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H. MORTIMER LAMB, Managing Editor.

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THE MONTH.

We have received from the local office of the Tyee Copper Company, Ltd., a communication stating that a dividend of two shillings per share, payable on the 15th December has been declared, thus bringing the total dividends paid since smelting operations were commenced in January, 1903, to four shillings per share, or \$180,000. Besides the distribution of this sum of money, a large reserve fund has accumulated, which has been invested in government stocks, while also extensive improvements, the cost of which have been paid out of profits, have been made in the plant and buildings at both mine and smelter. It would be a very excellent thing for the province if there were a few more mines capable of making so good a record.

In the appeal in the now celebrated case of Tange vs. Morgan *et al.*, which was heard by the Full Court sitting in Vancouver last month, the decision of Mr. Justice Martin was upheld. There is, therefore, no longer any question in point of legality as to the right of any "smart" or unscrupulously inclined person to stake a suppositious placer claim on property previously located for quartz. There is here a magnificent field for the blackmailer and hanger-on of mining

camp, and as the Provincial Government has signified that it has no intention of remedying such an obvious and dangerous defect in the mining law, doubtless full advantage will be taken of so promising an opportunity.

It is gratifying to note the return of the St. Eugene to its former position among the dividend-paying mines of the province, a quarterly distribution of two per cent having been declared at the recent annual meeting of the company in Toronto. The net earnings to September 30th, allowing for an indebtedness of \$26,000, are reported to have been \$131,000, which as operations were not resumed until late in the year, and summer working was seriously restricted by reason of unusual drought and consequent shortage of water for milling requirements, may be regarded as an exceptionally good showing. It is now reasonably certain that, as a result of generally improved silver-lead mining conditions, the St. Eugene will be worked steadily henceforward.

Of the great undertakings in the Boundary district none possess a more promising future than the B. C. Copper Company, which is not only, in contradistinction to other enterprises, capitalized at a reasonable figure, but also enjoys with the Granby the advantage of excellent local management. According to a recent press despatch from New York Mr. Underwood, the President of the company, is stated to have announced that earnings equal to 20 per cent on capital are being made, which if true, is a most creditable showing and far beyond local anticipations. It is also reported that arrangements are under way for largely increasing the capacity of the smelter plant by which it is expected to further reduce costs and increase profits correspondingly.

The following editorial paragraph which appeared in a recent issue of our St. Louis contemporary, the *Lead and Zinc News*, is locally interesting in view of the preparations that are being made to install special machinery for the reduction of zinc ores in the Slo-can "The advent of a custom magnetic separating plant in the Wisconsin field has raised the price of low grade ores in that district from 25 to 50 per cent.

Those plants which have been operating magnetic separating plants of their own are securing prices generally satisfactory these days and, taken as a whole, the closing months of the year see the Wisconsin lead and zinc interests in more favorable condition than they have been in for many years. A number of new concentrating plants are being erected and the production this year has been the heaviest in the history of that district."

During the past month a more than usually large number of "deals" in mining claims are reported to have been made. A significant feature of these transactions is the circumstance that in nearly every instance, while the consideration has been large, no actual cash has been paid, the properties having been acquired on "working-bond" terms. It is an ill wind that blows no one good, and the depression under which the mining industry of the province has suffered for the past few years has at least had the salutary effect of knocking reason into the heads of prospectors and claim-owners, who are now much more ready to treat with capital in a businesslike spirit. The result will be—as has already been shown—that a far greater proportion of claims will be taken over and developed, and thus the chances of a considerable addition being made to our number of productive mines are so much the greater.

In a recent issue the *Nelson Daily Tribune* referring to the higher price of lead on the London market, points out that should the prices go to £15 10s., under the conditions of the Act the Federal Government will discontinue the payment of bounty on lead to Canadian producers, and adds, "Had a duty been imposed on lead and lead products, the lead producer would have received whatever benefit accrued from the duty, whether the price were high or low." While we believe this view is shared by many of the Kootenay mine operators, it can hardly be asserted that the bounty has failed to effect its purpose to a very considerable degree. It is not, however, improbable that eventually a tariff adjustment will be made to further improve the conditions of lead production and manufacture in the Dominion, with a view to aiding in the establishment on a substantial footing, of the industry in the country, and it is not unlikely that the steps recently taken for the inauguration of lead corroding and manufacture in Canada were made in anticipation of tariff changes.

An effort may again be made shortly to employ Mongolian labour in the Atlin hydraulic mines. Two years or so ago a number of Japanese were taken in to the district for this purpose, but in consequence of the determined opposition of the local miners' unions the mine owners decided to abandon their intention in the matter. Since, however, conditions have considerably changed, there being far fewer white miners in the district than formerly, while it has been clearly shown that it is not possible to profitably operate many of the

Atlin hydraulic properties without largely reducing the costs of labour. Under these circumstances it is probable that there will be less opposition to the contemplated employment of mongolian labour, particularly as it is proposed to increase the wages of white miners now in the district who will be employed as foremen or overseers. In other cases the labour problem is being solved in a different manner by the adoption of a method of placer mining by means of dredging, a practice which, as is well known, has given excellent results in California. This new departure in Atlin is ably described by Mr. Ebbs-Canavan in this issue.

At the annual meeting of the Hall Mining & Smelting Company held in London last month the chairman, Lord Ernest Hamilton, delivered a very sensible speech summarizing the situation, which, as he implied, is now more hopeful than it has been for some years past. This improvement we attribute almost entirely to the, we almost might say heroic, efforts put forward by the Company's local representatives during the past year or more which has resulted not only in the effecting of economies but also in increasing the value of the company's assets. It is gratifying to find that these services are appreciated at their real worth by the directors (who relatively speaking have more or less of an easy time of it), and as recognition and acknowledgment of this sort is somewhat out of the common, we think it quite worth while to quote in full the chairman's remarks on the subject, printed at the conclusion of his address. He said: "Before I sit down I must take this opportunity of expressing the appreciation of the Board of the services of our excellent representatives on the other side. I do this every year when I address you; so that it becomes a matter of form. I wish it, however, not to be a mere matter of form, but to take the opportunity of saying that we as a Board thoroughly appreciate the services of our representatives on the other side. We think they have worked extremely well over there and they have served the Company in a manner of which I can hardly speak too highly."

Relatively considered the report of the Hall Mining & Smelting Company, Limited, for the year ending June 30th, 1904, may be described as satisfactory. Although the earnings do not represent an adequate return on capital, still the fact that a profit of over thirty thousand dollars has been made during the period reviewed, under circumstances still far from favourable, should appear encouraging to shareholders, and also have the effect of appreciating the market value of the stock, which for some time past has been quoted at rubbish prices, ranging from a shilling to one and six pence. The improved position is attributed largely to greater activity in the silver-lead mining industry, consequent upon the payment of a Government bounty on lead production, the company's purchases of lead ores having been during the year nearly double those made during 1903. We note, however, that Mr. J. J. Campbell, the business manager, states

in his report that the output from the Slocan and East Kootenay lead mines is falling far short of estimates made by the Silver-Lead Miners' Association at the beginning of the year.

Another interesting feature of this address was the intimation that the company contemplate introducing a "new process" by which the costs of smelting in the future will be materially reduced. This reference was made in explanation and confirmation of a paragraph which appeared in the Directors' Report stating that the Board have under consideration the adoption of a process which is said to have worked successfully in Australia and elsewhere, showing a great saving on old methods. It will at present be conceded, we think, that there is room for improvement in lead smelting practice in British Columbia, far greater advances having been made in the economic production of gold-copper ores. It is needless to add, for example, that the Hall Mines' smelter is far from being a model of well-planned construction for which, however, the present management is in no way responsible.

In view of an erroneous report in respect to the Hunter V. mine, published recently in an important Eastern mining journal, we print the following information: The company has made arrangements for shipments of 160 tons a day to the Granby, Northport, Trail and Nelson smelters, and expects to increase this output within the next two months. The greater part of the output carries as high lime as ever, namely, about 45 per cent CaO and only about 12 per cent silica. A portion of the ore body recently opened up is somewhat more silicious, carrying 25 to 35 per cent silica, and higher values, running from \$8.00 to \$10.00. The crushing plant which is under consideration is similar to that in use at the Mother Lode and Granby mines in the Boundary district, and is calculated to save much bulldozing and hammer breaking of rock. One quarry upon the deposit is about 140 feet wide, with ore on all sides. The other, 1400 feet distant on the line of the deposit, is about 70 ft. by 100 ft.

In a paper recently read before the British Association an interesting comparison was made between the present hydro-electric developments in different countries. In this connection it is gratifying to note the position of Canada, which occupies the second place, the greatest developments now being those in the United States. Canada is credited with the development of 228,225 horse-power, which, however, is below rather than above the mark, for these figures do not appear to consider the recent important installations at Niagara. It is not too much to expect that, in time, the development of water power in the Dominion will exceed that of any country in the world, for certainly no country in the world possesses finer natural facilities therefor. On the Pacific slope in particular the potentialities in this direction are

very great, and there can be no doubt that the abundant opportunities for cheaply developing water powers in British Columbia are destined to play a still more important part in the industrial developments of the country.

For several months Mr. Thos. Kiddie, manager of the Tyee Copper Company's smelting works at Ladysmith, has been experimenting with hot blasts for the furnace at that smelter. After close observation of the results obtained Mr. Kiddie felt justified in recommending that the substitution of hot blast for cold be given a trial, and now, his recommendations having been approved by the Board of Directors, he is arranging to give the hot blast a thoroughly practical test. Its success would mean an appreciably large saving in the cost of smelting, for not only would the percentage of coke used be considerably lessened, but the proportion of raw ore that could be smelted would be largely increased, thus doing away to a great extent with the cost of roasting the ore and tramming it from the roast piles to the roast ore bins. On previous occasions we have had the pleasure of calling public attention to distinct advances in metallurgical practice made at the Tyee Copper Company's smelter, and we shall be much gratified if as may be confidently anticipated, another success be achieved at these works, thereby demonstrating that metallurgy on Vancouver Island is well abreast of the times.

The difficulty of securing financial support in London for British Columbian mining undertakings at the present time is all but insurmountable, and in consequence the few promising ventures remaining in which British capital is enlisted have either to reach a profit-earning standing as best they may without further aid, or else go to the wall. Thus though every effort has been made by the directors of Slough Creek, Limited, to place another issue of debentures, the attempt, according to a circular issued to shareholders, has failed, and the interest on the £20,000 debenture stock having fallen due, it has become necessary to appoint a receiver to protect the interests of the debenture-holders. It seems to us that there are, however, only two ways by which these interests can possibly be protected. Either the mine must be immediately sold or work continued without pause. To sell the mine at anything like a fair figure in its present condition would, however, be practically impossible. Of course, if there is no money, work must necessarily cease, but shareholders would be certainly most ill-advised to allow their property to go by the board at this juncture, when by submitting to another call sufficient capital might be raised to successfully complete the pumping operations. Thereafter the mine should be made to yield very handsome returns.

A rather curious error, possibly a misprint, appeared in connection with an article contributed recently to the *Engineering and Mining Journal* by Mr. Robert Musgrave on the subject of the copper de-

posits of Mount Sicker. Here the average assay values of Tyee ores are given in percentages, the gold value appearing as .14 and the silver value as 2.87 per cent. If these figures had been shown to represent ounces per ton, as might have been intended, they would of course have been nearer the mark. For an engineer of, as yet, comparatively limited experience, Mr. Musgrave also is unduly bold in the emphatic assertion that no marked continuity in the vertical extent of large bodies of ore is to be expected, which assumption is based on the theory that the schist, when subjected to such violent fracturing and movement, would not break in any definite or continuous cavity, but would rather form series, more or less unconnected, of lenticular chambers, now containing ore, which may be difficult to find and require much exploration. The theory is no doubt plausible, but theory of a similar nature having reference to the continuity of our coast ore-deposits advanced in the past, by greater authorities than Mr. Musgrave, have, in the case of the Texada mines in particular, proved so erroneous that it is quite possible that his opinion in this instance may prove incorrect. After all there is nothing like power-drills and dynamite to demonstrate whether or not an ore-body is in place.

It is hardly necessary to say that the statements appearing elsewhere from a report on the Cassiar district by Mr. Haskins of the Rosella Hydraulic Mining & Development Company are not to be taken too seriously, allowances having, of course, to be made for that gentleman's proverbially exuberant optimism. Nevertheless there is reason to anticipate that mining enterprise will be largely and successfully carried on in this field in the next few years. Heretofore the inaccessibility of the region had discouraged any considerable attempt to prospect for mineral since the supposed exhaustion of the placer diggings worked in the pioneer days, but recently the likelihood of improvement in this regard, the greater interest which, in consequence of negotiations for the construction of transcontinental railways through northern British Columbia, has been re-awakened in the northern districts, and to some extent the satisfactory showing made by and the promising prospects before the pioneer hydraulic undertakings at Thibert Creek, have combined to render capital disposed towards investigating and developing the resources of the district; and during the past season a number of new leases were applied for covering, we are informed, practically all the available ground in the vicinity of the better known creeks. During the summer the Thibert Creek Company having been successful in securing additional capital, spent much time in installing plant and other equipment by which an efficient water supply has been made available in preparation for active mining work next spring, and with the improved facilities it is certain that a very large clean-up will then be realized.

According to the *Mining and Scientific Press* the zinc industry of the United States has been

wonderfully stimulated by the large and constantly increasing demands for that metal for use in the cyanide process and in other industries. In the face of a constantly increasing production the price of zinc has advanced, and this has still further stimulated its output. Throughout the Rocky Mountain region and the Pacific Coast zinc ores occur in greater or less amount in many places, but the larger portion of zinc ores exist as sulphide, and is combined with the sulphides of iron, copper and lead. These ores, where the several sulphides occur in finely disseminated crystals, intimately intermixed, were, up to a short time ago, undesirable, as the zinc was not wanted by the lead smelter, and the lead and iron were not wanted by the zinc smelter. The electro-magnetic separator, however, has made a clean separation of these several sulphides possible, and as a result the waste dumps of several districts suddenly became valuable for their zinc, lead and copper contents, besides at once rendering profitable a large volume of ore in place in the mines. Under the new conditions and the stimulus given the output of zinc by the demand for it, that metal has become an important factor in the mineral output of several western mining sections. Colorado and Utah have greatly increased their zinc output, and in British Columbia zinc has become a noted feature of its mineral production. In nearly all cases the zinc ores are shipped hundreds of miles to smelters for treatment, indicating that this class of ores will bear a long-distance transportation charge and a comparatively high reduction charge and still afford a profit

Recently shareholders in the Athabasca-Venus, Ltd., a Toronto mining company operating gold mines in the neighbourhood of Nelson, received notice of a general meeting, the purpose of which was to consider the financial position of the company. Only last month we had occasion to comment on the position of a Montreal mining company, also operating in this province, that has a developed mine capable of earning profits but not able to pay off a large back debt, and it would appear that the Athabasca-Venus mines are in a somewhat similar position—similar in character if not in degree. These mines have for some time past been carefully and economically managed and have, we understand, more than paid working expenses, but having been saddled with a heavy debt at re-construction time have been and still are handicapped to such an extent as to prevent their returning profits to the shareholders. Inadequate cash capital is the first cause of so many mines getting into difficulties that it is surprising people can be induced to associate themselves with undertakings involving risk of failure from this cause, yet time and again mistakes of this kind are made, and the business of mining receives a bad name as a consequence. From information we have periodically received we have reason to regard the Athabasca-Venus mines as properties that under ordinarily favourable conditions would prove profit-earning, but neither the acknowledged value of the mines nor the competent management they have had is equal to impossibilities. Given a fair

chance there is reason to think they would return profits, but it is too much to expect them to as well discharge the heavy liabilities with which they have been so unwisely handicapped.

All through the mining districts of the province complaints have been heard of the shortness of the water supply and the consequent difficulties that in most cases, have been experienced in carrying on milling and concentrating operations, and sometimes even of continuing mining work. Recent rains have as a rule removed the chief cause of these difficulties, so that for the time a resumption of operations on the usual scale has been practicable, at any rate in connection with lode mining. There has been, though, at least one exception to the rule as regards the complaints referred to—namely, the Cascade Water, Power & Light Company, which supplies electric current for power purposes to mines and smelters in the Boundary district. This power company has had, during the recent dry season, larger demands for power made upon its generating station than at any previous time. It was well that it was in a position to readily meet those demands, for had it not been so the Boundary district would not during the summer and autumn have made nearly so good a showing in regard to ore production as it has done. The flow of water down the North Fork of Kettle River was unusually small during recent months, consequently the hydro-electric power derivable from it was considerably less, so it is stated, than was necessary to operate the smelting works that has in the past obtained the greater part of its power from this source. A reduced smelting capacity would have necessitated a reduced production tonnage, but fortunately the alternative power supply mentioned was available and the biggest mines in the Boundary district were enabled to continue to produce largely with little or no interruption.

The description of the lead and silver refinery at the Canadian Smelting Works, Trail, is the fourth of a series of interesting articles that have been appearing in the *MINING RECORD* during several recent months. The first of this series dealt with the bessemerising or copper converting plant lately installed at the British Columbia Copper Company's smelting works at Greenwood, in the Boundary district; the second described the roast yards, ore-roasting methods and the way in which fine raw ore is made into bricks for roasting, at the Tye Copper Company's works at Ladysmith, Vancouver Island; last month a description of the Le Roi Mining Company's smelter at Northport, Washington, was given, after the particulars had been months in hand awaiting receipt of photographs for illustrative purposes; now the subject chosen is, as already stated, the lead and silver refinery at Trail. All of the reduction works mentioned were visited by the writer of the articles, which were specially contributed to this journal. It is gratifying to have assurance that our enterprise in this direction is appreciated and that our endeavours to give wide publicity to the substantial progress that is being made

by the metallurgical branch of the mining industry of British Columbia are serving the double purpose of affording satisfaction to many of our readers in the province and disseminating useful information in Eastern Canada, the United States, Great Britain, and other countries. It is an easy and inexpensive way to fill the columns of a mining journal by means of scissors and paste, but our custom is to publish as much original matter as, within reasonable bounds of expense, we can get together. That our policy is a good one is evidenced by the steadily increasing circulation of the *MINING RECORD* and the growing appreciation of its efforts to advance the best interests of the mining industry of the province. We have full confidence, therefore, in the future and have no hesitation in suggesting to our many friends that the most effective way in which they can assist us to enlarge our sphere of usefulness is by favouring us with the benefit of their recommendation and support in increasing measure.

