. Amongst those present were the Hon. Forbes Vernon, Agent-General for British Columbia; Mr. J. Howard, Agent-General for Nova Scotia; Mr. William Thompson, C.E.; Mr. Byran Johnstone, Chairman of the British Columbia Development Association; Mr. W. A. Townsend, General Manager of the same Company; Mr. F. E. Har-

mon, Director of the Klondike Mining Transport and Trading Company; Mr. Robertson, Director of the Quesnelle Gold River Company; Colonel J. Harris, Chairman of the proposed Chartered Hudson's Bay and Pacific Railway Company; Mr. F. A. Gillam, of the British Columbia Agency, Limited, and others. Letters of approval was received from Mr. J. H. Lukech, General Manager of the British Columbia Exploration, Limited; Colonel Cradock Hartopp, Mr. John McDonald, Mr. Cecil Hartridge, Major Flood Page, and others.

The Hon. Secretary, Mr. Jerome Dyer, reported that the resolutions framed at the last meeting of the Committee of the Canadian Chamber of Mines had been carried out. A representative board was in process of formation, and steps were being taken to incorporate the Chamber under licence of the Board of Trade. The Canadian Government had been communicated with, as had also the Provincial Governments.

It was resolved that the Canadian Chamber should co-operate with the Australian Chamber of Mines in regard to the proposed Mining, Metallurgical and Machinery Exhibition which it is proposed to hold in London in 1899. Mr. Seton Karr, M.P., was, it was stated, now in Canada, and would see the Governments on the matter; and Mr. J. Lowes, M.P., and Sir Somers Vane were now in Australia representing the Australasian Chamber in interviewing the Australasian Governments regarding their support to the Exhibition.

What is Electricity.

The American Electrician condenses from the *London Engineering's* review of Prof. Trowbridge's new book, "What is Electricity?" as follows: The writer says that in spite of the all-round progress made during the last thirty years, we know no more about the essential nature of electricity than did Benjamin Franklin 150 years ago. The several explanations offered, based upon the ether, or either and matter associated, merely substitute one unknown for another. "After all, what is matter? What is the ether? How is matter associated with the ether? To such fundamental questions we can return no other answer than the now famous *ignoramus*. They make, or tend to make, us painfully conscious of the infinitude of our nescience." The writer of the review adds that Lord Kelvin must have been brooding over these provoking unknowns when he wrote to him in 1892. "Tell me what electricity is, and I'll tell you all the rest." This inability to detect electricity in its primordial form need, however, exert no distrustful, no depressing effects on the mind of the student of physical science. "Let him remember that a ray of light is an unexplained phenomenon; yet what wonderful truths are revealed to Fresnel, what knowledge has been wrested from it by means of the spectroscope, and what marvels is it not every day recording on photographic plates. If he feels himself morosely affected by the agnosticism, let him recall the astronomical phenomena which are accurately calculated years in advance without any knowledge whatever of the nature of gravitation; or let him think of that masterly bit of analysis

which led to the discovery of argon with at any knowledge on the part of Lord Rayleigh or Prof. Ramsay, of what chemical affinity is. If he is a practical man, let him reflect that the engineer lives amid stresses and strains, and though ignoring the intimate nature of the forces which he uses, builds up powerful engines and dynamos, and as successfully tunnels a Mount Cenis as he throws a bridge across the Hudson or the Firth of Forth."

Conditions of a Good Result from Amalgamation.

- (1) Very fine stamping if the gold is very fine.
- (2) A coating of gold amalgam on the copper plates. No amalgam should be removed until a hard layer of it has been formed on the plates.
- (3) The use of a proper quantity of water; too much will result in a coarse crushing, a less complete mechanical exposure of the fine gold, less contact of the gold and quicksilver, and a premature sweeping off of both. The addition of too much quicksilver, though causing the formation of more amalgam, will only lead to its being swept away by the current.
- (4) Proper temperature of the battery water. The water ought neither to be too cold nor too hot; 90° to 110° Fahr. is the best, if by artificial means it can be raised to it.
- (5) The addition of quicksilver in proper quantity. This condition should be closely studied in each mill. There is always a considerable loss of quicksilver. The quicksilver when introduced in the battery is finely divided by the stamps, and thus affords an opportunity for the amalgamation of the fine particles of gold. By the violent motion of the water in the battery, produced by the fall of the stamps, particles of gold amalgam, and quicksilver are carried with the pulp to the copper plates, to which they adhere.
- (6) Proper height of the charge in the mortar. This should not be allowed to rise higher than about three inches below the lower edge of the inner plates. If the quartz and pulp in the battery come nearer the plates, too much stuff, which is also too coarse, is thrown upon them, thus either preventing the accumulation of amalgam or displacing it after collection.
- (7) Regular feeding.
- (8) Care in keeping the plates clean.
- (9) Care in the mill against the introduction of grease or greasy substances, and against the use of exhaust steam for heating water required in any of the amalgamating processes. In lubricating the cam shaft, journals, cams, tippets; or any other portions round the batteries, care must be taken not to drop any lubricant into the mortar.
- (10) Rejection of hydrated oxidised iron ores, silicate of magnesia, and alumina ores; they cause a frothing of the water, and coat the gold with a slime which resists amalgamation.
- (11) Avoidance of mineral waters for battery amalgamation, especially if they contain sulphur in the shape of sulphuretted hydrogen, as a coating will be formed on the gold particles which prevents amalgamation.

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(REPRESENTATIVE LIST)

NAME.	LONDON OFFICE.	CAPITAL		Denom-ination	Price Oct. 12	Price Nov. 12	Rise x Fall -	Highest and Lowest	
		Authorized	Issued					Since Jan., '96.	
British Columbia Development Association	Broad St. Avenue.	£ 20,000	£ 19,900	£1	1/8 par.	1	- 1/8	1 1/4	par
British Columbia Development Co	3 Gracechurch St.	30,000	28,050	1	2 1/8	1 7/8	- 1/8	2 1/4	1 1/4
British Columbia Fin Trust	Blomfield House.	245,000	75,260	1	1/8 dis.	1/8 dis.	- 1/8	3/8 par	1/8 dis
Dundee		\$1,000,000		\$1	1/8	1/8		1/10 1/2	1/1 1/2
Canadian Exploration Syndicate	92 Bartholomew Close.	£ 2,000		£50					
Fairview	2 Gracechurch St.	100,000		1	1/8 par.	1/8 pm.	- 1/8	1 1/4 par	1 3/4 pm
Galena Mines	20 Threadneedle St.	550,000	525,000	1	1 1/8	1 1/8		1 1/4	1
Gold Explorers of Canada	Tower Cham., Finsbury Pk	100,000	82,000	1	1 1/8	1 1/8		1 1/4	1
Golden River Quesnelle	6 Gt. St. Helens	325,000	247,000	1	1 1/8	1 1/8	x 1/8	1 1/4	3/8
Hall Mines	1 Leadenhall St.	300,000	250,000	1	1 1/8	1 1/8	- 1/8	3 1/4	2 1/4
Invicta	25 Abchurch Lane	100,000	95,607	1	1/8	1/8		1 1/4	1 1/4
Klondyke and North-West Territories	Broad St. Avenue	60,000	120,000	10s.	14/6	14/	- 6d	15/6	9/
Duncan Mines	6 Gt. Winchester St.	150,000							
Lillooet and Fraser River	1 and 2 Gt. Winchester St.	300,000	250,000	1	1/8	1/8		1 1/4	3/8
London and British Columbia Goldfields	3 Lawrence Pountney Hill.	200,000	100,000	1	par	1/8 dis.	- 1/8	1 1/4 par	1/4 dis
Mikado	79 Gracechurch St.	45,000	36,207	1	3 1/8	3 1/8	- 1/8	3 1/8	2 1/2
Big Valley Creek	6 Gt. St. Helens	125,000	16,291	1		2 6			
Goldfields of British Columbia	16 Copthall Avenue	60,000	60,000	1	par	par			
New Goldfields of British Columbia	23 Leadenhall St.	250,000	50,000	1	nom	par		1 1/4	1 1/4
Pioneer Development	9 and 10 King St.	150,000	100,000	1	1/8 par.	1/8 pm.		1 1/4 par	1 1/4 par
New Fraser River	23 Leadenhall St.	75,000	75,000	1	1/8 par.	1/8 par.um.			
Yukon Goldfields	3 Lawrence Pountney Hill.	100,000			nom	nom			
Ontario	Blomfield House.	160,000	160,000	5s.	2 4 1/2	2 1/2	1 1/2 d	3	1/4
Ontario Government Gold Concessions	Finsbury House Ec.	80,000	30,000	1	nom	par			
Recordia Syndicate	16a Tokenhouse Yard	5,000	5,000	1	4 1/8	4 1/8	- 1/8	5	1 1/2
Vancouver Syndicate	20 Threadneedle St.	25,000	25,000	1	1 par.	1/8 par.	- 1/8	7 1/2	par
British Columbia and Dominion Explorat'n	10 and 12 Walbrook	150,000		1	nom				
British Columbia Corporation	70 Basinghall St.	300,000	117,190	1	nom				
Dominion Mining Development and Agency	6 Gt. Winchester St.	100,000		1		5/ par.			
Waverley Mine	16 Copthall Avenue	100,000		1	par	3/4-1		1 1/4	1
Canada Venture Syndicate	31 Lombard St	25,000		1					
Canadian Pacific Exploration	88 Cannon St.	500,000	375,000	1	par	par			
Fraser River Mines	9 Gracechurch St.	10,000		5s.	nom				
New Vancouver Coal Mining and Land	12 Old Jewry Chrs.	215,000		1	6/3	6/3			
Regina	13 and 14 Walbrook	170,000	155,000	1		4/			
Seine River Gold Mines	Broad St. Avenue	100,000	80,000	1					
Cariboo Goldfields	6 and 8 Eastcheap	100,000	70,000	1	par		(Pref.)	1 1/8	3/8
Alberta Railway & Coal Company	37 Old Jewry	1,125,000		£5 10s					
General Mining Ass.	9 New Broad St.	151,079		8 10s		7 1/2			
Bell's Asbestos Co.	Southwark St.	200,000		1		7/8			
Asbestos and Asbestic	13 St. Helens Place	500,000		10		9 1/2			
Anglo-Canadian Asbestos	15 Poultry Chambers	20,000		1					

General Mining—Accounts to December 31 submitted in April, but an interim meeting is held in November. Dividend for 1891, 5 per cent; for 1892, 6 1/2; and for 1893, 9 1/2. In 1894 a return of £2 10s per share capital was made, reducing the shares as above, and for 1894 the dividend was 14s per share; for 1895, 12s; and for 1896, 15s. Reserve fund, £31,400.

New Vancouver Coal—Accounts to December 31 submitted in May. For the two half-years to June, 1895, 5 per cent per annum was paid; to December, 1895, 4; to June and December, 1896, 6; to June, 1897, 5; to December, 1897, 3; to June and December, 1898, nil; for 1899, 3 per cent; for 1899, 4; for 1898, nil; and for 1895, 3. Reserve fund, £20,000. Debentures, £65,000.

Anglo-Canadian Asbestos—Accounts to December 31 submitted in April. Dividends for 1890, 1891, and 1892, 2 1/2 per cent per annum; 1893, 1894 and 1895, nil. Debentures, £4,100.

Asbestos and Asbestic—Registered February 8, 1897. Authorized capital, £500,000, of which £166,600 was issued fully paid to the vendors in payment of the purchase, and the balance was offered for subscription.

Bell's Asbestos—The debentures are redeemable by 1913, by annual drawings in December, at 1s 5 from a sinking fund which the directors may increase. There is also a mortgage of £25,000. Accounts to December 31, submitted in March. Dividend for 1889, 2 1/2 per cent; 1895, 15; 1891, 10; 1892, 7 1/2; 1893, 5; 1894, 11; 1895, 3; 1896, 5. Reserve, £65,000.

Big Valley—Registered April 24, 1895.

"B.C." Development—Registered May 11, 1896. Authorized capital £30,000, of which £28,057 was first offered.

British Columbia Development—Registered December 14, 1895. There are also founders' shares of £1 fully paid which take 50 per cent. of the profits after payment of non-cumulative dividends of 10 per cent. on the preference.

British Columbian Exploitation—Registered July 29, 1897. Authorized capital, £200,000, in shares of £1.

British Columbia Financial—Registered February 10, 1897. Founders' shares take one-half the profits in excess of 10 per cent. on ordinary.

British Columbia and New Find—Registered August 3, 1897. Authorized capital, £500,000, in shares of £1. There are also £33,000 deferred shares, which are entitled to participate in profits until 10 per cent. has been paid on the ordinary shares.

Canadian Pacific Exploration—Registered February 2nd, 1897, to carry on a mining and financial business.

Cariboo—Registered November 22, 1894. The preference shares rank first for 10 per cent. dividends, an equally with the ordinary in profits in excess of that rate on both classes. Debentures, £9,000.

Countess—Registered June 16, 1897. Authorized capital, £50,000.

Covinth—Registered April 2, 1897. Authorized capital, £100,000. Development now in progress.

Dominion—Registered August 23, 1895. Accounts to August 31 submitted in December.

Fairview—Registered April 15, 1897. Authorized capital, £100,000.

Galena—Registered December 21, 1896.

Gold Explorers—Registered October 26, 1896. Authorized capital, £100,000.