The last issue of the *Mining Magazine*, a high class engineering monthly published in New York, is described as the "first annual power number," much attention being paid therein to the different applications of the various forms of power in mining. A leading article deals with the great economies that have been made during the past twenty years by the introduction of power driven machinery in mines, in open quarry work hand-drilling having been replaced by steam or compressed air drills: the hand or horse-power derrick has given place to the steam crane or over-head cable way, and locomotion or a wire-rope haulage system are employed instead of carts or small cars. In quartz mines the speed of hoists have been quadrupled; underground electric or compressed air haulage system have been adopted, while in coal mines coal cutting machinery operated by electricity or compressed air is gradually coming into general use. It is further pointed out that the use of electricity in mining operations has enabled the engineer to establish a central power plant and obtain the economy resulting from the use of large evaporative units, large engines and dynamos. For short distances a 500-volt direct current carries power to local points at the face of the workings, operates pumps placed in the most advantageous position, and furnishes a means of transporting the product from the workings to the shaft, or other central point. The improvements which have been made in the three-phase alternating system have given these same advantages, at great distances. The problem of mining at increased depth, and under the most unfavorable circumstances, without increasing the cost of production is being solved by the introduction of machinery, replacing manual labour, and as a result not only has it become possible to profitably work mines which only a few years ago would have been considered hopeless, but operations may be carried on upon a much more extensive scale. Excellent illustrations of the truth of these contentions are afforded in the case of mines in our own province.

We suppose that shareholders of the new Fairview Corporation, Limited, have no other alternative, if they desire to save their original investment, than to respond to the invitation to subscribe for the balance of the unissued preference stock in accordance with the terms mentioned in the circular recently issued by the directors. From the accounts submitted at the recent annual meeting held in Hamilton it appears that the company's indebtedness has already been considerably reduced, and that a comparatively small sum, \$25,000, is now required to pay off the remaining debt, and at the meeting in question a committee of shareholders was appointed to report on the position and submitted the following statement:

"We are assured that unless the necessary capital is provided, either by sale of the preferred shares or in some other manner, this enterprise must fail. \$125,000.00 is required to pay off the debt, and give ample working capital. We believe that the plan of the directors, of issuing preferred stock, was a wise one, and entirely in the interest of all the stockholders. While it is practically a first lien on the whole of the assets of the corporation (after payment of debt), and therefore a gilt-edged security to the purchaser with interest (cumulative) at 8 per cent., it allows the surplus profits to be divided among the common stock holders. With the balance of the preferred stock sold, the company would be absolutely free of debt, and have about \$115,000.00 in cash with which to purchase necessary machinery, and place the corporation among the leading mining companies of this country. Our opinion is that the balance required to pay off the loan account and place the company in a safe position, should be immediately subscribed by the present preferred stockholders. This in addition to the overdue calls, which are steadily coming in, would make about \$25,000.00. Of this amount \$6,000.00 was subscribed before and at the meeting, and the vice-president has since subscribed \$2,000.00 in addition to the \$10,000.00 he already has invested. Should it be found impossible to obtain the balance required for working capital, the preferred shareholders will be entitled to take over the property, and there will be nothing left for the holders of common stock. We have reason to know that this is considered favourably by many. We are convinced that the majority of the preferred stockholders will not allow the company to be held back for the want of a small balance of working capital, which would be no trouble to obtain if the common stock were non-existent. We take the opportunity of informing the common stockholders who have not already purchased preferred stock that failing to do so, they are taking great chances of losing what they have already invested, as this project will be carried through by those holding preferred stock. We strongly advise those who hold common stock, and have not subscribed for preferred, to immediately do so and place themselves in a safe position. It is the only means of safeguarding their interests. We are assured that the ore at present in sight would, after the installation of the required machinery, soon repay

the whole issued preferred capital, and we cannot doubt but tremendous bodies of ore only require further development to be available; so that the good character of the investment should be apparent to all, and we strongly recommend all the shareholders to immediately subscribe for as much of the preferred stock as they can afford, and enable the corporation to make their present holdings the valuable investment they should be."

The question, therefore, that shareholders have principally to consider is whether in responding to the call it is worth their while to provide more money in order that a mine which certainly up to the present time has made a wretched showing should be operated with the continued prospect of loss. Although, however, the Stenwinder ore is very low grade, it is, we believe, quite possible to mine it at a profit under favourable conditions. Conditions heretofore have not been favourable and we certainly share the general impression that there has been much mismanagement in the past—at least a number of needless and costly mistakes have been made. If these are to be avoided in future it is imperative that the general management of the mine should be in the hands of a capable and experienced engineer, and if shareholders are wise they will only agree to subscribe additional capital to the undertaking on the distinct understanding that steps will be taken in this necessary direction.

LEAD AND SILVER REFINING AT THE CANADIAN SMELTING WORKS, TRAIL, B. C.

(By E. Jacobs.)

THE Canadian Smelting Works, owned by the Canadian Pacific Railway Company, situate at Trail, are the largest and most important reduction works in British Columbia. When the C. P. R. Company acquired the smelter from the British Columbia Smelting & Refining Company in March, 1898, the works were comparatively small and unimportant. They had been established by Mr. F. August Heinze, who commenced their construction in October, 1895, and in February of the following year began operating them on a small scale, treating the gold-copper ores of the Rosslund camp. After the C. P. R. Company purchased them, the smelting of silver-lead ores was undertaken as well, and last year a lead refinery was added. Still later, arrangements were completed for refining the silver and gold contained in the silver-lead bullion produced at the works, and finally a plant was installed for the manufacture of lead pipe, sheet lead, etc. The contrast between conditions as they were here in 1896 and in the early part of the current year has been strikingly shown by Col. Egan, a journalist well known in the Kootenay district, who wrote last spring: "When I first visited the plant it consisted of two small copper furnaces, capable of reducing 250 tons of copper ore per day; now it has three copper furnaces, of 900 tons capacity per diem, and three lead furnaces which can treat 400 tons of

silver-lead ore each twenty-four hours, besides a lead refinery capable of turning out twenty-five tons of pig lead per day. The value of the entire plant when Mr. Heinze owned it was \$150,000, while the present plant is valued at, approximately, \$1,000,000. Then the plant gave employment to 150 men, now it ordinarily has 350 and at times, when the entire plant is in full motion, 500 men are worked. The works at the start covered ten acres; now about forty-five acres are occupied by buildings and appliances of various kinds, making them the largest lead-copper reduction works in Canada. Where formerly there were about 700

smelter treats custom ores only, the C. P. R. Company not owning any metalliferous mines. The ores are varied in character and grade, making the most accurate sampling imperative. The copper-gold ores come chiefly from Rossland mines. These are delivered at the smelter in 30-ton hopper-bottom dump cars. In the course of sampling the ore passes through three crushers—two Gates and one Blake—several sets of Cornish rolls, three Vezin automatic samplers of graduated sizes, and Jones' riffles, the samples going thence to the bucking room for further pulverising before being assayed. A portion of



No. 1.—Canadian Smelting Works, Trail, B. C.
General View of Electrolytic Lead Refinery Buildings.

feet of railway siding there are now about three miles devoted to various uses by the smelter."

As the present purpose is to describe the lead refinery rather than the whole of the works, only a brief description of the general plant and operations of the smelter will here be given, as follows: The works are operated by electricity transmitted about thirty miles from the West Kootenay Power Company's generating station at Bonnington Falls, Kootenay River. The line current is 20,000 volts, which is transformed to 550 volts at the smelter. There is a total of 1,600 horse-power in motors, divided into 20 units. The

the ore is roasted in open-air heaps, the roast piles containing from 2,000 to 3,000 tons each. After the greater part of the sulphur has been got rid of by burning from four to six weeks, the roasted ore is conveyed to the blast furnace charge bins. The furnaces are fed mechanically, the ore being dropped in as the cars move along the track at the side. Both matte and slag are granulated. The first matte produced contains 6 to 8 per cent copper; it is roasted in O'Hara furnaces, of which there are two. It is then briquetted and afterwards resmelted with some raw ore, the resulting matte running from 40 to 50

per cent copper. This high-grade matte is sent to Greenwood, where it is Bessemerised and the percentage of copper brought up to 98 per cent. The blister copper is then shipped to Eastern refineries, where the gold and silver it contains is extracted by electrolytic methods.

Lead ores, obtained chiefly from Slocan, Lardeau and East Kootenay districts are crushed and passed through screens with one-quarter inch mesh, thence through Brunton and Vezin samplers, and the samples further cut down by Jones' riffles before going to the assay laboratory. The ores are roasted in reverberatory

is separated from the other part of the structure by a brick wall, contains five muffle furnaces. The electrical equipment in the electrolytic parting room is very complete.

THE ELECTROLYTIC LEAD REFINERY.

The lead refinery is situated 300 to 400 yards north of the smelter, alongside the Columbia & Western Railway. The arrangement of the several buildings is shown in No. 1 of the accompanying illustrations. The brick building at the rear on the left is the melting room, in which is also the lead-pipe manufacturing



No. 2. Canadian Smelting Works, Trail, B. C.
Interior of Melting Room, showing melting kettles, pig lead moulds, etc. Pipe-making machine in far corner.

roasters, of which there are ten, or in Bruckner cylinders, after which the charge is made up in large cars, elevated and dumped directly into the blast furnace which produce the silver-lead bullion that, having first been sampled, is refined in the company's refinery.

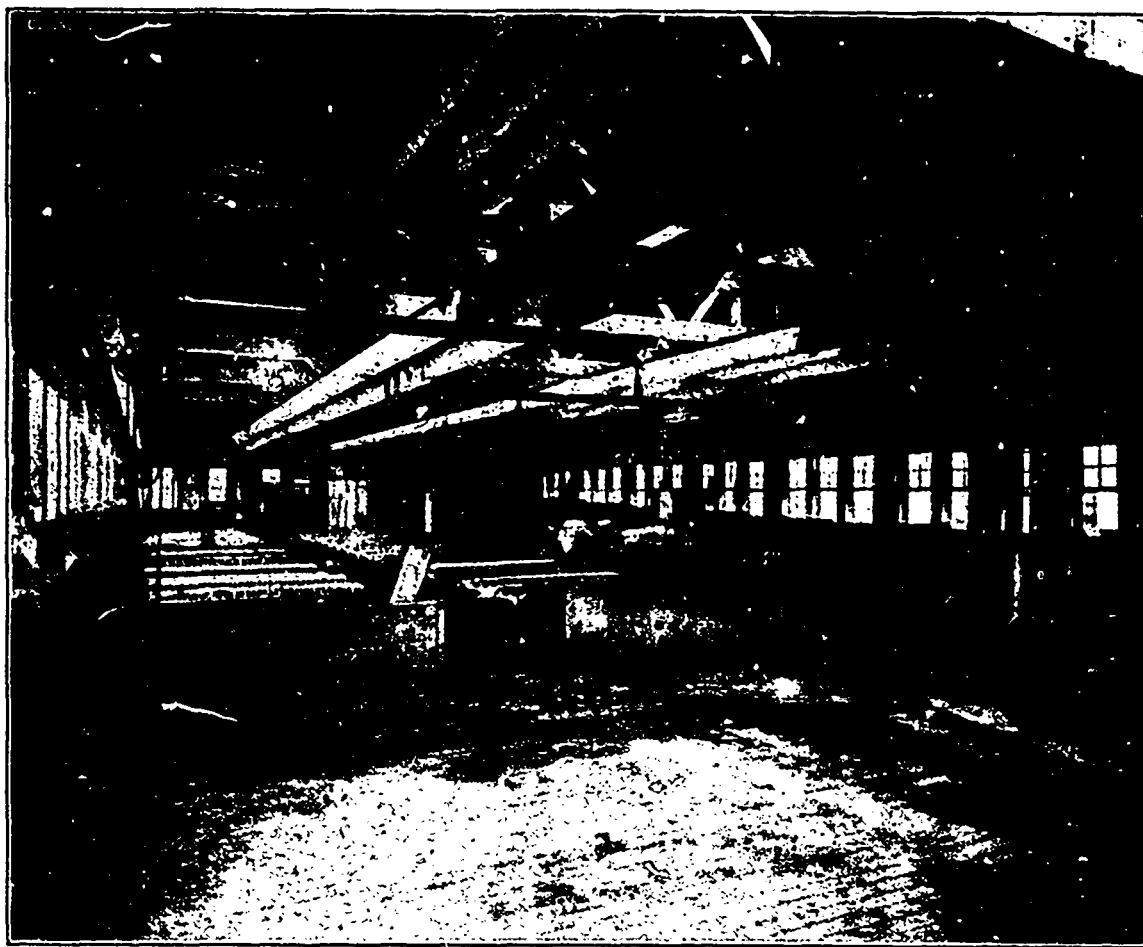
The laboratory and assay department of the Canadian Smelting Works are probably the most complete in Canada in point of modern equipment. The buildings are of brick; the main structure is 70 by 35 ft., and includes office, two balance rooms, electrolytic parting room, chemical laboratory, bucking room, store room and basement. The furnace room, which

plant; the frame building is the tank room; the large brick building on the right contains the slime plant in the centre and the kettles, reverberatory furnaces, etc., for parting and refining the silver and gold, at the nearer end, while the electrical equipment is at the other end; and the frame building at the extreme right, beyond the smoke stack, houses the sulphate of copper or bluestone plant. Immediately in front of the larger brick building are brick chambers with 48-in. steel U pipes through which the fumes from the Dore and fine silver furnaces pass and which collect any values the fumes contain ere the latter escape through the 80-ft.

high brick smoke stack. These several buildings together cover two acres, which area is enclosed by a high board fence topped with four barbed wires.

Illustration No. 2 gives an interior view of the melting room, the dimensions of which are about 60 by 120 ft. The bars of bullion are delivered here after having been sampled at the smelter. On the left are the two 30-ton melting kettles, the nearer one at present used for pig lead and the other for bullion. It is intended to shortly put in a 50-ton kettle for pig lead and use both the smaller kettles for melting the bullion. The melted bullion is pumped by a steam pump

first operated, are about 60 by 170 ft. The two rows of electrolytic depositing tanks shown on the right of illustration No. 3 comprises the 28 tanks put in when this industry was inaugurated here; the other two rows, containing 44 tanks set lower, are a later addition to this portion of the plant. The tanks are made of 2-in. cedar, bolted together and thoroughly painted with rubber paint. Each tank is 86 in. long, by 30 in. wide by 42 in. deep, and each receives 20 anodes of lead bullion which is refined by the Betts electrolytic process. This involves the dissolution of the lead contained in the bullion or anode, and its precipitation



No. 3.—Canadian Smelting Works, Trail B. C.
Tank Room, Showing Electrolytic Depositing Tanks.

from the melting kettle to the anode moulds, four of which are placed at a time on a mould carriage. Each anode contains about 350 lb. of bullion. After casting, the anodes are placed on cars, ten on each car, the spacing between the anodes being similar to that in the electrolytic depositing tanks, so that the whole carload may be picked up by a carrying device and placed directly in the tank. Cars loaded with anodes, ready for removal to the tank room, are shown in the background of the illustration.

The dimensions of the tank room, which originally contained the whole of the refinery appliances as at

upon a cathode by electrolysis, which is a chemical change induced by the passage of a current of electricity through a chemical compound in solution. The solution used as an electrolyte contains lead fluosilicate with an excess of fluosilicic acid. It is prepared at the refinery by the simple solution of quartz in hydrofluoric acid, with the subsequent addition of lead carbonate or white lead. The anodes are suspended in the tanks; each has an area of 26 by 33 in., exposed to the electrolyte on each side. The anodes may contain any or all of the elements—generally about three per cent of these impurities—

gold, silver, copper, tin, antimony, arsenic, bismuth, cadmium, zinc, iron, nickel, cobalt and sulphur; but whatever of these there is present remains in the slime, the lead only being deposited on the cathodes. At first the cathodes or starting sheets were made by depositing about 1-16 in. of lead on paraffined steel sheets, but now these are moulded in sheets of pure lead. One end of each sheet is wrapped around a copper bar, the cathode thus formed being suspended in the tanks in like manner to the anodes, with which they alternate at uniform distances of two inches from each anode. The selective action of the electrolyte dissolves the lead

ing with fresh bullion into anodes; while the slime is conveyed to the slime room. The cathodes are taken to the melting room, and there melted in the pig lead kettle, from which the molten lead is pumped into moulds. Illustration No. 2 shows part of a semi-circle of 80 moulds with 100-lb. pigs of lead resting on the edges of some of the moulds preparatory to removal for shipment or manufacture into lead pipe, etc.

The building containing the slime plant, silver refining appliances, and electrical equipment is about 80 by 120 ft. The slimes treated here contain, approximately: Antimony, 30 per cent; arsenic, 12 per cent;



No. 4.—Canadian Smelting Works, Trail, B. C.
Slime Plant and Silver-Gold Refinery.

in the anodes, and the current of electricity transfers it to the cathodes, leaving the foreign substances, including the gold and silver, on the undissolved portion of the anodes. The process of dissolving the anodes and redepositing the lead occupies about eight days. The portions left of the anodes are at present handled by travelling chain blocks, a mechanical arrangement admitting of the whole of the 20 anodes in each tank of those more recently installed being lifted at once by two men. These spent anodes (or "scrap") after the slime has been cleaned off them are returned to the melting room and melted in the bullion kettle for cast-

copper, from 5 to 10 per cent; silver, from 25 to 30 per cent, and other constituents in smaller proportion. The gold content varies considerably. After treatment in tanks by a special process, the slimes are melted in a reverberatory furnace into Dore bars containing gold and silver which are afterwards parted by the sulphuric acid method. The resulting pure silver is melted in another reverberatory furnace and moulded in 15,000 oz. bars running .999 fine; the gold from the parting kettles is thoroughly cleaned, melted in graphite crucibles by gasoline furnace and made into bars, these running .994 fine. The silver and gold is always

shipped from the smelter the same day as it is produced.