Gold Fields—Registered March 5, 1897. Authorized capital, £600,000.

Golden River—Registered July 1, 1895. Preference shares rank first for 10 per cent., and equal with the ordinary on surplus profits.

Hall—Accounts to September 30 submitted in December. Out of the profits of 1895-7 the preference dividends were paid to date.

Invicta—Accounts to October 31 submitted in December.

Klondyke Gold Reef—Authorized capital £100,000. Founders' shares take half the surplus profits in excess of 10 per cent. on the ordinary.

Klondyke, Yukon and Stewart—Registered July 31, 1897. Authorized capital, £700,000. Founders' shares take half the surplus profits in excess of 10 per cent. on the ordinary.

Klondyke-Yukon Exploring—Registered July 30, 1897. Authorized capital £25,000, in shares of £1; 23,000 ordinary and 2,000 founders, the latter taking half surplus profits after 20 per cent. has been paid on the ordinary.

Klondyke and Columbian—Registered August 5, 1897. Authorized capital £100,000. Deferred shares are not entitled to participate in profits until 20 per cent. has been paid on the ordinary shares.

Klondyke Mining—Registered July 28, 1897. Authorized capital, £150,000.

Kootenay—Registered March 17, 1896.

Lillooet—Accounts to September 30 submitted in December.

London and British Columbia—Registered May 16, 1896. Deferred shares take one-half the profits after providing for 20 per cent. on ordinary.

Africa—Registered February 11, 1897. Authorized capital, £80,000.

New Fraser River—Registered March 6, 1897. Authorized capital, £75,000.

New Golden Fruits—Registered August 18, 1897. Authorized capital, £90,000.

New Goldfields of British Columbia—Registered November 20, 1896. The authorized capital is £300,000, of which £50,000 was first offered.

Ontario Government Gold—Registered May 29, 1897. Authorized capital £150,000.

Pioneer Development—Registered June 17, 1896. Authorized capital, £150,000.

Regina—Registered February 4, 1896. Debentures, £16,000.

Seine River—Registered March 20, 1896.

Smuggler—Formed in September, 1896, under British Columbia laws. Of the capital of \$1,000,000, \$350,000 is in the company's hands.

Tilt Cove—In March, 1897, the properties were leased for 99 years to the Cape Copper Company at a rent of £4,400, profits after certain deductions to be divided equally between the Cape Copper and the Tilt Cove companies. On August 31, 1896, the total amount owing to the Cape Copper Company was £73,84. No dividends.

Vancouver—Registered April 25, 1897.

Waverley—Registered April 2, 1897. Authorized capital, £100,000.

Yukon—Registered July 27, 1897. Authorized capital, £97,500 ordinary shares, and £2,500 deferred shares; the latter take one-half the surplus profits after paying 20 per cent. per annum on the ordinary.

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(12) Care that the amalgam on the copper plates is not allowed to get too hard, as it may fail to catch the gold. If, therefore, the amalgam should get too hard, it will be well to sprinkle through chamois cloth some globules of quicksilver over the amalgam. If, however, it becomes too soft again, there is danger of "flouring" and losing it, with some of the gold.

(13) A dilute solution of cyanide of potassium should be always kept on hand, and when yellow spots appear on the plate some of the solution should be poured over it. If this does not remove a spot, hold a lump of the cyanide over it, or rub it, which will have the desired effect.

(14) If the ores contain soluble sulphates, arising from the decomposition of iron or copper pyrites, the addition of lime will prove beneficial while passing through the battery.

(15) When treating gold ores containing manganese it is necessary to clean the plates of its adhering amalgam at least once a week and give them a fresh coating of quicksilver.

(16) It will be found that in many cases amalgamation can be promoted by discharging from the battery on to concentrators direct, which will collect all the heavy mineral particles which interfere in the ordinary amalgamating process, and submitting the concentrates to separate treatment. The overflow or tailings which pass the concentrators, if carried over copper

plates, will give up the gold easily now, in case any fine particles have escaped the concentrating process, as the ore has undergone a cleaning process in the separation of the sulphuretted ores, which naturally interferes with copper-plate amalgamation. If the concentrations are submitted to treatment in grinding pans, the tailings from the settler ought to be run over slime tables to collect any escaping mineral particles of value.

(17) When treating heavy pyritic ores, it will be found advantageous to have an iron pipe with little holes, discharging on the outside copper plates a fine, gentle shower of water, so as to assist the carrying off of the heavy sulphurets, which would cover the plates over and prevent the free gold coming in with them.

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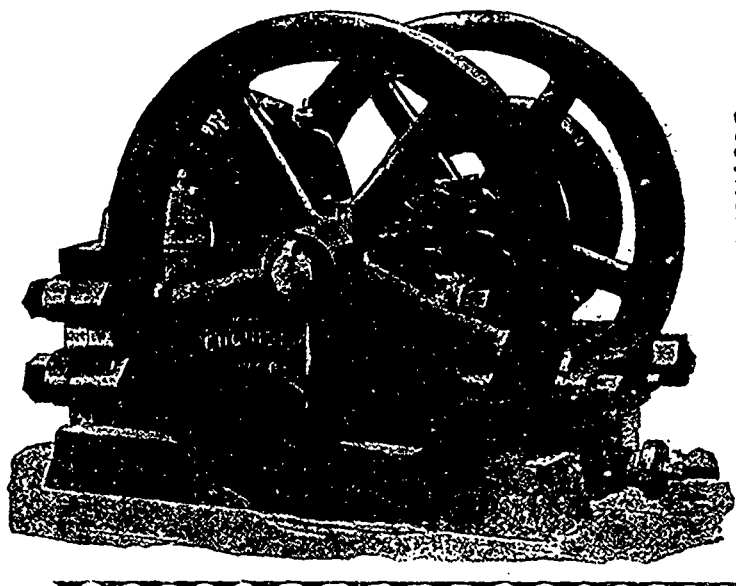
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CANADIAN RAND DRILL CO., SHERBROOKE, QUE.—Compressed air plant for General Mining Assn., Sydney Mines Colliery, Cape Breton; Compressed air plant Purves Gold Mine, Antigonish, N.S.; Compressor and complete equipment for the Mikado Gold Mining Company, near Rat Portage, Ont.; Compressor plant for Bruce Mines and Thessalon, Ont.

Trail Creek District.

CLIFF.—The prospects of this mine of late are said to be improving. Small shipments of ore continue. Its shipments to date amount to 842 tons.

CROWN POINT.—There have been no new developments in connection with the recent find in this mine. The work on the winze, which is to be sunk on the ledge from the tunnel level, is in progress.

GREAT WESTERN.—The main shaft is now down about 90 ft.

LILY MAY.—This company, since its compressor was installed, has found a good body of ore, carrying gold and silver values to the amount of \$30.20, so the management reports.