Illustration No. 4 shows only a part of the plant contained in the last-mentioned building, viz., that used for parting the silver and gold constituting the main portion of the Dore bullion, neither the slime treatment tanks nor the reverberatory furnaces appearing in it. The rear end of this building is occupied by the electric generating plant. There are now in use two direct-connected motor generator sets for generating the electric current for the electrolytic deposition, each having a capacity of 30 volts and 3,500 amperes. These

ered as blue vitriol, the "mother liquor" being afterwards converted into strong sulphuric acid, which is used over again for treatment and parting purposes. The sulphate of copper or bluestone is crystallised and packed in barrels containing from 250 to 300 lb. each. This is used by farmers for pickling seed wheat so as to destroy smut, and is utilised beside for many other purposes. The bluestone plant is contained in a frame building about 40 by 80 ft.

So far no provision has been made to recover the antimony and arsenic contained in the slimes, but it is probable that eventually these will be saved and added



Canadian Smelting Works, Trail, B. C.
Electric Motor Generator Room.

are operated by power obtained from the Bonnington Falls power station. They are shown in illustration No. 5, and are large enough to provide sufficient current to deposit in the electrolytic tanks about 50 tons of lead each 24 hours. There are two other sets in the room, these being of smaller capacity and having been superseded by those now in operation. In an adjoining compartment there is a steam boiler for generating steam to work the pumps in the melting kettles, and for heating the solution used in treating the slimes.

The copper retained in treating the slimes is recov-

to the products of the works, which are already producing pig lead, silver, gold and sulphate of copper. Beside manufacturing pig lead into lead pipe and sheet lead, this product is shipped to Montreal, Quebec, which is its largest market, and to Toronto, Winnipeg, and to British Columbian cities on the coast. It is anticipated that in the course of a few months a considerable quantity of lead will be required for the lead-corroding works, the establishment of which in Montreal has already been arranged for. It is stated that such works would at first use in the manufacture of white lead and other pigments from lead, at the rate

of about 10,000 tons of pig lead per annum. In this connection it is interesting to note that a short time ago the manager of the Canadian Smelting Works received from the Carter White Lead Company, of Chicago, Illinois, which company is establishing the lead corroding works above referred to, the following advice relative to lead shipped from the Trail lead refinery:

"We might mention that we are extremely pleased with the results obtained from this car of electrolytic lead; in fact the product was noticeably whiter than that produced from refined corroding lead we are in the habit of purchasing. The amount of tailings was also less than is usual. We sent a couple of the lead to a chemist in Racine, Wisconsin, and his analysis is as follows:

PHYSICAL AND CHEMICAL ANALYSIS.

Lead carbonate.	71.42	per cent.
Lead hydroxide.	28.57	" "
or		
Oxide of lead	86.10	" "
Carbonic acid	11.17	" "
Water	2.13	" "
Specific gravity.	6.562	
Volume, 12.53 lb. per gallon.		

"The percentage of carbonate is a little higher than the average, but not enough to cause the slightest trouble. In fact, this analysis shows the finished article to be of very fine quality."

The market for refined silver is not restricted to one country. Shipments have been made to New York and San Francisco and to the United States government. Others again have been to the Orient, silver having been sold to China. All the gold is sent to the United States assay office at Seattle, Washington. When Canada shall have its own mint in operation it will not be necessary to ship the local gold to a foreign country. Much of the bluestone is shipped to the farming districts of the North West Territories, the remainder finding a market in other places, where it is put to various uses.

The machine installed here for making lead pipe is of large size. Its manufacturing capacity is up to about 15 tons of lead pipe in 10 hours. Seventy sizes of pipe are made, ranging from one-quarter inch to four inches in diameter. The display of manufactured lead products—pipe, sheet lead, etc.—made at two or three of this year's Fall exhibitions in British Columbia, was both creditable to the Canadian Smelting Works and interesting to large numbers of people who attended the exhibitions and who were much gratified to find that this important addition had been made to the manufacturing industries of the province. At Victoria the exhibit was awarded a special silver medal.

Although the lead refinery is being operated on a commercial scale, it is yet to some extent experimental, that is to say, the erection of additional permanent buildings and provision of more plant and equipment is being deferred until longer practical experience shall have demonstrated whether or not changes in, or

modifications of, certain methods can be made with advantage. For instance, the erection of a more commodious and permanent tank room and the construction of many more electrolytic depositing tanks, the latter to have an electric crane for handling the anodes and cathodes, have been delayed so that the most economical and expeditious arrangement and methods may be provided for. Meanwhile a temporary extension is being made by the addition of about 60 feet to the present tank room and the construction of more tanks, so that by the time the corroding works in Montreal shall be ready for operation the pig-lead producing capacity of the refinery will be sufficient to meet the increased demands that will then be made upon it.

The Canadian Smelting Works enjoys the distinction of having produced the first electrolytic lead produced on a commercial scale in the world. It is claimed too that the *Betts' process admits of the production of pig lead at less cost than the old or fire process. The establishment of the industry is a distinct advantage to the Slocan, East Kootenay and other lead-producing districts of British Columbia and it in large measure removes what has in the past been a serious obstacle to successful lead-mining, viz., the difficulty in finding a market for British Columbian lead. The further development of this industry will be watched with deepening interest, since its considerable expansion will add to the industrial prosperity of the province.

The officials of the Canadian Smelting Works are: General manager, Mr. W. H. Aldridge; superintendent, Mr. Jules Labarthe; superintendent of the lead refinery and engineer, Mr. John F. Miller; accountant, Mr. T. W. Bignay; ore buyer, Mr. D. W. Moore, and chief chemist, Mr. S. G. Blaycock. That these gentlemen respectively hold important and responsible positions is evident from the comparatively large value of the metal output for the year 1903, which was as follows: Gold, \$1,441,200; silver, \$641,900; copper, \$391,500; lead, \$162,300; total, \$2,636,900. For 1901, in which year the prices of silver, copper and lead were higher, the total value of the smelters output was about \$3,325,600. No figures are yet available as to the current year's production, but it is probable that it will reach a higher total than that of 1903.

RECENT MINING DEVELOPMENTS ON VANCOUVER AND TEXADA ISLANDS.

(By W. M. Brewer.)

THE position of metalliferous mining on Vancouver and Texada Islands—having regard to the work now being done, is to-day much more satisfactory than at any previous time. It is true that there are relatively few prospectors searching for mineral and consequently not as many new claims being located; it is also true that a large number of the locations made in earlier years are idle for lack of capital to continue development work, although of course

*See paper on "Electrolytic Lead Refining," by Anson G. Betts, Transactions American Institute of Mining Engineers.

in very many cases this idleness is due to the fact that claims themselves possess little intrinsic value. But new sections have been prospected within the past two years. Notably the country in the vicinity of Ladysmith and extending up to the western edges of the coal measures; another new section is the territory in the neighbourhood of the Koksilah River, whilst still another is the country lying adjacent to the head of Central Lake which is nearly in the centre of the Island and about fifty miles from Alberni. In each of these localities prospects which promise to develop into good mines have been located, and from the two first mentioned shipments of copper ore of good commercial value have already been made to the Ladysmith smelter. In the last mentioned territory, for lack of transportation advantages no ore has yet been brought out, but several mining men of experience have seen the prospects located by Drinkwater and Nichols and these authorities agree that on the claims located there are very extensive outcroppings of ore, already exposed by nature in a somewhat similar fashion to the Mammoth Bluff exposure on the Britannia mine at Howe Sound.

The country adjacent to the Kennedy Lake and Elk River is still receiving considerable attention from prospectors, and so far as the copper prospects are concerned there is a zone extending from Clayoquot River, which empties into the Clayoquot Arm of Kennedy Lake to the northwest arm of the lake, through which not only the outcroppings are very promising but actual work is demonstrating (there is every reason to believe) that extensive bodies of good grade copper pyrite occur, with indications promising continuity with depth. These are contact deposits occurring between chrySTALLINE limestone and igneous rocks. No ore has yet been shipped from any of these prospects, but men have been steadily at work during the last summer extending development, in order to determine that a sufficient amount of ore is in sight to warrant the construction of aerial tramways for transporting the ore to the lake shore.

The shipping facilities from this section to salt water at or near the cannery at Tofino Inlet are reasonably good to-day, the Dominion Government having in the last two years spent large sums in improving the Kennedy river, which has been rendered navigable for scows measuring about twelve feet at the beam. If considerable production from these localities were maintained, it would be advisable to build a tramway which would be no more than about a mile in length, round the rapids from deep water in the Kennedy River to deep salt water.

The returns on the shipment of ore lately made from the Indian Chief group on Sidney Inlet were sufficiently satisfactory to warrant the prosecution of extensive development work on this property with a view to the blocking out of ore. The probabilities are that such work would result in opening up a sufficient tonnage of ore to justify the installation of an aerial tramway.

Although very little has appeared in the newspapers for some time past in respect to mining developments

at Texada Island, yet extensive mining operations are being continuously carried on at the Copper Queen and Marble Bay mines and about 2,000 tons of ore per month are being shipped from the Island to the Ladysmith and Tacoma smelters. In the case especially of the Marble Bay mine, actual experience has shown how necessary it is for mining engineers before they attempt to report on properties on this Coast to make a thorough study of the geological conditions. Thus when the original owners of the Marble Bay property had sunk to a depth of 140 feet, the advice was sought of three leading mining engineers whose experience in South Africa and Australia entitled them to high professional rank, with the result that each of these gentlemen after examining the property advised Mr. Palmer, the owner, to mine out what ore he had in sight above that level and then abandon the property. Mr. Palmer, however, disregarded this advice (although he shipped the ore from above that level), and sunk another 100 feet when he sold the property to the Tacoma Steel Company which has since successfully operated it, having paid \$200,000 for the mine out of the profits of ore shipped between the point where Mr. Palmer ceased work and the 500-foot level to which depth the main shaft has since been sunk. At the present time this property is producing about 1,500 tons of ore per month, and it is reliably reported that there are no present indications of the ore-body giving out; but on the contrary that it will maintain its continuity to a very much greater depth as well as its extent in other directions. When it is considered that in 1898 these mines on Texada Island were generally condemned and that since that time the yield from them has been in the neighbourhood of \$1,000,000; that the ore-bodies have been shown to maintain continuity to 600 feet, the depth of the present workings on both the Copper Queen and Marble Bay with all the indications of continuing to a greater depth, it must be admitted that not even mining engineers are not infallible.

Very promising prospects from which a considerable tonnage of ore has been shipped have been partially developed on the property of the Puget Sound Iron Company on the West Coast of Vancouver Island, but for some reason, the policy of this company has never been an active one. Since the closing down of the Irondale furnace near Port Townsend and the death of Mr. Homer Swaney, who was drowned in the *Clallam* disaster last year, no active operations have been carried on on the iron mines of this company, but previous to that quite a considerable tonnage was shipped on a royalty basis to Irondale.

It is to be very much regretted that the Puget Sound Iron Company in which the shareholders are chiefly Californian millionaires, fail as yet to realize that systematic development of the copper prospects that occur on their land would be desirable and most probably profitable, for in view of the very satisfactory results which have followed systematic development of the copper properties on the east coast of the Island whereon very similar geological conditions prevail, it

would certainly seem worth while to carry on operations in this locality.

—*—

COPPER DEPOSITS OF MOUNT SICKER,
VANCOUVER ISLAND.*

BY ROBERT MUSGRAVE.

ON Mt. Sicker soil and an accumulation of forest debris render the prospector's task arduous and the study of geologic conditions difficult. The known ore bodies occur near the summit of the mountain, on its eastern slope, in a wide band of crystalline schist which has an east-west trend. The lateral extent of the schist is obscured by a bed of unconformably overlying Cretaceous shale, which originally covered the whole mountain. This shale, where in evidence, conforms to the general structure of the hills, forming anticlinal and synclinal folds, affording undoubted proof that the mountain is an uplift of comparatively recent date.

An intricate igneous complex is formed by numerous dikes, which traverse the schist along the same general strike. These dikes appear to be of considerable extent, but underground development has revealed the fact that they are narrow, having overflowed on reaching the surface. The schist, in general, is light green in color, with alternating bands of gray and black, due to the presence of graphite. It dips steeply north at an angle of 85 degrees, but faulting and later intrusions have produced marked local variations both in dip and strike. The rock has been broken by dislocations, along which the ores have been deposited, forming large lenticular masses, which conform, in the main, to the schistosity both in strike and dip; but cases are not wanting where the ore appears to cross the dip of the country, although with such soft and easily mashed materials it is difficult to measure the uniformity. The ore bodies have a well-defined footwall, wonderfully strong and persistent. As found in the lower workings of the Lenora, Tyee and Richard III. mines, over a distance of 2,000 feet, this footwall carries an almost unvarying dip and strike; it is separated from the ore-bearing zone by a clay selvage, in places two feet thick. There is no hanging wall to the ore bodies, as far as present exploitation indicates although the country has been cross-cut for a distance of nearly 400 feet.

Single specimens of most of the rocks have been examined microscopically. The footwall is a porphyrite very much sheared and altered, showing the typical porphyritic structure and containing phenocrysts of a lime-soda feldspar and hornblende in a holocrystalline ground-mass. Stain phenomena are developed to a marked degree, and much of the feldspar has been altered into epidote and the hornblende into chlorite.

The ordinary green schist of the mineralized country represents a very much more sheared and altered condition of the same rock. The graphitic schist

which, under the microscope, is seen to be composed of quartz and calcite or dolomite very much crushed and broken up into a fine mass, with veinlets of graphite running all through it, evidently differs in origin from the foregoing and presents one of the numerous and interesting problems in connection with these ore deposits which yet remain to be solved. The composition suggests that it is a disguised sedimentary, but present structure affords no clue to past history, unless the schistosity is interpreted as conforming to original bedding planes. A thin slice of the nearest dike, which runs parallel to the footwall, shows the rock to be a diabase, or closely allied rock; but it is so completely altered and the original structure so obscured that its exact determination was not possible. It contains a considerable amount of titanium-ferrous iron, which is shown by the development of leucoxene at the perimete of the sulphides—a common constituent of these rocks.

The ore is chalcopyrite, associated with pyrite, blende and galena, in a gangue consisting mainly of barite, with some quartz and calcite. The gold values are wonderfully constant; individual assays have seldom failed to give an appreciable amount. As no visible gold has been found, except in one instance, this metal is evidently very finely distributed throughout the ore; these facts indicate its probable deposition contemporaneously with the other metals.

Oxidized minerals are rarely found either in the Lenora or Tyee mines, the main bodies of ore being pure sulphides. The gossan, which led to their discovery, is only exposed for about a hundred feet on either side of the western boundary between the above claims; no evidence whatever exists on the surface of the large bodies which have been developed in an easterly direction in the Tyee. The ore appears to pitch into the mountain, as, in the Richard III. mine, which extends from the eastern Tyee boundary, a considerable depth had to be reached before ore was encountered. Here, however, oxidation has played its part, and the ore, while giving evidence of its original similarity to that found in the Tyee, has been subjected to reconcentration, resulting in the formation of the richer sulphides. Pure oxide or carbonate is rare.

The ore bodies, as is usual in schistose rocks, are lenticular and irregular in form, both vertically and horizontally; at the 165-foot level in the Tyee, where they have received their greatest development, they continue, in a more or less connected line, for the whole 1,500 feet of the claim, extending westward into the Lenora and eastward into the Richard III., pinching and swelling in a marked manner. In places the bodies are 40 feet wide, remarkably clean and free from waste.

The change from ore to country is sudden and well defined. The former may be said, in general, to conform to the schistosity of the latter, but locally every conceivable unconformity exists. That a considerable amount of movement and pressure has taken place since the deposition of the ore is apparent from the schistose structure which the latter has developed in

*Extracts from an article contributed to the *Engineering and Mining Journal*, New York.

places; the lamination planes are parallel to the foot-wall, and also to those of the country, showing the movement to have been similar to that much greater and older one, which rendered the rock itself schistose. These movement have given rise to post-mineral faulting, which is plainly to be seen in "slickensided" surfaces; but such faulting is, in general, at a small angle to the wall bounding the deposits, and, while clay-slips and selvages remain as evidence of the latter, it is extremely doubtful whether even the most scientific examination would suffice to reach a satisfactory conclusion as to the amount of throw in the midst of such conditions.

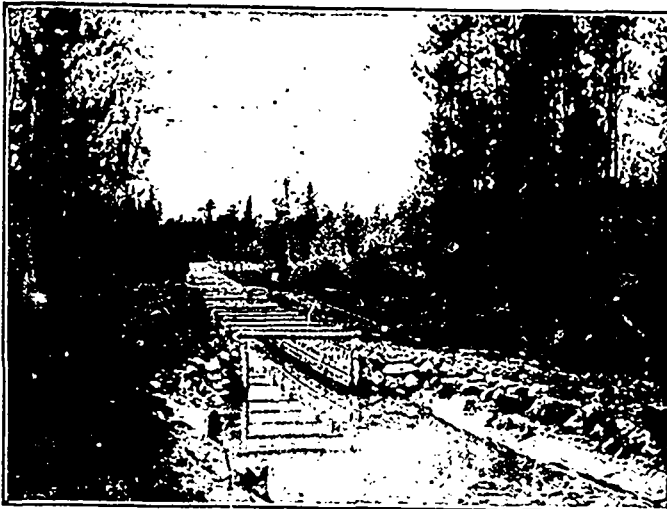
The form of the orebodies follows no rule. The dislocating forces which produced the cavities may have been due to the intrusion of the diabase dikes, forming channels for the passage of mineralized solutions.