MONTÉ CRISTO.—This company is pushing development to the fullest extent. The ore in the winze at the breast of the main tunnel is said to be improving.

THE INTERNAL CORROSION OF WIRE ROPES.—In a recent paper before the Chesterfield and Midland Institute of Engineers, Mr. T. G. Lees called attention to the importance of the subject, since upon the quality and endurance of the ropes used in winding the lives of all persons employed underground directly depended. The fact that internal corrosion of wire ropes does take place he affirmed as a matter of common knowledge. He described various stages in the development of the process of corrosion, and attributed as the chief cause the percolation of water through the strands of the rope into its interior. Three points where corrosion was most commonly found were the cap-end of the rope, the place where the rope rests on the pulleys, and the part underlapping the drum. Where, as in many cases, water was acidulated or was even salty to a slight extent, corrosion was more likely. His remedy was that several feet should be cut off the cap-end of the rope, and the rope recapped at intervals of three or four months. By this means, the parts affected by the strain were changed. Further, the ropes should be frequently oiled with the best lubricant obtainable. Experience seemed to show that the wire rope with hemp core was a danger, as it had a tendency to absorb moisture and so promote corrosion. One remedy for corrosion was that the outer strands of the wire should be galvanized, or that a galvanized core should be used, and so far as those ropes had been tried in use they had given satisfaction. Their life was much longer than that of other kinds of rope, and the breaking strain was very little less.

METHODS OF MINING ON THE RAND.—The number of main shafts on the various properties ranges from one to eight, the Simmer and Jack Proprietary mines having the latter number. Most of the deep level mines have two each, about 22 feet by 6 feet in the clear. With the exception of the circular shafts at the New Primrose, United and Langlaagte Royal mines, they are of rectangular section, and of sizes varying from about 11 feet by 5 feet to 26 by 6 feet, with from one to four hoisting compartments; the long axis of the shaft is generally lying parallel with the strike of the reef, the shafts at the New Primrose being among the few exceptions to this rule. On the deep level mines the shafts are vertical down to their intersection of the reefs, and from there proceed on the wide limits of 350 feet and 3,300 feet. Some have independent winding arrangements for the two sections, but others, like the Jumpers Deep, have a single system. The majority of the shafts of the outcrop companies are inclined throughout, but some few intersect the reefs vertically, and are then continued as inclines like the deep level shafts.

With shafts having two or more winding compartments, it is customary to reserve one or more for development and general work, these, as a rule, being provided with smaller skips and an independent engine. In the inclined shafts, automatic tipping skips of capacities ranging up to three tons are in general use, and their satisfactory and expeditious working is leading to their adoption in the vertical shafts.

Rand winding engines include both the geared and direct acting pattern, but the increasing depth of the workings and the higher speeds now required are creating a growing demand for the latter type.

One of the striking features of this gold field is its great head gears, which are now invariably constructed of timber, and are of heights rising from 40 feet to 88 feet, the Knight's Central mine possessing a fine gear of the latter size. In the early days a few steel head gears were erected, and some are still in use, the George Goch having one of 50 feet, the Jumpers one of 34 feet, and the Langlaagte Estate one of 35 feet. As a constructive material for the gears, steel would be more used if it were not for its greater cost, for with wood there is the objection that the great length of leg called for necessitates each being built of several timbers, and trouble occasionally arises from chafing at the joints. Many of the head gears are provided with grizzlies and several ore bins, and it is common practice for them to carry the sorting and breaking plant which, when not so installed, is usually to be found in a separate sorting and crushing station, there being very few instances of breakers being located in the mill itself.



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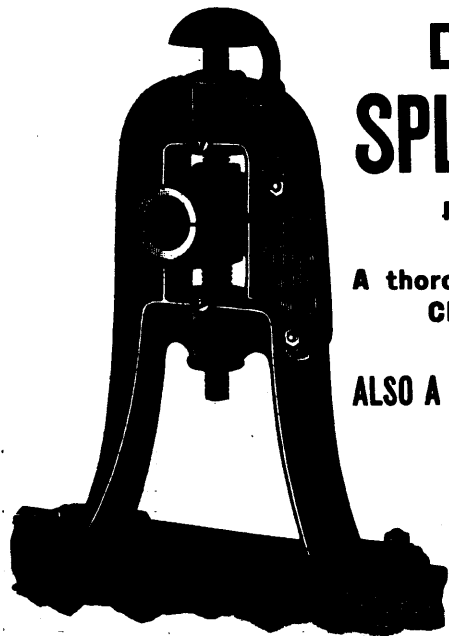
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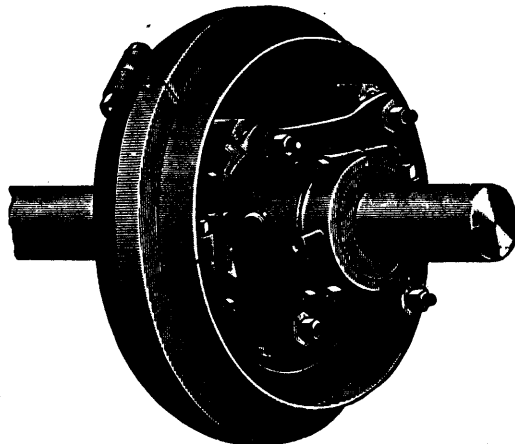
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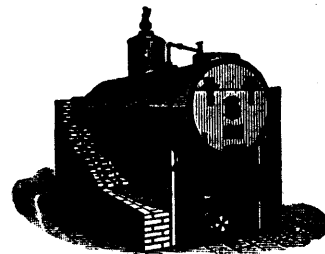
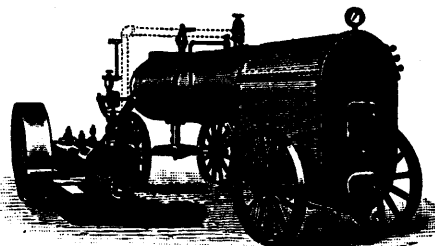
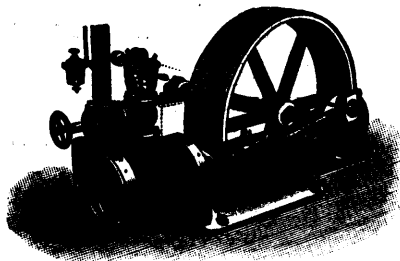
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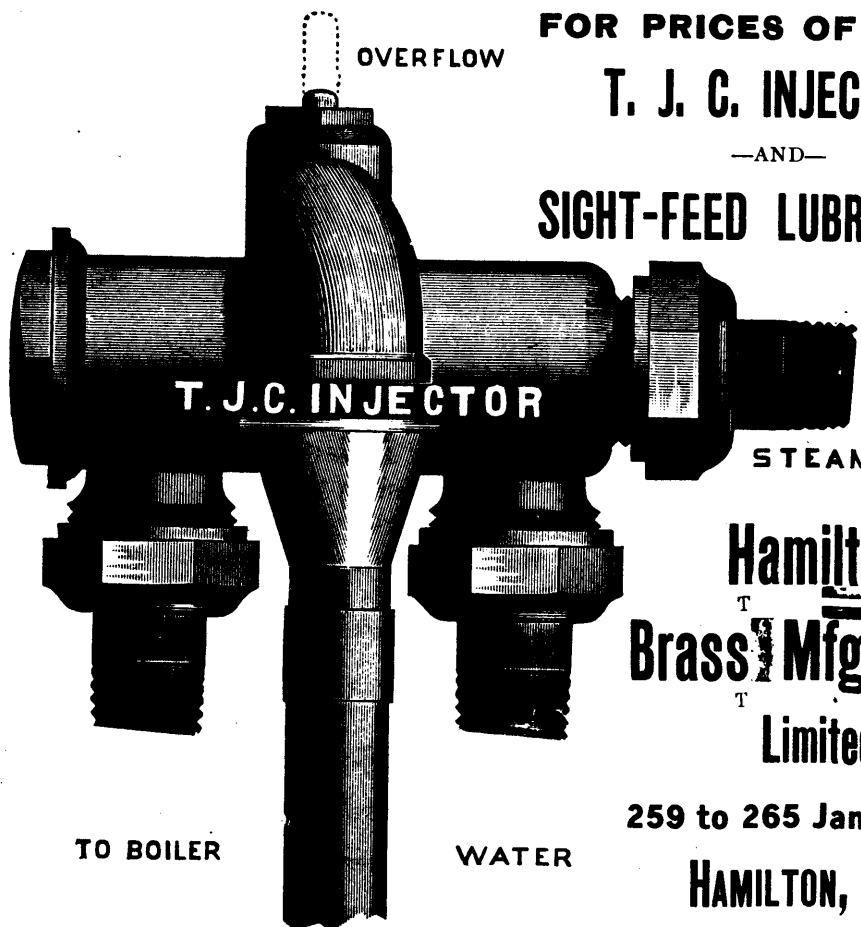