The presence of bands of schist containing carbon in the form of graphite, in close proximity to the ore-

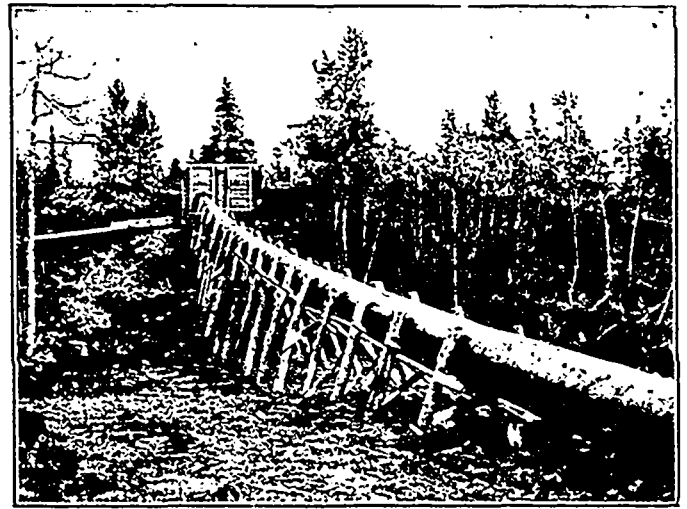
well if worked by dredging methods. Of course this method of placer mining is not novel in other parts of the world, it being a well known fact that similar dredging plants have been most successfully operated in the Oroville district of California, where ground carrying values at from 15 to 20 cents to the cubic yard is worked at a profit. In New Zealand also a very successful record has been established.

In this province there are large tracts of gravel that are known to contain values in excess of 20 cents per yard and should other conditions, such as no very heavy wash, which cuts down the yardage per day, equal distribution of the gold, etc., obtain, then there should be numerous dredges of the modern type working in the country in the next five years, with every assurance of success. In most cases plants may be operated by electricity generated by water power, which is the most economical.

The British American Dredging Company's plant at Atlin consists of one mile of ditch, several hundred feet



A Section of B. A. D. Company's Ditch.



Pressure Box on Pine Creek.

bodies, is significant, affording, as they do, an ample re-agent for precipitating metals contained in solution.

THE PROSPECTS FOR SUCCESSFUL GOLD DREDGING IN THE ATLIN DISTRICT.

(By H. W. Ebbs-Canavan.)

DURING the past season in Atlin much interest has been centred in the operations of the British American Dredging Company, which has inaugurated the method in this district of gold-mining by the utilization of a powerful dredge set up on Gold Run Creek. It is realized that the success of this company will mean a very great deal to the district (and perhaps to the other sections of British Columbia where similar conditions prevail) as a whole, for there are unquestionably in Atlin immense areas of auriferous gravels which, providing the operations of the British American Company prove profitable, will pay

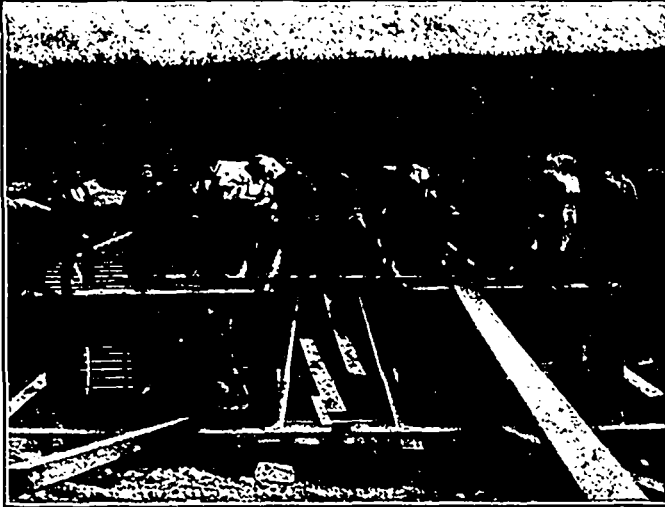
of wooden flume and 1,900 feet of steel pipe running from 30 to 24 inches in diameter, which drives two Stillwell-Bierce high pressure turbine water wheels under an effective head of 175 feet. These wheels have each a capacity of about 500 h.p. and are connected to the Westinghouse 180-k.w. generators, the whole resting upon a concrete foundation. From the generators the current passes into step-up transformers and is transmitted at 22,000 volts over some five miles of line to the dredge, where it enters the step-down transformers and is used on the dredge at 400 volts. The dredge is of the Bucyrus type close connected bucket line, which is driven by a 100-h.p. motor; one 10-in. centrifugal pump driven by a 75-h.p. motor, and one 6-in. centrifugal pump supply the necessary water for sluicing. While other small motors operate the side line, speeds, etc., using in all about 210 h.p. The dredge is lighted by 100 incandescent lights, which lights up the whole plant so as to allow of working 24 hours per day; capacity, 3,000 cubic yards per day.

The gold-saving devices are of the most improved type, comprising 90 feet of iron sluices with both Hungarian and longitudinal riffles. In this sluice are two grizzlies through which the finer material runs on to some 200 square feet of gold-saving tables, and the fine gold is caught in quick-silver laden riffles.

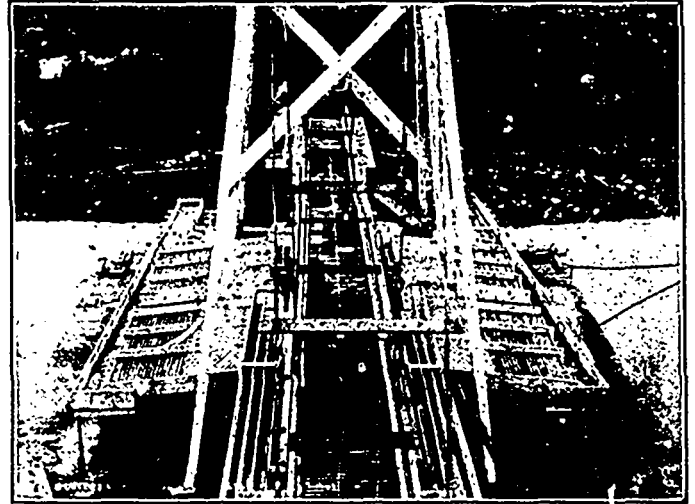
The dredge and power plant was built by the West-

power house, operations were not commenced until May 24, on which date the water was turned into the ditch from Pine Creek, the wheels and the power house were started, and the current was turned on to enable the big bucket line to commence digging.

This style of dredge, with its long sluice behind, renders the starting of operations slow as all the tailings



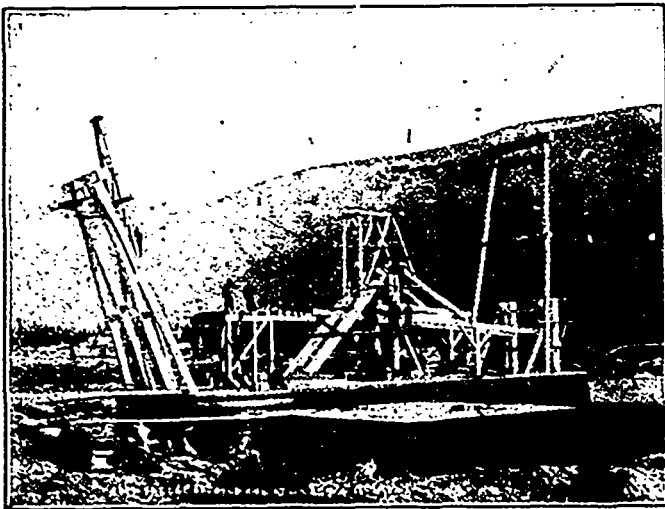
Construction Crew on Dredge at Gold Run.



The Slimes and Tables.

ern Engineering and Construction Co., of San Francisco, California, the Pacific Coast agents of Bucyrus Iron Works, of Milwaukee, Wis., and the construction work was carried on under the personal superintendence of Mr. D. P. Cameron, vice-president of the company, who may well be described as the father of dredge construction in California. When one remarks

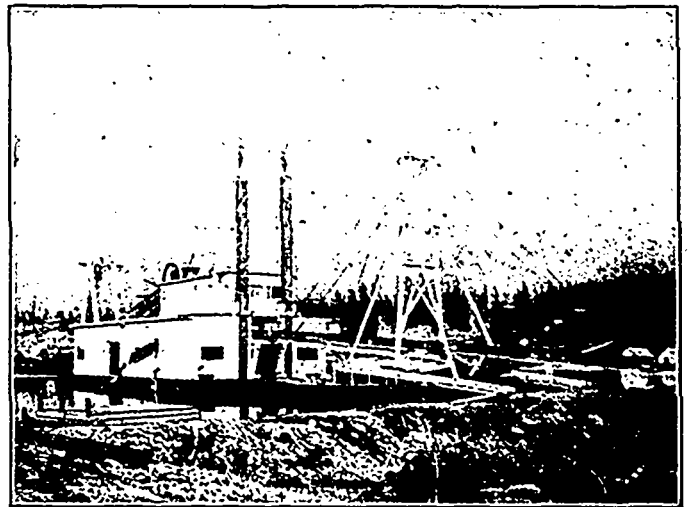
have to be taken away from the sluice until a hole is excavated sufficiently large to allow of dumping behind as the dredge moves ahead. In this case a cut was started 150 feet in width and continued for a distance of over 200 feet in length 30 feet deep, before there was room to allow of free dumping behind and uninterrupted work. During the digging of this pond a



Dredge at Gold Run in Course of Construction.

that all the lumber necessary was brought from Vancouver and the machinery was handled some sixteen times before being put in place the difficulties of the undertaking may be the better appreciated.

This season some alterations being necessary in the



View of Dredge Showing Bucket Ladder.

streak of hard yellow gravel with boulders embedded in it was encountered which told very severely upon the bucket lips, which, though made of manganese steel one inch thick, wore away very rapidly. Finally, however, bed-rock was reached at 30 feet, and some

two feet of it taken up by the bucket proving by its character that the gold on bed-rock is capable of recovery. But the excavation of the necessary pit and the labour required to remove the tailings made the work somewhat tedious and it was only towards the end of the season that any effective work became possible.

Dynamite was successfully used to shake up the hard yellow gravel, this being accomplished by boring a line of drill holes with a Keystone drilling machine. These holes were put down about 20 feet back from the face and 50 feet apart and fired by electricity. The results proved very satisfactory. It is the intention of the company next year to install a small motor on the drilling machine, and by this means the expense of drilling will be much lessened.

By the time the dredge had gone sufficiently forward to allow of freely dumping behind, the bucket lips had worn down so as to lose their cutting efficiency and as it was too late in the season to put on new

pleted the dredge should be ready for the commencement of operations by August 1st of next year. This dredge will be supplied with power from the British American Dredging Company's line and a pole line has been constructed a distance of seven and a half miles to connect therewith.

To Mr. Switzer, general manager of the B. A. D. Co., is due the credit of organizing this company—of which he is managing director—as well as organizing the B. A. D. Co.—which has resulted in bringing into British Columbia American capital in large amounts. Mr. Switzer was one of the early pioneers of the Atlin district, in the future of which he has unbounded confidence, which the result of this past season's operations fully justifies.

During the past season the district was visited by Mr. R. Tolmie, the Deputy Minister of Mines, who thus, assisted by Dr. H. E. Young, M.P.P., was enabled to familiarize himself with conditions. It is

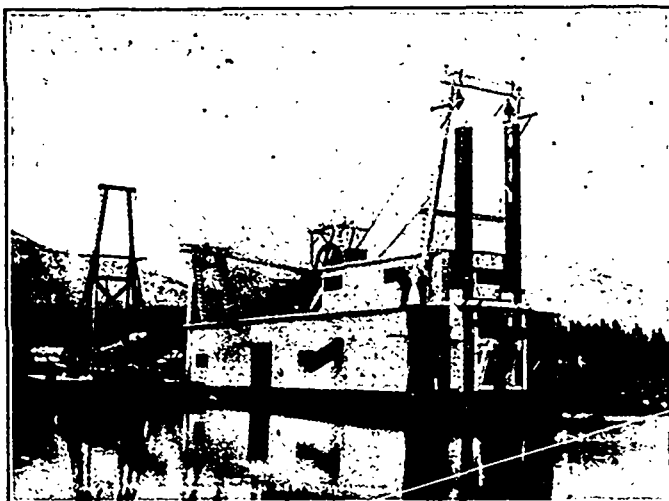


Main Winch on Dredge.

lips the general manager, Mr. Switzer, decided to suspend work for the season on October 18th. It is meanwhile the intention of the company to place on the buckets new thicker and wider lips at the beginning of next season.

This season's work has demonstrated several important facts: (1st) That the ground can be worked by means of dredging, (2nd) That this type of dredge will do the work, and will take up the gold with the bed-rock; (3rd) That the boulders are not an insurmountable difficulty and can be handled in most cases, (4th) That the values in the ground are such that a dredge digging to less than one-fourth of its capacity should afford a most profitable investment.

A second dredge was in course of construction this year on the property of the British Columbian Dredging Company, on Upper Spruce Creek, most of the lumber and machinery being hauled from Atlin to the company's property, a distance of 15 miles. This dredge is larger than the plant already described, and of the open connected type, having a capacity of 5,000 cubic yards per day. The hull being now about com-



The Dredge—Stern View.

hoped that as a result of Mr. Tolmie's visit, the Department will be in the future in a better position to adjudicate upon and adjust matters of dispute relating to property rights in Atlin and hence the costly expedient of litigation will be avoided.

Reviewing briefly mining operations in the district during the past year it may be presumed that the outlook has considerably improved and the future promises better than ever before. Hydraulic operations were conducted on Pine, Spruce, Boulder, McKee and Birch creeks with generally satisfactory results. A considerable area of new ground was acquired by Eastern syndicates and this area will be carefully exploited next spring with a view if conditions promise well to the installation of gold-saving dredges thereon. A part of Upper O'Donnell Creek was prospected this season by a local syndicate with encouraging results. Bull Creek, a tributary of O'Donnell, was also prospected in the same manner and good results obtained. O'Donnell Creek and its tributaries form a larger area than the Pine Valley, and the finding of gold therein in paying quantities will open up a very large district

for further dredging operations. Active operations have been continued on several of the quartz properties in the district, and in due course many of these properties will no doubt prove paying mines.

Individual placer claims, though fewer in number than in previous years, were successfully worked last season, and, in brief, conditions in every branch of mining have been unquestionably good, and the district's gold yield should vastly exceed that of 1903.

A TRULY WONDERFUL COUNTRY.

WE have been privileged to see an advance copy of a report prepared, we understand by Mr. Haskins, of the Rosella Hydraulic Mining & Development Company on that portion of the Cassiar district, through which it has been proposed to build a railway to be known as the B. C. Northern & Mackenzie Valley road. The report, it is presumed, has been written in order to hasten the construction of the railway in question, and if financiers can only be found to swallow all that Mr. Haskins has to tell them, there can be no doubt that the railway will be built in very short order. As the report has afforded us much entertainment, and is without question a most interesting document, we take the liberty of taking the following excerpts therefrom:

"The road when built will form a junction most likely with the Grand Trunk Pacific Railway at or near the Dease River. The ocean port will be on Nasoga Gulf in British Columbia, which is one of the best harbors on the Pacific Ocean. The other terminus will be Dawson City in the Northwest Territory, on the Yukon River, making the trunk line about 1500 miles in length, with branches about the same length or about 3,000 miles in all. The country to be served by this road is about 1,000,000 square miles. That country contains everything which is essential to make up a great railway traffic.

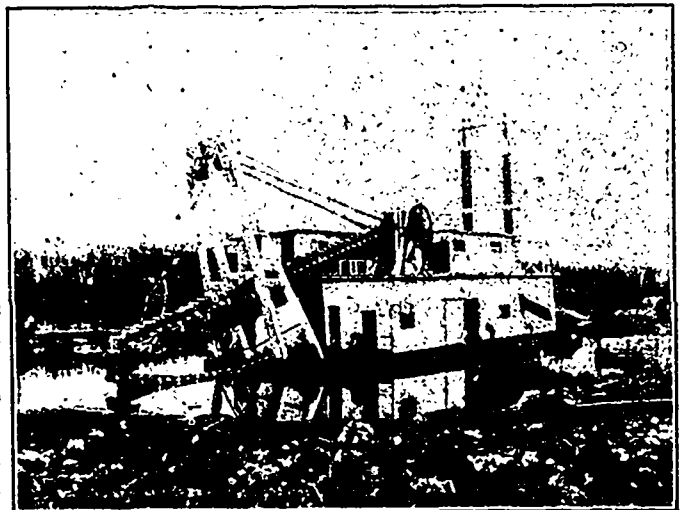
"The country that will be opened by the B. C. Northern and Mackenzie Valley Railway, has not only wheat land and stock ranges, but it has gold and silver, copper, lead, coal, oil, salt, platinum, zinc and fireclay, besides marble and bismuth, as the writer has found all these minerals, and I have no doubt that tin and nickel will be found in paying quantities in this vast country. As for the other ores, they are in abundance, as no other part of America that I have visited shows such large bodies of ore of equally high grade and so well defined, and as I have mentioned in previous reports, the country bearing those vast bodies of ore extends for one thousand miles in length at least, and five hundred miles in width, besides its vast gravel deposits, that in the near future, will be the homes of thousands of hydraulic people, and most of these deposits are lying along both sides of the proposed railway.

"On authentic returns the amount of gold obtained yearly, is about \$16,500,000, in other words this amount goes through the San Francisco mint each year from this northern country, and with this large amount now from a small population, what may be ex-

pected in the near future? as there is not more than about 5 per cent of the rivers and creeks worked that are known to be gold-bearing, of sufficient value to pay enormous profits by modern methods. Besides there is not one half of the country that a white man has ever trodden, and what will be the result if the proposed railway is built? and with millions of people prospecting, mining and settled on the lands adjacent to the railway? Is it not safe to say that there will be one hundred million in gold produced annually, besides, and it is safe to say that the other previously mentioned minerals will at least equal this; and no doubt the oil fields of the Northern country will turn out just as extensive and as valuable as those of Pennsylvania and other parts of the U. S. and Canada, and the writer knows that there are already discovered indications of oil in the Cassiar."

GOLD-BEARING GRAVELS OF CASSAIR.

"It can be safely said that the acreage on McDames,



View of Dredge at Gold Run.