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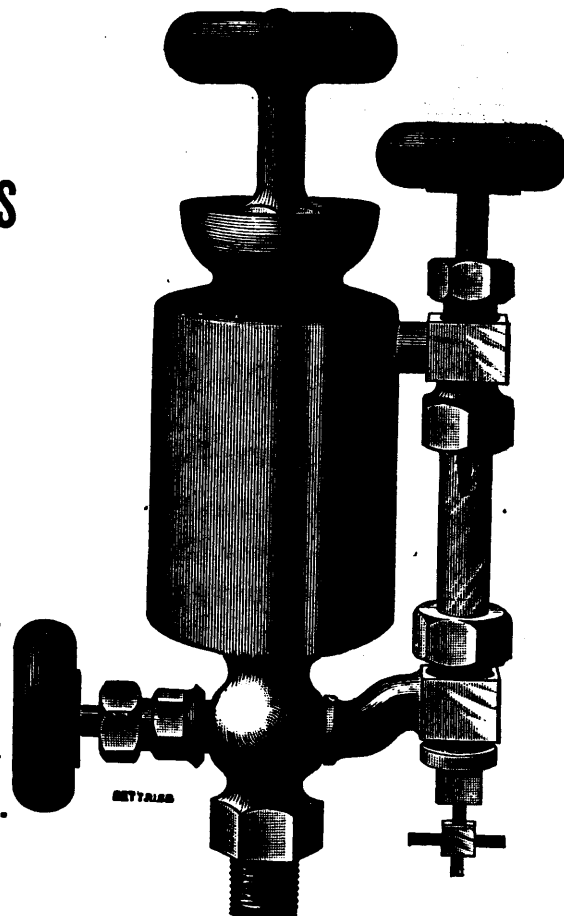
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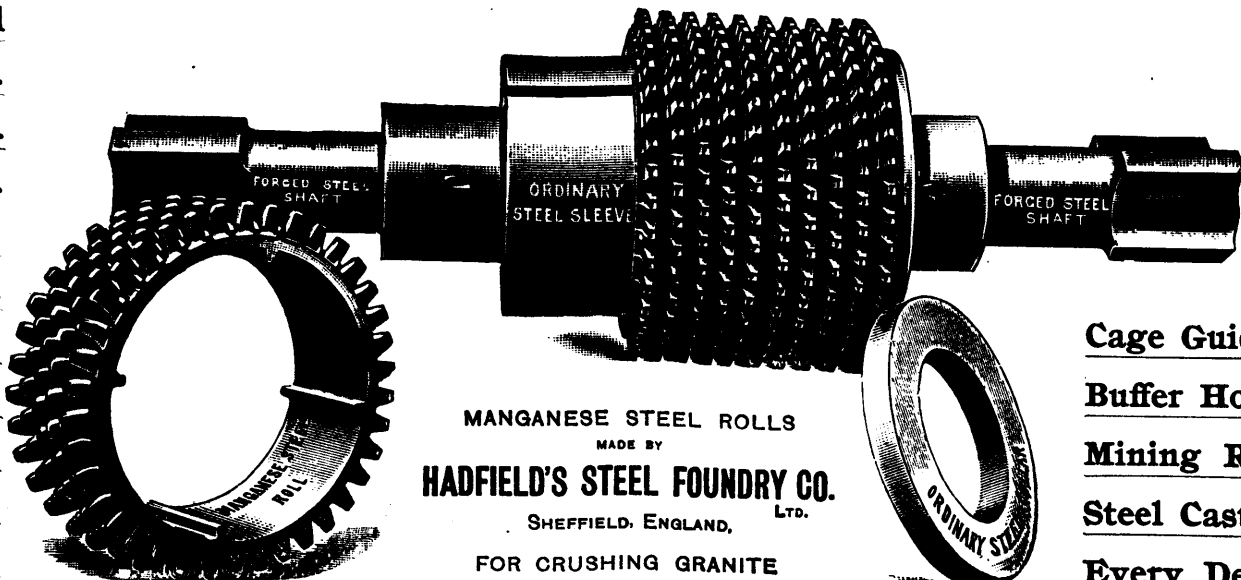