Spring and French Creeks and their tributaries which would pay handsome profits by hydraulicing there is at least 150,000 acres that will average 100 feet deep and will take 100 hydraulic plants of five monitors each 100 years to work out those deposits alone, and those creeks comprise only a small portion of Cassiar district without speaking of the Northwest Territory in which Dawson City, the Klondyke and the headwaters of the Yukon and Mackenzie rivers are situated. The length of the last named rivers in the Canadian Northwest Territory, counting their branches where gold has been found, is at least twenty thousand miles, so one can form but a faint idea of the gold that is contained in those streams.

"There is also very large number of quartz propositions in the vicinities of French, Spring and McDame creeks, that will be opened up next season. The Rosella Company has large quartz properties in addition to their hydraulic leases, on which they intend to do extensive development work next year. Some of the largest ore bodies in the world are adjacent to the

above Company's property. One of these immense ore bodies is a true fissure vein ore ledge, and is upwards of five hundred feet in width and solid ore, the contents of which are gold, silver, copper, lead and zinc and belonging to the granite series. The footwall of this enormous body is the primitive granite its hanging wall is diorite, also of the granite family and this ore body is sufficient to supply any of the large trunk lines on the continent of America to its full capacity, as it can easily produce five thousand tons per day, if no other bodies of ore are found, but there are several other ledges found that will produce from 100 to 500 tons per day, and that from a radius of not more than 20 miles square, besides the large bodies of free milling and cyanide gold quartz, some of these carry high values in free gold and some high values in copper, silver, and gold."

"From Shakes Creek on the Stikine river to the head of Dease lake is 85 miles and will prove to be a very easy section to build as it offers no obstacles of great importance. With plenty of fairly good coal near the proposed line, this coal I understand is good for steam purposes. Of course I have not visited the ground in person but I have been told by men who have that the measures are from 10 to 40 feet in thickness, and was only taken up last season for the first time, and no doubt could be bought cheaply if taken in time."

MAGNETIC SEPARATION. *

(By F. T. Snyder, Oak Park, Ill.)

EVERY one is familiar with the simple fact that a magnet will pick up small pieces of iron; many persons are familiar with the fact that sufficiently powerful magnets will attract a large number of materials in which the presence of iron is, at least, not in evidence, but few persons realize that the design of magnetic separators and the practice of magnetic separation have developed to a point where it can be stated that there is no material which cannot be moved by magnetism if the commercial conditions under which its movement is desired will permit the necessary expenditure. For many materials the cost is usually prohibitive, but as a curiosity, pieces of wood, apples and other things generally magnetically inert, have been moved through distances of several inches.

In the early days of magnetic separation, previous to half a century ago, it was generally thought that the law of magnetic attraction was simple, and even quite recently it has been stated in text books that the attraction of a magnet for a movable particle varied directly as the strength of the magnet and inversely as the square of the distance. This, in common with the other simple laws of natural phenomena, has proved to be simple only under theoretical conditions which are not secured in practice. However, the law of movement of a free particle in a magnetic field

was understood and perfectly formulated at least half a century ago. In such formula the distribution of the field is assumed as known, while it is from this factor that the complications in the theory of magnetic separation usually occur.

The early types of magnetic separators consisted of a straight bar permanent magnet or an equally simple electro magnet. The material to be separated was either touched by one end of this bar or allowed to fall near it and in that way dragged out from the non-magnetic material. From this were developed numerous types of machines, similar in theory but better in mechanical form. Two troubles which developed were, first, the entanglement of non-magnetic material by the material attracted, and second, the question of getting the attracted material off the magnet again so that the magnet could operate continuously. Most of these machines were weak and applied to highly magnetic materials only and as the results were indifferent, the commercial growth of the industry was slow. During this time—that is, in the period of the last twenty years—the question of magnetism has come to be relatively very well understood in connection with the design of dynamo machinery, and as the necessity for magnetic concentration was urged with more and more persistency, it eventually fell into the hands of competent dynamo designers. The result was magnetic separators of greatly increased power and from them has developed a knowledge of the design of such separators which makes it possible to-day to build a separator which will handle practically all materials, the limit being that the more difficult the material is to handle, the greater the cost of the machine and consequently the less return commercially.

This great advance in design was largely due to the conception of a magnetic field as made up of lines of force which are assumed to emerge from a pole-piece of one polarity and pass through the air to a pole-piece of opposite polarity. In the production of this magnetic field the conditions are similar to those in an electric circuit, the magnetism produced being the equivalent of the current. The magneto-motive force due, in electro-magnets, to the current circulating in the windings of the coil, is the equivalent of the electro-motive force in the electric circuit while the resistance of the magnetic circuit is analogous to the resistance of the electric circuit. It was early seen that a large part of the cost of exciting a magnet was due to the resistance of the parts of the magnetic circuit at which the lines of force were compelled to jump through the air, air having a very high magnetic resistance as compared with iron. In an endeavour to reduce this resistance, the air path was shortened by bringing the magnet poles close together. In the early types of machines the material to be separated was passed through the field in such a manner that both of the poles were on the same side of the material so that in falling, the material passed through the loops of the lines of force twice. It was this looping of the lines that led to the entanglement of the non-magnetic materials with the magnetic materials and

*Paper read before the sixth annual meeting of the Canadian Mining Institute, March, 1904.

it was this entanglement which eventually led to the abandoning of the looped field type of machine for the type where the material to be separated passes between the poles and through the magnetic field but once and in consequence escapes entanglement.

The freeing of material which had been attracted was at first secured by means of scrapers, and later by reducing the field at the point where the material was desired to be freed, but it is now generally obtained in the best machines by reversing the magnetism, producing a neutral point at which all material of whatever attractability is dropped. So well have the principles of the designs of a magnetic separator come to be understood that a difference of magnetic susceptibility now offers in many cases a cheaper way of concentrating minerals than the customary way of taking advantage of the difference in specific gravity.

From its highly attractable property and from its low value, which has ordinarily prevented any other method of concentration, iron ore has naturally been a special field for magnetic separation. This has been with two specific ends in view, one, the enrichment of a low grade of iron ore for the purpose of reducing the freight to a furnace and also the furnace cost of operation per unit of iron smelted. The other use has been to free iron from deleterious materials, such as titanium, phosphorous and sulphur. Where these occur in separate crystals which can be liberated by crushing the iron ore, the resulting separation is one which frequently proves commercially feasible. In the case of sulphur the success depends on the fact that the sulphur compounds usually found in iron are either more or less magnetic than the iron oxides of the ore.

The separation of iron has divided practically into the separation of magnetites—that is, iron oxide, which is naturally magnetic and which can be picked up with an ordinary hand magnet -- and the hematites and limonites which are less magnetic, usually so feebly magnetic as not to be attracted by a hand magnet.

In the enrichment of hematites the question has divided into two different sorts of separation, one, the separation of high-grade hematites from sandstone in which they occur as a conglomerate, having been deposited as detrital material from older iron beds along with the sand; the other, the separation of silicious material which was originally deposited at the same time as the iron and usually in the form of intimately entwined crystals.

The question of the physical condition of iron ore with reference to its impurities, is one of the more important in the magnetic concentration of such material. One of the first questions which are asked by a furnace man when approached on the subject of iron concentrates is "the amount of the fines." If it is necessary to crush the material to such fine sizes that most of it will blow out of the top when put into a furnace, the purchase of any considerable tonnage of such material is evidently a matter to be approached with caution. Briquetting has made material advances and large experiments are being carried on

at present in the smelting of briquetted iron material. It should be noted that this matter of briquetting and the production of fines is entirely a question of the physical character of the ore. Magnetic separators now handle such feebly magnetic materials as hematite in chunks of practically any desired size, separators being constructed to concentrate material up to one inch in diameter. The cost of building and operating a separator increases about in proportion to the size of material which it is to handle. It is therefore a commercial matter as to whether the cost of briquetting, or the cost of concentrating at a larger size, out-weigh one another. Almost invariably it is cheaper to build a machine capable of handling larger size than it is to briquette, as in general briquetting costs more per ton than the cost of separation, including interest, depreciation and royalties on the separator when handling material as large as one inch in diameter.

In such a matter as the St. Lawrence iron sands, where the material is already crushed, and generally crushed even finer than enough to free it from the accompanying gangue, the question of briquetting is an important one and bears an aspect which should interest Canada with its water powers. The need of briquetting iron ore for use in a smelting furnace is brought about by the high pressure of the modern blast. If this blast could be eliminated, within certain limits it would be a matter of indifference as to whether the material was coarse or fine. It would still have to be granular enough to permit the escape of the gases generated in the smelting operation. Electric smelting provides the required condition that there need be no blast. The magnetites, being iron oxides, need only be mixed with carbon in the shape of any clean fuel, such as coke or charcoal, and subjected to the heat generated by an electric current, to have the carbon join with the oxygen of the magnetite and escape of carbon monoxide, leaving the iron to be tapped off in the form of pig. These St. Lawrence magnetites could probably be dredged up and concentrated wet into an iron ore of unusually high grade, and delivered in the Ottawa valley for a cost not to exceed one dollar per ton. This commercial utilization by means of magnetic separation would appear to offer the promise of a very considerable industry when taken in connection with smelting by means of the water power of the Dominion.

Of next importance (commercially) from the standpoint of magnetic separation is the separation of the mixed sulphides of lead, zinc and iron. This so-called "Leadville problem" has existed for many years. There was in this camp a large tonnage of zinc-lead ore which was too high in zinc to permit the lead furnace men treating it without getting into serious difficulty through the choking up of his stack from zinc accretions, and too high in lead and iron to permit the zinc smelter from treating it without the destruction of his retorts through slagging by lead and iron. The specific gravity of the zinc and iron was too close to permit of commercial water separation. Through zinc interests who were looking for an ad-

ditional supply of zinc ore, this problem was attacked along the lines of magnetic separation, and in its solution was secured much of the data which now forms the basis for an established magnetic separation industry. A parallel problem existed at Broken Hill in New South Wales, Australia. Here the lead and zinc were so intimately mixed that when crushed to the proper mesh for separation, a large amount of the lead was lost by sliming, and the zinc concentrates which were secured were too low in grade to stand the freights to a European smelting point. Here, as at Leadville, the introduction of magnetic separation has resulted in the utilization of a very large tonnage of what was heretofore waste material. In British Columbia there exists a similar problem. It might be pointed out that there existed two different ways of handling this problem. The mixture of zinc and iron sulphides may be roasted to reduce the iron sulphide, which normally is almost entirely non-magnetic, to a form of a highly magnetic sulphide, or it may be roasted further to bring the iron to the condition of a magnetic iron oxide, in either of which conditions it may be removed as the magnetic product. Operating in this way the cost of roasting is involved, and an additional loss due to the fact that if such roasting be deferred until the zinc smelter is reached, the sulphur can then be utilized in the manufacture of sulphuric acid. At Leadville and at Broken Hill the ore is not roasted, it being the zinc that is pulled out as the magnetic product, the iron sulphides remaining behind as the non-magnetic product. There is reason to think that this would be the better commercial way of doing it in British Columbia in those cases where the zinc sulphide is sufficiently feruginous to permit it. Such is usually the case where the zinc is black, or, as the miners speak of it, "Black-jack."

Third in commercial importance has been the separation of the manganese. Manganese, as is generally known, is used in the manufacture of Bessemer steel to which it is added in the form of ferro-manganese or speigeleisen for the purpose of reducing the oxides formed by overblowing the charge. For the purpose of making ferro-manganese the commercial requirements are for an ore that carries 50 per cent. of manganese. The tonnage of ores of this class is rather limited, while there is an enormous tonnage which carries from 5 to 15 of manganese. This is too much manganese to permit the ore being used as an iron ore, and it is not enough manganese to enable the ore to be used for the production of ferro-manganese. The magnetic separator enables the owner producing material of this character, to separate it into the products one a 50 per cent. manganese ore, and the other an iron ore carrying two to three per cent. in manganese, so making out of an unsalable product, two products, both of which find sale. In this separation either the manganese or the hematite may be the more magnetic product, depending on the local peculiarities of the ore handled.

The magnetic separation in which Canada is especially represented is the cleaning of corundum. A commercial sample of Canadian corundum purchased

in Chicago was found to contain something over 10 per cent. of magnetite. Passing this over a magnetic separator, the magnetite was reduced below 3 per cent. the change representing an increase in the corundum contents from 89 per cent. to 97 per cent. Further experiments along this line seem to indicate that if desired, the iron could be sufficiently removed from the aluminum oxide to render corundum a possible ore for the smelting of aluminum.

The attractability of hornblende has been utilized in connection with the concentration of metallic copper. In ores of this character the gangue, which was almost entirely hornblende, was pulled away as a magnetic product from the copper, leaving a copper ore which was sufficiently rich to smelt directly for copper, although the original ore carried less than 1 per cent. of copper.

Another interesting separation has been the handling of mica as a magnetic product. This may be utilized in two ways, for the extraction of mica from other material as an impurity and also for the concentration of mica for use in making mica insulating materials.

Of all recent developments of the magnetic separating methods, the more important is the fact that the cost of such separation is now generally below that of the equivalent water concentration, so that even in cases where water concentration is particularly adapted technically, as in the separation of chrome ores from serpentine, the magnetic method still proves the better commercially. It was this very low cost of magnetic separation that enabled concentration to succeed in the enrichment of hematite after water methods had failed commercially. One fact of advantage in magnetic separation is that it can be made, as desired, either wet or dry. It occasionally happens that the freight on moisture contained in an ore shipment to a smelting point, is a sufficient item to warrant drying it. In this case if the ore is reasonably dry as it comes from the mine, the magnetic separation can be made dry, saving the cost of drying. On the other hand, if moisture in the ore is immaterial, either from freight considerations or from the smelters' standpoint, and it occurs in a wet mine, it is possible to put it through the magnetic separator without drying, shipping the product as it occurs. This is of special importance in connection with the St. Lawrence magnetite sands. The cost of drying that material before separation would probably prohibit its commercial utilization. As it is, such sands can be dredged up by any economical form of suction or dipper dredge and sluiced through a machine with an adequate supply of water, and produce a concentrate which can be drained to less than 15 per cent. of water without artificial heat.

As illustrating the results which are being obtained at present by means of magnetic concentration, there are exhibited samples showing separation on the magnetite ores of Cornwall, Pennsylvania, of iron pyrites and talc from magnetite, representing a reduction of sulphur from $2\frac{1}{2}$ per cent. in the original ore to less than $\frac{1}{2}$ per cent. in the cleaned ore. Samples of mag-

netite extracted from the St. Lawrence sands show an iron content of 69.3 per cent. with a trace of titanium, leaving a sand tailings carrying 2.8 per cent. iron.

As illustrating the enrichment of hematites, two samples are shown, one being the separation of hematite and sandstone, producing an iron concentrate carrying 65 per cent. in iron and .008 in phosphorous, and a sandstone tail carrying 8 per cent. in iron, .04 in phosphorous showing a most interesting elimination of the phosphorous from the iron compound. The second being the separation of hematite and jasper, the hematite product carrying 50 per cent. iron, jasper 13 per cent. In connection with the hematite samples it will be interesting to note the size, the material having been crushed to pass a 4 mesh screen.

As illustrating the iron-zinc separation at Leadville, samples are shown, assaying for a zinc product 46 per cent. of zinc and 3.2 per cent. iron, and for the iron product, 37 per cent. iron, 7.3 per cent. zinc. The equivalent samples for the Broken Hill ores were tails carrying 8 per cent. in zinc and heads 48 per cent. zinc.

From the manganese industry samples are shown representing the concentration of Utah manganese from silica and gangue, the manganese being enriched from 15 per cent. to 41.8 per cent.

From the field of corundum cleaning two samples were shown, one being material at 20 mesh, showing cleaned corundum having .08 per cent. of iron and a magnetite which had been taken from the corundum carrying 65 per cent. in iron. Corundum of 100 mesh showed only a trace of iron after having been cleaned and produced heads running 63 per cent. iron.

Another sample of the concentration of magnetite was shown in the concentration of black sands from placer workings. In this case the concentration was 20 to 1, ilmenite and some of the rare metals being pulled away from the gold and other sands leaving a concentrated product which would stand shipment to a smelter.

A SUMMARY OF MINING PROGRESS IN BRITISH COLUMBIA DURING THE MONTH OF NOVEMBER.

CONDITIONS generally during November have been settled and favourable, production having been steadily maintained while a number of important transactions, chiefly in the nature of the bonding of claims on working terms are reported to have been carried through.

In the Coast districts activity has been chiefly confined to development work on Texada Island, in the Mount Sicker section, and at Howe Sound where the work of installing machinery at the Britannia continues. In the first named district very satisfactory results are attending the development of the Marble Bay mine, where a fine body of ore has been opened up in the lower levels. The Tyce Copper Company realized last month a record return on ore treated at the Ladysmith smelter, a recovery of \$83,547 having

been made, from which freight and refining charges are deducted, on consignments of rather under six thousand tons. Near Ladysmith a promising property, the Victoria, from which already small shipments have been made is being developed. The coal mining situation on Vancouver Island appears rather less satisfactory, the output from the collieries at the present time being relatively small. It is worthy of note, however, that the Comox high class bituminous coal is being subjected to test by the Japanese naval authorities with the prospect of its being used largely on that country's men-of-war.

The season of active work in the placer mining districts of Cassiar and Cariboo having been closed, there is, of course, little to note in reference to recent developments in those regions. The report of the season's operations of the Thibert Creek Hydraulic Company will, however, be issued shortly, and we are given to understand that the additional capital having been provided, the work of suitably equipping the mine and increasing the water supply to a thousand miners' inches was successfully carried out, and the mine may be expected therefore to yield proportionately greater returns for future working. Last year, it will be remembered, notwithstanding the inadequacy of the water system and the shortness of the season, the profits represented a return in the neighbourhood of 20 per cent. As a result of the pioneer work of this company, and its now promising prospects, a number of other undertakings of a similar nature are contemplated, all the available ground on the creeks in the neighbourhood having been applied for during the past season. In Cariboo the fact that the Slough Creek Company has been unable to secure additional and much needed capital in London, the attempt to place another issue of debenture stock having failed, is much regretted, as the existence of the enterprise is thereby threatened. The work at the mine has been carried on for many years in the face of great natural difficulties and at enormous expense, and it would certainly be most unfortunate if at this juncture when the company is within measurable distance of achieving success, that all should be lost. The persistence and well-directed energy, however, which has characterized effort in the past may yet carry the day, and doubtless those most heavily interested in the success of the venture will yet find some means of successfully meeting the present crisis in the company's affairs.