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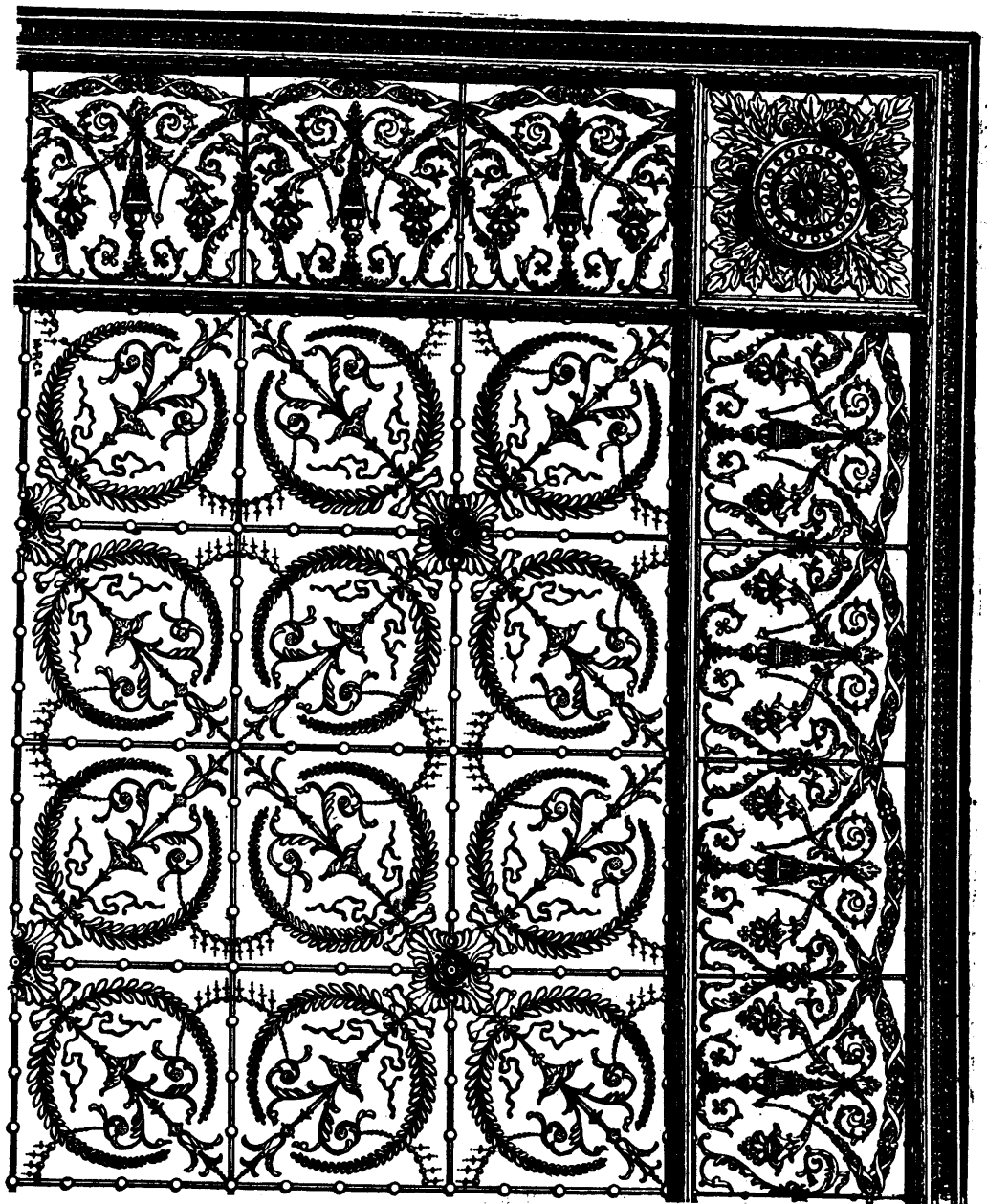
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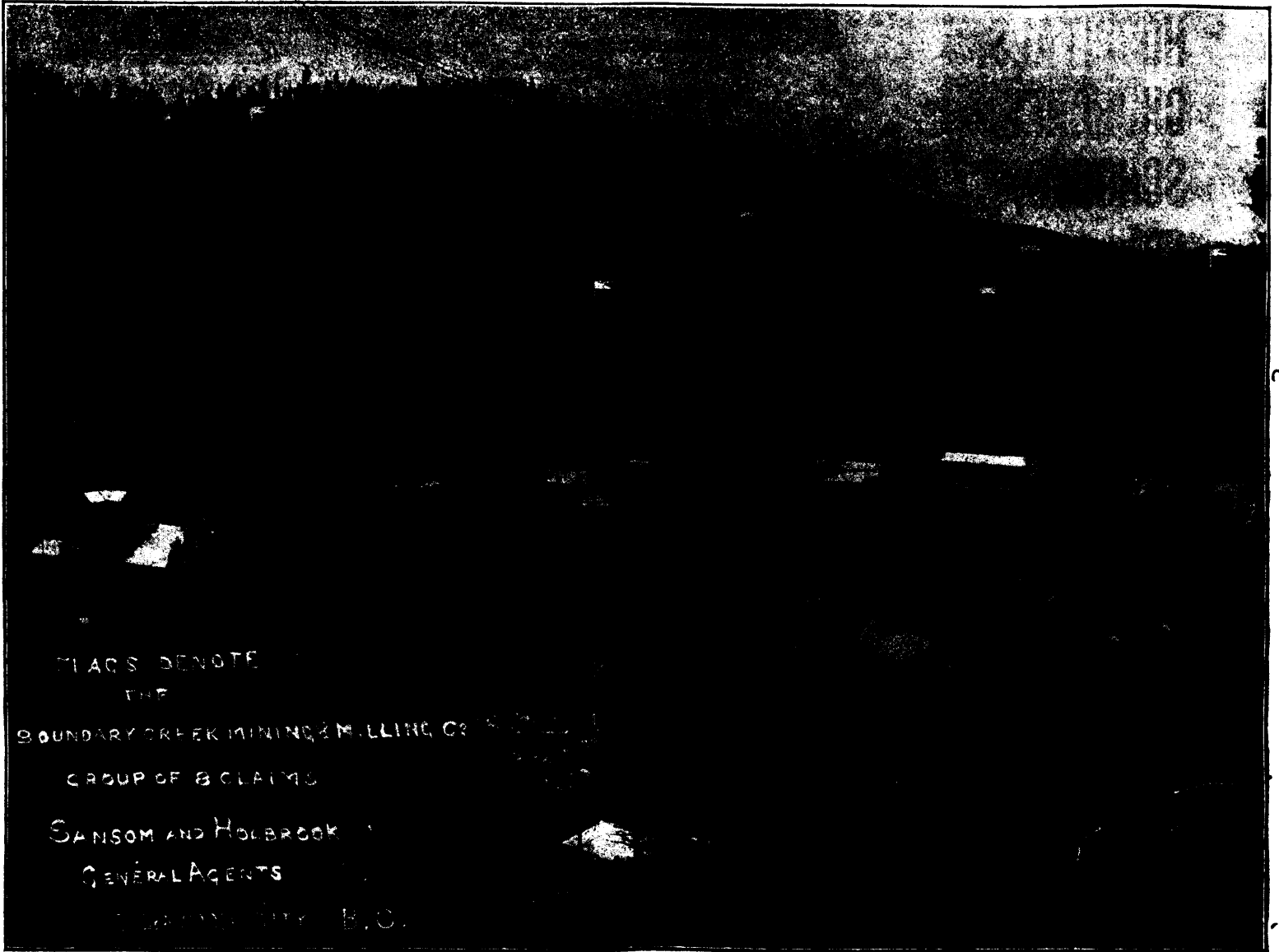
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This Company owns and operates a group of the highest grade in Gold, Silver and Copper properties in Boundry Creek.