At Kamloops the successful operation of the Iron Mask is reviving and encouraging interest in the development of other claims in the district, and this month work was resumed on the Truth group, which is reported to be a property of considerable promise. During the year, too, much development has been performed on claims in the Jacko Lake section. Of these the Ajax and Monte Carlo have been opened up by much surface work, which has exposed deposits or leads of good width carrying gold and copper values of \$12 and over.

At Camp Hedley, the Nickel Plate mill was closed down in October for some days by the washing out of

the flume. It is very difficult to obtain information regarding this mine, which is owned by wealthy Americans, but it is popularly believed that there are few more profitable mines in the province. The showing of the Stenwinder in the near-by Fairview camp, owned by the New Fairview Corporation, Limited, is less satisfactory. This mine has a large body of low-grade free-milling quartz which by this time should have been made to yield fair returns on operations. For reasons, however, which need not be gone into here, even if space permitted, this has not been the case, but instead the company is heavily involved in debt, and it is more than probable that the holders of common stock will be done out of their investment altogether, either by the forfeiture of the mine on the part of the preferred shareholders, or by the new proposal to make another large issue of preference stock, whereby the ordinary stock would become absolutely valueless.

Probably a greater number of mining investments have been made in the Lardeau this year than in any other section of the province and in November two more transactions of importance were recorded. One of these involved the acquisition by Minnesota capitalists of eighteen claims on the Nettie L. Hill on working bond terms, the bondholders agreeing to expend no less a sum than \$100,000 in developing the properties by driving a tunnel for a distance of a mile and a half into the mountain with the expectation of opening up what is known locally as the Silver Cup lead. The claims thus acquired under this agreement included the Rattler, Rantler No. 1, Morning Star, Jumbo, Florence, Union Jack, Independence, the Gloosecap, Kootenay and May Queen groups and the Lardo. Since the Raven and Vancouver claims in the same vicinity were bonded to Pittsburgh investors on very similar terms, claim-owners in British Columbia now appear to realize generally that in order to dispose of their properties they must be prepared to meet prospective purchasers in a reasonable manner, and it is largely due to this change of view that it has been easier of late to interest capital in mining undertakings in the province.

In the free-milling quartz district of Camborne there has been much activity during the month. Before suspending operations for the time being the Oyster-Criterion made a clean-up of 175 oz., while at the Eva surface operations have been steadily carried on, the towers of the tramway destroyed by fire last summer having been replaced and other work done for the resumption of active mining operations at an early date. Preparations have also been made for the commencement of shipments from the Mammoth and Beatrice, and at other claims development work has been in steady progress.

Beyond recording regular and fairly substantial progress there is little to remark anent mining development in the Slocan during November. The mines in the neighborhood of Sandon are making ready for winter working. Conditions, however, are steadily improving, and although the lead output yet falls short

of previous achievements upon which the Silver-Lead Mines Association based its estimate to the Government, the mine development work done this year, stimulated by better markets, the higher price of silver and a demand for zinc, is bound to tell in the immediate future. In addition to the extensive work, now nearing completion on the Rambler-Cariboo, the Ruth recently has let a contract for a 600-foot tunnel. The Payne Company's zinc separator was leased during the month to the owners of the Lucky Jim mine, from which 5,000 tons of zinc ores will be sent. Apropos of this Mr. A. C. Garde, late manager of the Payne, is reported as having said: "For years past the mainstay of the Slocan has been its lead ore. Indeed so much has this been the case that when the owner of property in the Slocan ran into zinc, he usually closed his mine. A striking instance of this being the Lucky Jim at Bear Lake, which was opened some twelve years ago, ran into zinc and closed. Last year it was again opened and four men took out over a thousand tons of ore, running 54 per cent in zinc, which was shipped at a profit. Any ore which will run from 42 to 44 per cent zinc and upwards is payable even under present prices for freight and smelting, and any over 50 per cent can be advantageously shipped in the crude state." Last month shipments of zinc were made by two mines, the Payne and Ivanhoe, and within the last week the Ivanhoe made a further shipment of 200 tons. It has been announced meanwhile that the zinc plant now building at Rosebery will be in readiness for the commencement of operations in April next. Lead production is being maintained from some twenty-three Slocan mines. In the Slocan City Division some promising new discoveries of ore were made at the Ottawa, which is being extensively developed. A carload shipment was also made from the Kilo on Lemon Creek during the month, from which a return of \$64 in gold values was received. Ainsworth, which at one time promised exceptionally well, but except in the case of one mine, has made of late years no considerable silver-lead output, is again receiving attention, several claims in the district having been bonded within the past few weeks. Thus, Mr. C. Fernan, the engineer responsible for the erection of the Rosebury works, has acquired the Black Jack and Old Timer, said to show good zinc and silver values on Coffee Creek, and other transactions, including the bonding of the Grant, are also reported. The No. 1 mine, too, was recently leased and operations started, while the Black Diamond Tunnel Company expect to ship ore from the Highlander next month. The tunnel on the Black Diamond, which has reached a distance of 2,605 feet, gives a depth, by-the-way, of 1,500 feet on the lead—the greatest depth, it is stated, yet attained in any British Columbia mine.

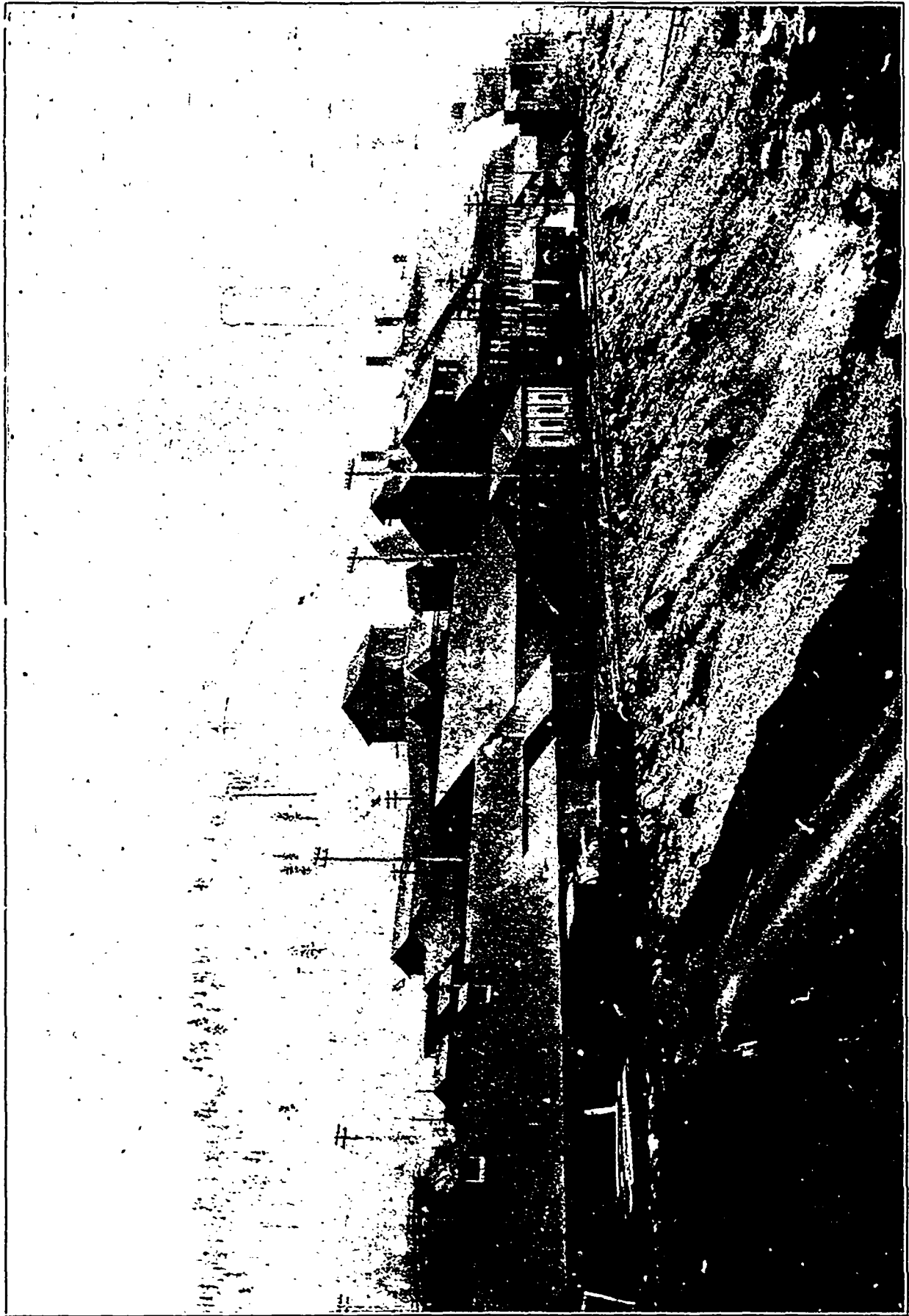
Residents of Nelson have been much cheered by the relatively satisfactory report of the Hall Mining & Smelting Company. The profit of approximately \$30,000 is not large on the capital represented—which, however, is excessive and should certainly be reduced to admit of the possibility of a reasonable return

thereon—but still the showing as compared with that of last year, when a loss was made, is distinctly encouraging, and it is hoped significant of better things in the future. It is to be noted that the chairman in his speech at the annual meeting intimated that the board had under consideration the introduction of a new smelting process (unnamed), which had already given excellent results in Australia, and would likely result if adopted at the Nelson Works in largely reducing operating costs. There can be no doubt that lead smelting practice in the province is capable of improvement. Other good news from Nelson this month is the resumption of operations at the Mollie Gibson, the bonding of the Fern at Hall Siding, and the announcement that developments have been sufficiently well advanced at the Juno to warrant the erection of a ten-stamp mill on the property. Bonds were also taken on the Belmont group of four claims near Waneta and on the Ivanhoe. Equally satisfactory reports have been received from Ymir. Thus it is announced that recent developments at the Ymir have been most encouraging, a better class of ore having been encountered in the 1000-foot level, and it is hoped that the correctness of the theory that the pay ore has an eastern trend will be shortly proved. During the month 40 stamps have been crushing, but it is expected that directly sufficient water becomes available the full complement of 80 stamps will be employed. The equipment of the Wilcox was increased in November by an additional ten stamps, and the output from the mine will thereby be considerably increased, while shipments from the Hunter V., which is proving to be a very valuable property, have since October been practically doubled, and now average two hundred tons a day. The conditions for mining at low cost at the Hunter V. are peculiarly good, and the ore is perhaps produced more cheaply there than at any other mine in the country.

Concentration operations at Rossland during recent weeks has been much affected by the shortage of water, for which an unusually dry summer is responsible. But this drawback no longer exists since the late autumn rains have set in. The tonnage output has meanwhile recently increased to rather over seven thousand tons a week. Of this Le Roi continues to contribute considerably the larger proportion, with weekly shipments of from two to three thousand tons, and it is proposed to maintain a monthly output of ten thousand tons. The work of examining the mines to be included in the proposed Le Roi-War Eagle amalgamation has commenced, but necessarily some weeks must elapse ere so comprehensive an undertaking can be concluded. Meanwhile it is possible, we are credibly informed, that still another valuable property may be included in the scheme, with a view to the satisfying of interests at present not entirely favourable to the proposal. It is believed locally that Le Roi No. 2, which has been earning fair monthly profits this year, will pay a dividend in the near future, while developments on the Annie are proceeding very satisfactorily, some excellent ore giving

exceptionally high assay returns having been encountered during the month. Machinery for the new Velvet-Portland Concentrator is now being delivered, and the work of installing it at the mine has commenced. The Velvet also recently let a contract for the hauling of ore to the railway. Another installation of importance is also to be made at the Jumbo mine, it having been arranged to improve the facilities for the shipment of ore by building an aerial tramway to connect the workings with the Red Mountain Railway. This tramway will be nearly a mile in length, and will have a carrying capacity of 500 tons a day. During the month the Rosslund Power Company's mill resumed operations and is now working at full capacity, while at the Le Roi No. 2 mill about 25 tons per day has been treated. The Trail smelter has been undergoing some repairs, and it is reported that there is a prospect of an increase being made in the capacity of the works. Activity has been very general in the Boundary district during the month, an average weekly production of over 10,000 tons having been maintained, considerably over half of which was treated at the Granby works, where six furnaces are in use producing between five and six hundred tons of copper a month. The construction of the branch line of the Great Northern Railway into Phoenix is now nearing completion, and it is expected that trains will be operated over the road before the end of December, but whether or not the building of this railway will have the effect of reducing charges for the carriage of ore remains yet to be seen. Amongst the developments of the month may be mentioned the finding of a new promising ore body on the Providence, the resumption of operations at the Republic, one of the earlier-discovered properties near Boundary Falls, the installation of machinery at the Skylark in readiness for winter working, the commencement of shipments from the Senator, and the extensive work that is being carried on by the recently organized Montreal & Boston Company at the Rawhide and Brooklyn mines. This company's smelter at Boundary Falls has had one furnace in use during the month, but early in December the second furnace will be blown in and a larger output made from the mines.

The announcement made at the annual meeting of the St. Eugene Company held in Toronto this month that quarterly dividends were to be resumed, a two per cent distribution being payable on December 15th, has been received with much enthusiasm, as it is felt that the profitable operation of this mine will be of material assistance in restoring confidence among Eastern Canadian investors in British Columbia undertakings. During November a new ore-body, showing 15 feet of clean galena in the face, was encountered in the 125-foot level, at a point about 250 feet distant from a former recent strike in the raise from the No. 1 tunnel. The prospects at the mine were, in fact, never more promising. Shipments were also made during November by the North Star, Paradise and other smaller properties. In the Wilmer, the Lead Queen, a prospect of very great promise, was bonded recently



A recent photograph of the Granby Company's Smelter, Grand Forks, at which there are now six furnaces in use.

to American investors, who purpose developing it forthwith.

East Kootenay coal and coke production has been maintained at about the same rate as last month, but it may be noted that the Coleman collieries are now beginning to supply the demands of the Granby smelter. At Michael three of the mines have been closed for the present, while a serious explosion occurred at Morrissey on the 18th inst., resulting in the death of fourteen miners and in considerable damage to the mine.

MINING IN THE KOOTENAYS.

(Some Notes from our Representative in the field.)

CAMBORNE DISTRICT MINES.

MR. A. H. GRACEY, manager of the Eva gold mine, situate on Lexington Mountain, near Camborne, Fish River camp, returned to Nelson recently from the mine. His report, submitted to a meeting of directors of the Eva Gold Mines, Ltd., held in Nelson on November 19th, ulto., stated that 35 men were employed on the company's property. The reconstruction of the aerial tramway between the mine and the company's 10-stamp mill at Camborne, the former having been partially destroyed by forest fires last summer, was about completed, and it was expected that by about December 1 it would be practicable to resume crushing at the stamp mill.

The Oyster-Criterion stamp mill of the Great Northern Mines, Ltd., also situate at Camborne, has been closed down, it is hoped only temporarily, but no announcement has been publicly made by the company as to its intentions in this connection. There were some negotiations between the management of the Eva mine and the Great Northern Company with a view of the former arranging to use the latter's air compressor to obtain power for machine drills, etc., at the Eva, but a mutually acceptable agreement as to terms and conditions was not arrived at, so nothing was done in this direction.

It is understood that the Beatrice mine will ship ore this winter, arrangements for rawhiding having been made. A trail has been built from the Fish River valley to the mine, which is on the divide between Mohawk Creek and the North Fork of Lardo Creek, and distant six or seven miles from Camborne, being at an altitude of about 5,000 feet above Fish River. By the new trail the distance to a shipping point is only about half that travelled with ore previously sent out, so there should be a saving in both time and costs. The Beatrice ore runs well in silver and contains gold and lead values as well.

The Mammoth, on Goat Mountain, also in the neighborhood of Camborne, is expected to contribute to the production of Fish River camp this winter and assist in making the season's output the largest it has yet made.

THE LEAD QUEEN, N. E. KOOTENAY.

The Lead Queen, situate on No. 3 Creek, which flows into the Columbia River north of Wilmer, is

stated to be one of the most promising mining properties in that section of the Kootenay district. Its showing of ore is described as being large, and although the development work heretofore done is not extensive, it is sufficient to indicate that the property may be developed into a productive mine. It has been bonded by men from the Eastern States, who purpose opening it up to prove whether its surface promise will be maintained at depth. On Horse Thief Creek and Toby Creek and their tributaries, all southward from No. 3 Creek, there are several shipping mines, including the Ptarmigan, Delphine, and Paradise, and it is confidently anticipated that the Lead Queen will, with development, prove to be quite as valuable as any of these.

OUTPUT OF HUNTER V. MINE.

The management of the B. C. Standard Mining Company's Hunter V. group, situate about five miles southeast of the town of Ymir and on the divide between Hidden Creek and Porcupine Creek, tributaries of Salmon River, have made arrangements with four Kootenay and Boundary district smelters to regularly take ore from the Hunter V. mine in the following proportions: Hall Mining & Smelting Company's smelter, Nelson, 30 tons daily; Northport Smelting & Refining Company's smelter, Northport, 30 tons; Canadian Smelting Works, Trail, 50 tons, and Granby Con. Mining, Smelting & Power Company's smelter, Grand Forks, 50 tons; total 160 tons per diem. This will allow of an output being made of between 4,500 and 5,000 tons per month, to regularly maintain which the mine is well equipped. The winter's snowfall has already commenced around Ymir, but the B. C. Standard Mining Company's aerial tramway from the Hunter V. mine to the Nelson & Fort Sheppard railway provides an excellent means of transportation, so that no difficulty in shipping the ore is anticipated. The average returns from about 400 tons of ore shipped from this mine last winter, when the market price of silver was only 44 to 48 cents per ounce, were within a fraction of \$10 per ton after deduction of freight and treatment charges. As the greater part of the value in this ore is in silver, ranging in last winter's shipments from 19 to 44 ounces to the ton, and the average market price is now fully ten cents an ounce higher, it is probable that the company's operations will be profitable, assuming that the ore now being shipped contains as good values as were obtained last season. The company is locally managed, has large deposits of ore, and its capitalization is only \$200,000, so it would seem probable that next year it will be a dividend payer.

GRANITE-POORMAN MINE.

The Granite-Poorman mines, situate near Nelson, together with the 20-stamp mill on the property, are now under lease to Messrs. M. S. Davys and S. S. Fowler, both of Nelson, who are working the Granite, and are understood to be doing fairly well. They commenced operations last summer and for about six weeks, in July and August, ran the stamp mill, until lack of water compelled a suspension of work. In November they started up

again, with one shift running the mill and the next the air-compressor and rock-breaker. With more water they would be able to put on two shifts. At present they are employing about fifteen men.

Both these mines are owned by the Duncan United Mines Company, which last year continuously worked the Poorman for nearly ten months, in that time taking out about 100,000 tons of ore, from which was obtained, approximately, 2,500 oz. bullion and 270 tons concentrates. This ore was all treated at the company's mill, which is run by water power obtained from Sandy and Eagle Creeks, under a head of 700 feet.

THE HALL MINING & SMELTING COMPANY.

IN his report to the Directors, Mr. J. J. Campbell, agent and business manager of the Hall Mining & Smelting Company at Nelson, gives the following account of operations during the past year:—

Mining Department.—Mr. Davys continued his operations under his lease of the Silver King Mine during the year, his shipments for that period amounting to 4,341 tons, containing 92,856 ounces of silver and 318-124 lb. of copper, or an average of 21.4 oz. of silver per ton and 3.66 per cent copper. His operations were confined to the old workings in and above No. 5 Tunnel and to some work on the surface of the Silver King, and a little prospecting work on the surface of the American Flag, where some low-grade ore was opened up. Some attempt was made to get down below No. 5 by siphoning out some of the water, but it was unsuccessful. As you have recently had an opportunity of having Mr. Davys personally explain the work done by him, it will be unnecessary for me to give details. Upon the termination of his lease, prior to his departure for England in August, a three months' lease was given to Richard White, who was restricted at our option to the employment of two men. Four men have been at work, and about 100 tons of clean ore have been placed in the ore bins.

Investigation of methods of concentration has not yet led to any results warranting the expenditure on plant for the purpose of treating the low-grade ore in the mine.

Emma Mine (Fluxing Ore).—The development of the property was continued, and at the same time 27,975 tons of ore were mined, of which 9,057 tons were shipped to our own smelter and the balance sold to the other smelters in the Boundary and Trail districts:—9,650 tons to the Granby Consolidated Mining, Smelting and Power Company; 88 tons to the Montreal and Boston Copper Company; 4,625 tons to the British Columbia Copper Company, and 4,555 tons to the Canadian Smelting Works.

The inclined drift was continued to a distance of 282 feet from the portal, and a pit sunk at the end 30 feet deep to test the grade of the ore underneath the incline. The quarrying of ore in the glory hole, connected by chute with this incline, was continued. Some car loads of ore were mined from the wide vein, where it is cut by the spur to the B. C. mine, and as

this body proved to be of good grade for 50 feet wide, a boiler hoist and loading skip were installed, and arrangements made for the sale of a large output. The grade of ore was not maintained, however, and after some 5,400 tons had been shipped, I stopped work at that point until a more favourable opportunity for further development should occur.

In February an adit from the level of the railway spur was started on the west vein, which after 30 feet, entered good ore. An incline was then begun, and the ore stoped nearly to the surface, connecting with the surface in two places. The vein varies from 15 to 20 feet in width, and the face of ore at the end of this incline is about 80 feet high vertically, and is nearly under the portal of the first incline.

In July and August of this year three diamond drill holes, aggregating 301 ft., have been bored from the lower incline, and have furnished evidence of an addition to the ore reserve of about 20,000 tons. I think that during the year ending June 30, 1905, we may look for a very fair return on our investment in this mine, as well as the assurance of an ample supply of iron flux so essential to the smelter.

Smelting Department.—The regulations for the payment of the bounty on lead became effective in February, 1904, when the first claims were certified to, and until then the stimulating effects of the bounty were not fully felt, although the bounty was then paid on all lead mined after July 1st. Our purchases of lead ores amounted to 12,409 tons during the year, or nearly double those of the previous financial year. I anticipate a considerable further increase during the current year. At present the supply is seriously affected by scarcity of water following a most unusually dry season, which has closed down some concentrators and greatly reduced the output of others.

Recovery from the results of the depression is slow, moreover, and apart from the temporary cause mentioned, the output from the Slocan is falling very far short of estimates made by the Silver-Lead Mines Association six months ago.

There has not been any improvement in the supply of profitable silicious ores.

We have the advantage, since February, of an ample supply of ore carrying a high excess of lime, from the Hunter V. mine, rendering the purchase of limerock unnecessary.

During August the Silver King ore on hand was smelted in No. 1 furnace, but it has since been more advantageous to have it smelted at Trail, as there was not enough for a long run.

The lead refinery at Trail of the Canadian Smelting Works is now working successfully, and some of our base bullion has been treated there, and it is now intended to increase its capacity considerably. Lead corrosion works are about to be started at Montreal which will greatly increase our home lead market.

On the smelting operations for the year ended 30th June, 1904, Mr. R. H. Hedley reports:—

No. 1 blast furnace was in operation for 204 days, and No. 2 for 324 days, and smelted 22,805 tons of custom ores, together with 9,331 tons of Emma, produc-

ing 6,155 tons of lead bullion. In addition to this No. 1 was operated for 27 days in August on Silver King ore, producing 140 tons of copper matte, which was shipped to the Granby Consolidated Mining and Smelting Company's smelter for converting. The tonnage of the lead smelting operations was made up of 14,169 tons lead ore and concentrate, a large proportion of which was roasted; 5,915 tons of dry ore, and 2,721 tons of B. C. Standard. This is an increase of 6,025 tons of ore, with 1,845 tons of Emma, over the previous year's smelting operations. For the first six months the ore supply was of a very unsatisfactory nature, and I find that lead being scarce, the proportion of flux was much higher in the charge; thus 10,180 tons of ore were smelted with 5,159 tons of fluxing Emma, while in the second half-year 12,625 tons of ore required but 4,172 tons of Emma. It is also evident in the bullion produced, which was 2,750 tons in the first, and 3,405 tons in the second half.

The lead bullion shipped carried 1,096,415 oz. of silver and 9,201 oz. of gold, while the copper matte carried 41,294 oz. of silver, 130 oz. of gold, and 130,800 lb. of copper, making a gross value for the year of practically \$1,000,000.

In the early part of the year the uncertainty as to the future of the ore supply made it seem unwise to put in hand any of the planned improvements at the smelter, but certain heavy expenditures for maintenance, etc., were absolutely necessary. In the second half of the year the promise of the bounty on lead somewhat stimulated the ore supply, and I felt justified in putting in hand certain improvements which have had their effect on the last month or two of the year. The maintenance of the plant generally has been extremely heavy, about \$22,000; a heavy item being renewals in timber, lumber, roofing, etc., much of which has been in service since the smelter started. The improvements and necessary additions during the year have been a culvert under the main trestle, at a cost of \$378: this enabled us to fill the trestle with slag, and obviate the necessity of renewal; new ore bins costing \$650; a system of connection with the old Silver King ore crusher and sampler, by which our B. C. Standard and Emma fluxing ores are handled from railway cars to gravity bins at a cost of from 15 to 20 cents per ton; cost of installation, including electric equipment, \$3,750; 40 ft. of additional trestle at the sample mill, \$440; a 6-in. pipe line from the penstock to the reservoir, \$476; a third hand roaster of improved design and greater capacity, \$2,864. We have also spent on flues, both in maintenance and improvements, \$3,390, old flues being inadequate for three hand roasters, and have purchased a new charging scale, fire hose and a pair of larger settlers for No. 2 furnace at a cost of about \$1,100. \$1,000 have been spent on a new elevating system, designed to economise labour in handling calcines and foul slag. This is not yet completed.

Beginning with January, I have gradually increased Mr. Harris' sphere of usefulness by transferring him from the assay office to the smelter. It seems desirable that the detail of smelting operations be watched closely, and I wish to carry on some experiments along

certain lines with a view to improving our metallurgical work. The experiments have proved satisfactory; and the step has been justified.

The chief improvements to bins have been in making the fuel and flux deliver by gravity to the barrows, which means a direct saving, observable towards the end of May and during June, of over \$12 a day.

Early in February we received the first shipments of moment of the B. C. Standard ore and gradually replaced our limestone with it, with advantage to the smelting operations. The roasting plant has been very hard pushed for the greater part of the year, and has generally given satisfaction, though the mechanical roaster had to go in for extensive repair at the close of the year.

THE KING AS A YUKON MINE OWNER.

HAD he but preserved the life of a mining claim that was deeded to him about two years ago,

His Majesty King Edward VII. would now be on a fair road to increase his private fortune by the addition of a considerable quantity of virgin gold taken fresh from the auriferous gravels of the Yukon. Thus the *Yukon World* of October 28th. The claim was thought to be barren and by reason of its non-representation was allowed to lapse to the crown, or nominally King Edward himself, and it is a question now, paradoxical as it may seem, whether or not the loss in one instance may not likewise be a gain in another, though it is quite likely that before a representative of His Majesty could make a claim to the ground some horny handed miner will have planted his relocation stakes at the upper and lower boundaries and received a grant to the same.

This is how it happened that the King came to be a mine owner in the Klondike, though the records in the Gold Commissioner's office fail to disclose the date of his miner's license. On July 2, 1900, a number of mining claims were sold at auction by the government, among them being a section designated as 1A on a tributary of Eureka Creek at No. 18 on the left fork. It was supposed to be 250 feet long and in the competition for its possession it was finally knocked down to J. K. Sparling. Things in those days were booming and it was not known but that Eureka would develop into a second Eldorado. At any rate there were those who were willing to take a chance.

Nothing was done with the ground the first year beyond the payment of \$200 in lieu of the representation work required by the regulations, and it was renewed to July 2, 1902. About the same time the renewal was taken out an agreement was entered into to sell the claim to W. E. Carlin and others for \$3,200, but the option was not taken up. Then came a grouping for the purpose of working in common claims 1, 1A, 2, 3, 4 and 4A, the work was done and the fraction that was destined to become famous as the private property of King Edward was again renewed.

Within a year afterward, the making of history as pertaining to 250 feet of ground on a tributary of Eureka commenced. It was on February 10, 1903, that

Mr. Sparling, in a spirit of generosity and loyalty to his King, determined to deed to His Majesty the claim upon which the depth, breadth, extent and richness of the paystreak was yet to be ascertained. So, a quit claim deed was made out wherein J. K. Sparling was nominated as the party of the first part and His Majesty King Edward VII. as the party of the second part, it was duly signed, sealed and acknowledged, \$2 was paid for the recording of the same, though the regulations were violated in not demanding the date and number of His Majesty's license, and to-day the book of records for Eureka Creek shows the transaction to have been made in due form and in perfectly proper manner.

That is the last entry in the book. The work required by the regulations has not been performed and the claim is open to re-location. In other words, any old sort of a man may jump His Majesty's ground and he will have no more redress than the commonest, most itinerant of his subjects and posterity might have forgotten the fact that their sovereign was at one time their neighbour had it not been for the persistent prospecting of those who own the adjoining claim.

During the past year Eureka Creek has been regarded with more favor than since the boom days and no section of the stream has been thought more promising than Eighteen up on the left fork. The pay has been rather spotted, but where it has been located it has proven to be quite good. Recently the paystreak on No. 2 was uncovered, and there is every reason to believe it extends through the fraction and into No. 1, which, had His Majesty retained possession of the claim, reminds one of the old saw, slightly paraphrased, "it might not have been." Some are born rich, others have riches thrust upon them, while others miss it by allowing their claims to lapse.

ANTIDOTE FOR CYANIDE POISONING.

THE committee of the Chemical, Mining and Metallurgical Society of South Africa, appointed to investigate cyanide poisoning, agree in recommending as an antidote the following:

1. Thirty c.c. of a 23-per cent. solution of ferrous sulphate.
2. Thirty-three c.c. of a 5-per-cent. solution of caustic potash.
3. Two grammes of powdered oxide of magnesium (light).

They recommend, therefore, that in every cyanide-room there should be kept three boxes, containing:

1. A metal receptacle to hold about a pint, and a spoon.
2. A hermetically sealed phial, containing 30 c.c. of a 23-per-cent. solution of ferrous sulphate.
3. A phial containing 30 c.c. of caustic potash.
4. A packet of oxide of magnesium (light).

They also suggest, further, that the ferrous sulphate be kept in a blue phial, and the caustic potash in a white phial; then, in the event of a case of cyanide poisoning occurring, all that the nearest employee would have to do would be to empty the con-

tents of a blue phial, a white phial, and a packet into the metal receptacle, stir it with a spoon, and give it to the sufferer.

The boxes should be placed in a conspicuous position and labelled "Antidote for Cyanide," and directions as above should be affixed inside the lid of the box.

MAGNESITE.

MENTION was made in last month's MINING RECORD of the intention to ship magnesite from Atlin. As this mineral has been found in British Columbia the following information relative to magnesite in the United States will doubtless prove of interest.

The United States Geological Survey has published an interesting and instructive bulletin, an extract from a report on magnesite by Mr. Charles G. Yale, of San Francisco, which will appear in the forthcoming volume of "Mineral Resources of the United States, 1903," which the Survey has in press. The bulletin, here referred to, makes historical allusion to what is still the chief source of supply of magnesite, particularly of the finest quality of that mineral, and says: "To students of the classics the island of Euboea, off the east coast of Greece, is the back-ground for a host of dramatic incidents; the mobilization of the armies gathered by the Grecian heroes who made war on Troy; the gloomy prophecies of Calchas, the blind seer; the attempted sacrifice of Iphigenia by her father, Agamemnon, "king of men." To the student of commerce the island of Euboea is more memorable as the chief source of our supply of magnesite. The United States furnishes only a very small part of the total quantity of magnesite consumed in this country. Most of it, especially that of fine quality, comes from the island of Euboea, although some is also furnished by Austria."

In the United States, the entire product of magnesite comes from California. During 1903 the quantity reported was 3,744 short tons crude, valued at \$10,595, equivalent to 1,361 tons calcined, worth \$20,515. This production is practically in the hands of one firm. The crude product, as is learned, is sent to the manufacturers of carbonic acid gas by calcination, and the calcined product is used by the paper mills. The demand for both crude and calcined magnesite is limited on the Pacific Coast. Owing to a freight rate of \$13 to \$15 a ton on shipments to Eastern points, it is not shipped out of California except to the paper mills in Oregon. The production of California could be quadrupled if the demands of consumption warranted the increase.

As stated above, the chief production of magnesite in the United States is from Tulare County, in California. Some small quantities still come from Chiles Valley and Pope Valley, Napa County. The most extensive deposit in California is in Placer County, but it is in an almost inaccessible mountain region, where a very costly road would be necessary to get the product out, and the deposit has therefore not been

utilized. Near Sanger, Fresno County, is another deposit which is now being opened. A deposit has been discovered also near Walkers Pass, Kern County, but it has never been developed. There are also unutilized deposits near Morgan Hill, Santa Clara County. The extensive deposits of magnesite on Red Mountain, at a point where Stanislaus, Alameda, and Santa Clara counties join, are now being opened by the American Magnesite Company, of Chicago, which has obtained control of numerous claims heretofore owned by individuals. Subsidiary companies include the Rose Brick Company, which is to manufacture magnesite brick at Oakland, California; the American Carbonic Acid Gas Company, and the Plastic Construction Company, which controls the American rights for making a fire-proof construction material as well as a patent brick.

Calcined magnesite, generally in the form of brick, is now universally recognized as the best material for lining basic open-hearth furnaces, cement kilns, etc. It may be employed to advantage wherever high temperatures and chemical reactions are detrimental to dolomite, chromite and silica brick. The distinctive characteristics of a magnesite lining are durability, freedom from moisture and silicic acid, and resistance to corrosion when exposed to the action of basic slags and metallic oxides. These qualities make the lining cheaper than most others in the long run.

GEOLOGY OF THE KOOTENAYS.

AN interesting paper entitled the "Geology of the Kootenays," by Mr. A. L. McCulloch, was read last month before the University Club at Nelson. In describing the rocks of Kootenay Mr. McCulloch stated that the most ancient of the series was the grey granite of the Shuswap mountains, also found on both sides of the northern part of Kootenay lake and around Christina lake. The next in point of age is the Cambrio-Silurian rock of the Selkirk range and then the Slocan ranges, but over all these and most confusingly mixed with them is a thick layer of volcanic rock, which covers the Nelson granite, and the Rossland alkali granite to a depth of 3,000 feet in places. Mr. McCulloch also gave an account of the southward movement of the great Cordilleran glacier which once covered the Pacific slope from the Arctic to Mexico and was in some places at least 5,000 feet thick. To its action is due the series of deep, parallel valleys in British Columbia, all running nearly due north and south. Kokanee peak is the only place near Nelson where the remains of the great glacier can be seen.

Mr. S. S. Fowler commented briefly on the paper, referring to the highly complex character of Kootenay formations, and to the evident change in direction of water courses, by geologic action.

Mr. W. Blakemore emphasized the necessity for geologic study and research in advance of the working miner and expressed a hope that it would soon be undertaken by the provincial governments. A vote of thanks to Mr. McCulloch on his very interesting and instructive paper terminated the proceedings.

THE COPPER OUTLOOK.

ELECTRICITY, published in New York, discusses the copper market situation, remarks that while the market price of the metal is now but 14 cents a pound, whereas three years ago it was selling as high as about 18, still the present position of the market is regarded by many authorities as being much stronger than it was three years ago, as the metal that is being bought is going into the hands of actual consumers, there being little or no speculative buying.