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From the above photograph it will be readily seen that, lying as they do on a steep sloping hill, the properties offer unusually good facilities for drainage and rapid and economical development, by main working tunnels driven in from the base of the hill.

The veins lie in the Granite Area—which occupies the upper part of Boundary Creek basin—along the line of contact with the more basic eruptures, and are among the oldest locations in the camp.

A small shipment of 8,653 lbs. was made to the Everett smelter in 1894, yielding per ton, Gold, \$103.15; Silver, 74-7-10 ozs.; Lead, two per cent., and a considerable amount of shipping ore is at present on the dumps of the different claims.

Careful investigation is earnestly invited by the Company, as their properties are being developed with a view to making mines and not to booming stock.

Attention is drawn to the large amount of stock (700,000 shares) put into the Treasury, and to the fact that the properties are all fully paid for.

150,000 Treasury shares fully paid up and non-assessable, have been put on the market at 10 cents, and most of the stock so far sold has been taken up locally. A large proportion of the miners now working are also taking stock in payment. For further particulars address

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THE FEDERATED CANADIAN MINING INSTITUTE

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On Wednesday, Thursday and Friday, 2nd, 3rd, and 4th February, 1898.

SYLLABUS OF PAPERS.

The following among others, will contribute papers for discussion:—

- | | |
|--|---|
| MR. HENRY S. POOLE, M.A., A.R.S.M., General Manager, Acadia Coal Co., Stellarton, N.S. | MR. ROBERT HEDLEY, Metallurgist, Hall Mines Ltd., Nelson, B.C. |
| MR. CHARLES FERGIE, M.E., General Manager, Intercolonial Coal Co., Westville, N.S. | MR. F. T. SNYDER, Ottawa Gold Milling and Mining Co., Keewatin. |
| MR. F. H. MASON, F.C.S., Halifax. | MR. H. H. PRINGLE, M. Inst. of C.E., Regina (Canada) Gold Mine, Rat Portage, Ont. |
| MR. C. A. MEISSMER, General Manager, Londonderry Iron Co., Londonderry, N.S. | MR. J. BURLEY-SMITH, Burley Gold Mining Co., Rat Portage, Ont. |
| MR. JOHN E. HARDMAN, S.B., M.E., Montreal. | MR. R. H. JONES, F.S.A., Mineralogist, London, Eng. |
| MR. GEORGE E. DRUMMOND, Canada Iron Furnace Co., Montreal. | MR. JOHN BIRKINBINE, M.E., Philadelphia, Pa. |
| MR. E. A. SJOSTEDT, Metallurgist, Montreal. | MR. SPENCER MILLAR, Am. Soc. C.E., New York. |
| MR. MILTON HERSEY, Ba.Sc., Montreal. | PROF. A. B. WILMOTT, McMaster University, Toronto. |
| MR. W. A. CARLYLE, M.E., Provincial Metallurgist, to the Government of British Columbia, Vancouver, B.C. | DR. W. L. GOODWIN, School of Mining, Kingston. |
| MR. JOHN B. HOBSON, M.E., General Manager, Cariboo Hydraulic Gold Mining Co., Quesnelle Forks, B.C. | MR. C. F. ANDREWS, Isaac's Harbor, N.S. |
| MR. A. H. HOLDICH, A.R.S.M., Nelson, B.C. | MR. JOHN RUTHERFORD, M.E., Ex-Inspector of Mines for Nova Scotia, Windsor. |
| MR. HOWARD WEST, A.R.S.M., New Denver, B.C. | DR. E. GILPIN, Inspector of Mines for Nova Scotia, Halifax. |
| MR. J. C. GWILLIM, Ba.Sc., M.E., Slocan City, B.C. | MR. C. C. HANSEN, M.E., Rat Portage, Ont. |
| | MR. LIONEL H. SHIRLEY, C. and M.E., Montreal, Que. |
| | MR. J. T. DONALD, M.A., Montreal. |
| | MR. FRANK C. LORING, M.E., Rossland, B.C. |

STUDENTS' SESSION.

A session for the reading and discussion of Papers presented by students of Mining Engineering, in competition for the prizes offered annually by the General Mining Association of the Province of Quebec, will be held on Tuesday Evening, 1st February. Intending competitors are requested to communicate the subject of their papers to the Secretary before the 31st of December.

ANNUAL BANQUET.

The Second Annual Dinner of the members of the Federated Institute will be held in the Windsor Hotel, Montreal, on Thursday Evening, 3rd February. His Excellency the Governor-General and other notable persons are expected to be present.

REDUCED RATES ON RAILWAYS.

By arrangement with the various companies, specially low rates will be given to members of the Federated Institute and their friends attending these meetings respecting which fuller particulars will be announced later. For further particulars application should be made to

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	Customary Measures.	1895.		1896.	
		Quantity.	Value.	Quantity.	Value.
Gold, Placer	Oz.	24,084	\$ 481,683	27,201	\$ 544,026
" Quartz	Oz.	39,264	785,271	62,259	1,244,180
Silver	Oz.	1,496,522	977,229	3,135,343	2,100,689
Copper	Lbs.	952,840	47,642	3,818,556	190,926
Lead	Lbs.	16,475,464	532,255	24,199,977	721,384
Coal	Tons	939,654	2,818,962	846,235	2,327,145
Coke	Tons	452	2,260	615	3,075
Other materials			10,000		15,000
			\$5,655,302		\$7,146,425

Production for 1890, \$2,608,608 ; for 1896, \$7,146,425.

GOLD.

Gold-bearing lodes are now being prospected in many parts of the province, and at Rossland magnificent ore-chutes of very profitable gold-copper ore are being mined and smelted, the Le Roi having paid to date, \$575,000 in dividends, with a large and increasing amount of ore in sight as the workings attain greater depth, while systematic development on other properties is meeting with excellent results, mining having just fairly begun in this camp. Little doubt can now be entertained that Rossland will become a heavy producer of gold, and that excellent properties now only await sufficient and abundant capital to become paying mines, to further aid in which the facilities for cheaper transportation and smelting are being now supplied. At NELSON and at FAIRVIEW, CAMP MCKINLEY, GREENWOOD, CENTRAL and other camps in the southern part of Yale, important work is being done on the quartz ledges there, several new mills being under erection.

Exploratory work is also in progress in EAST KOOTENAY and in LILLOOET, ALBERNI, and on the Gulf islands and along the coast line of the mainland, as well as in other parts of the province.

In CARIBOO, several large undertakings, involving a large amount of capital, are at work exploring both modern and ancient river channels, the Cariboo Hydraulic Mining Co., on the Quesnelle river, proving, on development, to have in a channel of the latter kind, a great gravel deposit of exceptional richness, while other parts of this district now offer every inducement to capital.

Into CASSIAR, OMENICA, and the great area to the north, as well as Cariboo, there now promises to be a great exodus of explorers, incited by rich diggings now being mined in the YUKON, as on the KLONDYKE, to the north, and river and creeks long reported to be gold-bearing will now be made accessible, and well tested.

SILVER-LEAD.

Despite the drop in the price of silver, the SLOCAN mines are being much more extensively worked, while the shipments of high grade ore are constantly increasing, the higher price of lead more than compensating for the lower silver values. The production for 1897 will much exceed that of 1896, as such mines as the "Slocan Star," "Payne," "Ruth," "Whitewater" and other mines increase their output.

At NELSON, the "Silver King" or Hall mines is shipping constantly a large amount of silver-copper ore, and the LARDEAU, TROUT TAKE, ILLECILLAET districts, on further exploration, promise to become rich districts. In EAST KOOTENAY large bodies of silver-lead ore will be mined on completion of the railroads now under construction.

COPPER.

Copper is being produced to a limited extent at ROSSLAND and NELSON, but the large deposits of at present low-grade ore in the BOUNDARY CREEK district will be fully tested when the railroad, now almost assured, is constructed. Prospecting is being done at KAMLOOPS, along the west coast of

the mainland and of Vancouver island, as well as at many other points, and TEXADA is producing high grade bornite ore.

COAL AND COKE.

The large collieries on VANCOUVER ISLAND are producing about a million tons of coal annually, and at COMOX an excellent coke is now being produced, much of which is shipped to the inland smelters. The great deposits of coking coal in East Kootenay, at the CROW'S NEST PASS, are now being opened, as the C.P.R. is now being built to the Columbia river to supply the great mining regions with cheap coal and coke.

SMELTERS AND RAILROADS.

The smelting industry is now beginning to assume large proportions, as preparations are being made to treat the ores of this province within her own borders, a most important factor in the increasing prosperity of this country, entailing as it does, and will, the employment of much capital and many men. The extension of the railroad systems to different parts is now in progress, and the next few years will see many parts in which the prospects for good mining are excellent, made easy of access, while ores can be shipped with facility to the smelting centres, where the assembling of the various interfusing ores will make possible the treatment of all British Columbia ores at home.

CAPITAL.

Capital can now find here excellent and many opportunities for investment, if proper business care and the experience of qualified men are utilized, as the values placed on mines and undeveloped properties have reached a reasonable basis.

MINERAL LANDS.

Mineral lands are open to location to any person over eighteen years of age, who has obtained a free miner's certificate, and perfect titles to lode claims can be easily secured after \$500 worth of work has been done per claim. A great extent of territory has yet to be prospected.

YUKON GOLD FIELDS.

As the KLONDYKE and other gold fields in the Yukon in British territory is reached mostly via British Columbia, all SUPPLIES and OUT-FITS obtained at VICTORIA, VANCOUVER, ASHCROFT, KAMLOOPS, etc., can be taken in FREE OF DUTY, which otherwise WILL HAVE TO BE PAID if not purchased in CANADA.

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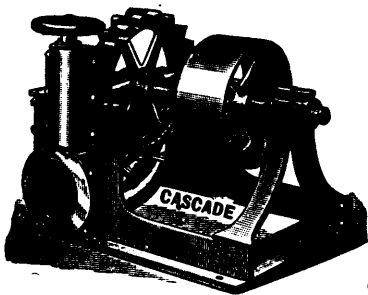
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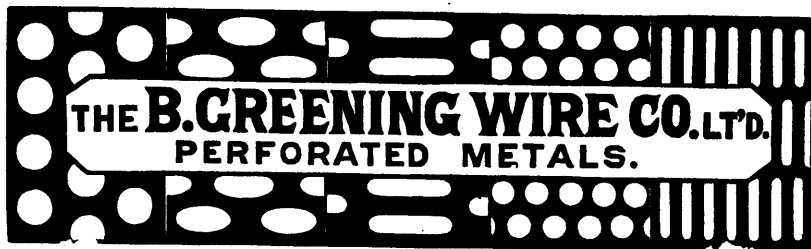


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WIRE ROPE

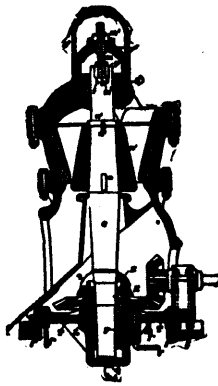
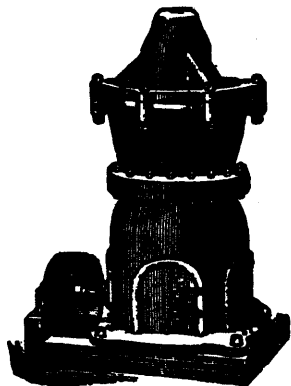
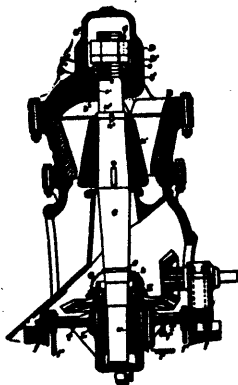
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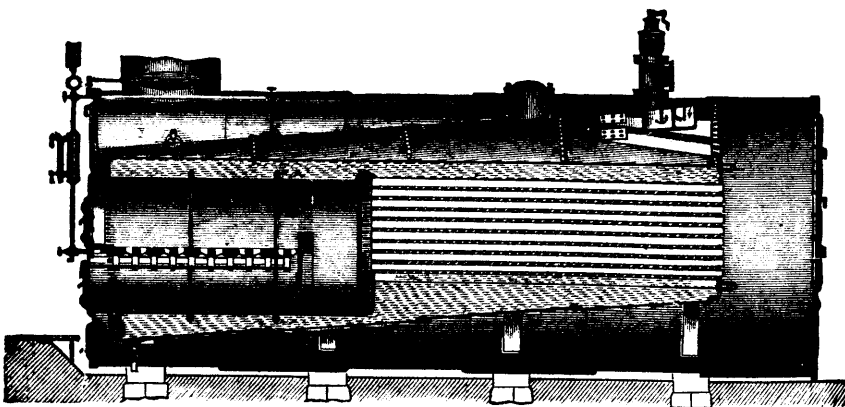
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