The demand for the metal on this continent is attributed in part by the above-mentioned paper to a change of motive power from steam to electricity on many of the railroads in this vicinity. Referring to the foreign demand, a contemporary states:

"The export demand for the metal is in almost unprecedented volume, amounting to 202,503 tons for the first ten months of the year, which is far above the total export movement of any year in the past. The demand comes chiefly from Germany and France and is stimulated to no small degree by the Russo-Japanese war, France and Germany manufacturing large quantities of war supplies for the belligerent nations. The English demand has not been much of a factor up to this time in the local copper situation. There has been a decided increase, however, in the shipments to China and Japan, although previously the latter country has usually produced enough copper for its own consumption."

"There is little doubt," *Electricity* concludes, "but what the demand for copper throughout the civilized world will increase rather than diminish. That such is the case may be inferred from the fact that during the past year the Western Union Telegraph Company alone has used approximately 15,000,000 pounds in constructing new lines. Furthermore, electrical undertakings, such as power stations, telephone systems and trolley roads are constantly being planned, which require copper in one form or another, and so great may the demand for the metal become that in the near future it may necessitate the opening of copper mines that have not been in operation for years.

ALASKAN TIN PRODUCTION.

A YEAR or so ago reference was made in the *MINING RECORD* to the discovery of tin in Alaska. From a statement attributed to Mr. Joseph Hutchison, formerly Lieutenant-Governor of Idaho, who recently returned from the Northern territory, there are fair prospects for the establishment of a tin mining industry in Alaska, a small trial consignment of ore having already been made. Mr. Hutchison is reported as having said:

"The tin so far obtained has been stream tin, or that obtained by placer mining, the tin having been washed down from the mountains. Quartz tin also occurs, and very large veins have been traced up the mountain sides, where it had been washed down into the streams. Over the entire area from Cape Prince of Wales to Fort Clarence and northward many signs of large quantities of tin being present in the granite

and slate beds in intrusive dykes in Silurian limestone exist. There is quartz tin from Alaska on exhibition at the St. Louis fair, tin that has been extracted by drills run by electric power. So far no large mining machinery is established in the tin region, although electric power is used to drive the drills and other machinery employed.

"The discovery of tin was very similar to the discovery of gold, tin having been found in sluice boxes, where it had been washed down from higher ground. The tin found was of dark colour, and only occasionally were large bits picked up. But its value was soon ascertained, and prospectors hurried there to ascertain the extent of the veins and its occurrence.

REMOVING METAL SPLINTERS FROM THE EYE.

AN accident, to which miners are frequently subject is that occasioned by small pieces of steel flying off drills and entering the eye. These splinters are sometimes very difficult to remove. The use of magnets has been recommended, but even the strongest magnet is entirely inefficient, if the splinters be imbedded. It has been found that a fine, sharp knife is the best instrument, but it requires skill and a steady hand. An effective method in the hands of the inexperienced is that which a London surgeon thus describes in the *Lancet*: "In consequence of the difficulty I experienced in removing from a patient a portion of steel deeply bedded in the cornea, which did not yield to spud or needle, some other means of removal became necessary. Dry, soft, white silk waste suggested itself to me, and was wound around a thin piece of wood so as to completely envelop its end. This soft application was brushed once backward and forwards horizontally over the part of the cornea where the foreign substance seemed fixed. To my astonishment it was at once entangled by the delicate but strong meshes of the silk, and was withdrawn with the greatest ease, caught by the same. A gentleman in turning steel at a lathe suddenly felt that a portion had entered his eye. He went at once to a surgeon, who, with the most skilful manipulation, failed to extract the same, saying it would soon work out of itself. The next morning the patient saw me, having suffered severely since the accident, and on the first application of the silk the steel was extracted."

MACHINERY NOTES.

Referring to the despatch used in installing a new 240 horse power engine at the St. Eugene mill, the *Moyie Leader* states: "The engine arrived here Tuesday morning and it was unloaded and put in place and was running inside of 20 hours. Ordinarily it would have taken from three to five days from the east and it will only be a matter of a short time until it will be here."

The Pacific Coast Pipe Works of Vancouver has been awarded the contract for 12,000 feet of 16-inch heavy wire bound wooden pipe for the Trail smelter. It will be used in connection with the three miles of fluming to carry water to the smelting works.

The directors of the B. C. Copper Company have author-

ized the preparation of plans for two additional 400-ton furnaces for installation at the Greenwood smelter.

In an interview recently Mr. C. Fernau, acting for British investors, stated that within the next few weeks the location of a new 40-ton zinc smelter, to be erected near Fernic, would be definitely decided, and construction work proceed thereafter. Mr. Fernau expects to purchase the plant in San Francisco.

The Lucky Boy Mining Company, operating in Lane County, Ore., which installed one of the De Keyser mills for the treatment of concentrates, is reported to have abandoned that process as unsatisfactory. The average saving with the De Keyser mill was but 23 to 25 per cent., which was too low. A Crawford mill is now being used on the property.

A contract has been let for the erection of an aerial tramway at the Jumbo mine, a mile and a half west of town. The length of the line will be within 300 feet of one mile. There will be ore bins at each end and a capacity of at least 500 tons a day, which can be doubled, and possibly trebled, by the simple addition of more buckets. The tramway will be modelled closely on the lines of the one at the Le Roi mine, but the buckets will be somewhat smaller.

A new skip has been ordered for the shaft of the Brooklyn mine, with a capacity of three tons, about double that of the present skip, while also a new air compressor is being installed.

Machinery is expected to arrive shortly from Sherbrooke, Quebec, for the Velvet-Portland's new concentrator, which when in running order, will increase the capacity of the plant to 100 tons a day.

The new tramway from the No. 3 tunnel to the mill at the Wilcox mine, Ymir, has been completed.

Arrangements are being made for the erection of a ten-stamp mill and cyanide plant at the Juno mine, in the Nelson district.

The owners of the Wilcox mine, at Ymir, have purchased the 10-stamp mill built for the Golden Wedge mine on Six-Mile creek, the machinery of which is being removed to the site on the former property. There is already at the Wilcox a small mill of four stamps.

It is reported that orders for supplies and heavy machinery for next year are about to be placed by the Bull River Mining & Power Co.

An electric light and pumping plant has been installed at the Marble Bay mine, Texada Island.

The Wellington Colliery Company is installing a washer of large capacity at the Ladysmith colliery.

In the Atlin district steam shovels are to be extensively used in mining next season, and in addition to those already arranged for the McKee Creek Consolidated Co. contemplate installing a steam shovel on their property in the spring.

Arrangements are being made for the operation of the Ward Horsefly Company's ground by dredging methods. This Cariboo property was recently examined by a California dredging authority, who reported favorably on the proposal.

COMPANY NOTES AND CABLES.

Tyce Copper Co. (Mt. Sicker).—The smelter returns for October were as follows: Smelter ran 27 days; 5,979 tons of Tyce ore smelted, giving a return after deduction of freight and refining charges of \$83,547.

Alaska Treadwell.—The October returns were: 240 stamp mill ran 29 $\frac{1}{4}$ days. 300 stamp mill ran 28 $\frac{3}{4}$ days. Crushed 78,746 tons ore. Estimated realisable value of the bullion, \$89,357. Saved 1,850 tons sulphurets. Estimated realisable value of same \$97,000. Working expenses for month, \$83,918.

Le Roi (Rosland).—The following report for October has been received: "Shipped from the mine to the Northport smelter during the past month 10,211 tons of specially select-

ed ore, containing 4,443 oz. of gold, 5,637 oz. of silver, 310,400 lb. copper. Estimated profit on this ore, after deducting cost of mining, smelting, realisation and depreciation, \$27,000. Expenditure on development work during the month, \$180,000. Development of the mine fairly satisfactory. Have discovered small vein of ore in north crosscut 450 ft. level; unable at present to state if it is continuation of the north vein. Have discovered fair ore body shipping grade 900 ft. level the south vein, thus proving continuation south ore chute on this level.

Le Roi No. 2 (Rossland).—The mine manager reports that 1,725 tons were shipped in October. During the month the net receipts were \$48,204, being preliminary payment for 2,116 tons shipped, \$4,223 being deferred payment on 1,913 tons previously shipped. \$2,463 being payment for 44 tons concentrates shipped. In all \$54,890. Annie No. 2 shaft, at a depth of 100 feet met with ore west of the dyke. Its width is 18 inches; the assays are: gold, \$4, copper \$5. Some time will be required for development before we can decide its importance."

The Ymir Gold Mines.—The manager reports the return for the month of September, by cable, as follows:—35 stamps ran 29 days and crushed 2,500 tons of ore, producing 460 oz. bullion. The estimated realisable value is \$5,250; 174 tons of concentrates, shipped, estimated value \$4,360; cyanide plant treated 1,700 tons of tailings producing bullion having estimated gross value of \$1,700; sundry revenue, \$395; total, \$11,705; working expenses, \$15,000; loss, \$3,295. There has been expended on development, \$835. It appears that the expenses were unusually heavy through the continued drought, making it necessary to use steam power instead of water power. Certain changes have also been made in the method of dealing with the accounts, which unfavorably affect the figures for last month's operations, but this position will adjust itself hereafter.

The October returns were: 20 stamps ran 29 days and crushed 1,700 tons (2,000 lb.) of ore, producing 412 oz. bullion. The estimated realisable value (gross) of the product is \$4,925; 90 tons of concentrates shipped, gross estimated value, \$2,250; cyanide plant treated 1,150 tons (2,000 lb.) of tailings, producing bullion having estimated gross value of \$550; 38 tons of crude ore shipped, \$1,950; sundry revenue, \$220—\$9,895; working expenses, \$9,780; profit \$115. There has been expended during the month on development \$403.

Arlington (Eric).—During October, 1904, four carloads of ore (87 tons) were shipped to the Hall Mines Smelter, Nelson, net returns from which amounted to \$4,180. The total expenses for the month in British Columbia were \$3,458.

BOOKS RECEIVED.

Twenty-second annual coal report of the Illinois Bureau of Labor Statistics for the year ending October 1, 1903, State Printer's, Springfield, Ill., 1904.

Geological Survey of Canada, Annual Reports, new series. Vol. XIII.

Notes on Assaying and Metallurgical Laboratory Experiments, by Richard W. Lodge, Assistant Professor of Mining and Metallurgy, Massachusetts Institute of Technology. Svo. Illustrated. Cloth, \$3. John Wiley & Sons, New York; Chapman & Hall, London, 1904.

This important and comprehensive work is divided into two parts, the first thoroughly covering the subject of assaying, and the second dealing with metallurgical laboratory experiment. The book, though primarily intended for the student, being largely a compilation of notes in use for many years by third and fourth year students in the metallurgical laboratory of the Massachusetts Institute of Technology, contains much information and many references and tables of value to those actually engaged in metallurgical practice.

MINING MEN AND MATTERS.

Mr. James Cronin, a large shareholder and manager of the St. Eugene mine, at Moyie, has joined the directorate boards of the Centre Star, War Eagle and Rossland Power Companies, in succession to Mr. C. H. Gooderham, whose death recently occurred.

Mr. Jos. Randel, who for twenty-one years has occupied the position of underground manager at the Nanaimo collieries, has signified his intention of retiring, and will be succeeded by Mr. Thos. Mills, the present assistant manager.

Intelligence has just been received that the Albetra Oil Company has met with great success in boring for oil on their property below Kootenay Lake and near the British Columbia boundary, a fine flow of oil having been started in the old well, which has been drilled to a depth of 1,080 feet. The Company has already shipped 200 barrels of oil to Winnipeg, via Pincher Creek. A number of 2,000 gallon tanks have also been filled with oil, and the work of drilling a second well has been commenced. The Pincher Creek route is likely to remain for some time to come the main road into the Flathead country. It is here that the oil indications are most promising, but operations have not yet reached the stage to which those in Alberta have been advanced.

From the progress now being made it is thought the new branch of the Great Northern railway will be completed to Phoenix before the end of the year.

Recent development of properties in the Skeena district have afforded some promising results, and an engineer who lately visited the Dry Hill Mining Company's property on Lorne Creek states that between \$30,000 and \$50,000 have been expended in the development of this claim, including the construction of a large flume by Seattle capitalists. The work was in progress during the summer months and was completed a few days previous to this gentleman's arrival there. Water had then been admitted to the flume for two days. It was closed off at the expiration of that time, and the clean-up amounted to \$500. This was the result of not more than forty-eight hours' work.

Mr. Fred. W. Bradley, the well-known mining engineer, whose name was for a time permitted to be used in association with that of Mr. John M. McKenzie as consulting engineer to the Le Roi Mining Company, Rossland, is reported to have been seriously injured by a gas explosion which occurred at Mr. Bradley's place of residence in San Francisco. It is feared that his sight may be permanently injured as a consequence.

Mr. S. F. Parrish, M. E., formerly general manager of the Le Roi Mining Company, is stated to have removed his office from San Francisco to Salt Lake City, Utah, where he will continue the practice of his profession of consulting mining engineer.

Mr. A. C. Garde, for several years resident manager for the Payne Consolidated Mining Company, Ltd., has, with his family, removed from the Payne mine, near Sandon, to Nelson.

Referring to Mr. E. R. Woakes, formerly of the Duncan United Mines, Ltd., Nelson, but now in Spain in charge of the mine of the Linares Lead Mining Company, the chairman of that company speaking at a general meeting of shareholders held in London a few weeks ago, said: "In Mr. Woakes we have a superintendent who has our entire confidence, and our thanks are due to him and the staff on the mines for the able manner in which their duties have been carried out."

Mr. Frederick Keffer, manager for the British Columbia Copper Company, has returned to Greenwood, after a six weeks' vacation in the East, during which he visited Montreal, New York, Philadelphia, Cleveland, St. Louis and other large centres. He states that the Canadian exhibit at the St. Louis Exposition is a very creditable one and is much pleased with the prominence given there to Canadian minerals, including an excellent display from British Columbia.

Mr. H. G. Pemberton, general manager for the Montreal & Boston Consolidated Company, is about again, having nearly recovered from injuries received when a horse he was riding fell with him last month.

Mr. Paul Johnson, manager of the Alaska Smelting & Refining Company, was in Seattle last month to confer with his principals. It is stated that the company's smelter at Hadley, Prince of Wales Island, Southeast Alaska, will shortly commence operations.

Mr. A. J. McMillan, managing director of the Le Roi Company, who visited Victoria during the last month, made the statement that steps were being taken to continue explorations in the lower levels of the mine by diamond drilling, and a contract has been let to a Spokane firm to proceed with the work.

During October silver-lead production was made from twenty-nine mines in East and West Kootenay, shipments aggregating 1,221,501 lb. lead.

At the annual meeting of the Pathfinder Mining Co., Ltd., held in Grand Forks last week, the following officers were elected: John Rodgers, president; W. K. C. Manly, vice-president; M. S. Martin, secretary-treasurer. The accounts showed the mine to be now free of debt.

At a meeting of the directors of the B. C. Copper Company, held in New York on November 13th, Mr. John Weir, a pioneer investor in Boundary district mines, he having been one of the original purchasers of the Mother Lode mine, was elected a member of the directorate.

Mr. G. Alexander, of Kaslo, speaking the other day of the zinc situation in Kootenay, stated that when the new works at Kaslo were completed, it would be possible to obtain a 50 per cent. product for shipment as against 36 per cent. product obtained by water concentration. The new works would have a daily capacity of about 120 tons, and from the known zinc capacity of the Ruth, Slocan Star and other Slocan properties, there would be no difficulty in getting all the zinc necessary. Meanwhile good progress is being made with the installation of plant.

Mr. C. H. Robertson, managing director of the Britannia Company (Howe Sound), has purchased the Leonard interest in the Company, amounting to approximately one-eighth of the issued shares. The price paid has not been made public.

A despatch from Ottawa states that tenders have been called for the building of a mint at the capital, the assurance being given that Canada will shortly coin her own gold and silver currency.

The death occurred recently in California of Captain J. R. Gifford, formerly superintendent of the Silver King mine at Nelson. The deceased was a Cornishman by birth. Previous to his engagement by the Hall Mines Company, he was employed by John Taylor & Co., and Taylor & Sons, of London, as mine manager of properties in the Western States and in Australia. He was also for a time manager of the Great Boulder mine in the Rainy river district of Ontario.

YUKON MINING INTELLIGENCE.

THE Dominion Government has established a new temporary office for the recording of claims on Bunty Creek, to which a "rush" recently took place, a number of claims having been staked. The discoveries in the Tanana country have had the effect of depopulating Dawson to some extent, statistics showing that compared with last year the population has decreased to the number of 2,401 persons.

A new road is now being built from Barlow to the Clear Creek mines. In the past miners in this locality have been much handicapped by the cost of getting in supplies, particularly in the summer months when the creeks are in flood. This season, however, operations were carried on upon a fairly extensive scale, pay having been located on the left

fork covering a distance of about eight miles. The ground is mostly shallow.

Dawson's fuel requirements during the past year have been supplied by a local company operating mines at Coal Creek from which an output of 6,000 tons of excellent coal has been made. The Company expended during the year \$50,000 in permanent improvements, including new docks and coal bins, the latter having a capacity of 2,000 tons. The coal is brought in cars from the creek a distance of twelve miles. In the old workings, which have been operated by means of an incline shaft, there are 200,000 tons of coal blocked out. During the winter a few men will be kept employed sinking a new shaft to tap a seam 200 feet below the present workings. The shaft will be vertical and will be 250 feet deep. The new seam is eighteen feet thick, the coal being of a harder character. About 800 tons from the new vein near the surface have been marketed.

The new discoveries on a tributary of Rosebud Creek are reported to be exceedingly promising, the ground, in the opinion of many experienced miners, being thought to be a continuation of the famous white channel. Over thirty claims in the Mellish group have been staked. So far as prospected ground is very shallow. The only anticipated difficulty is the distance water would be required to be brought to some of the claims. On the discovery claim, meanwhile, good prospects have been found in the shaft.

Dredging operations on Bonanza Creek and the operation of a steam shovel plant at the mouth of Bear Creek were suspended on October 22nd. The dredging season has been a long, and, it is reported, a satisfactory one, work having been first commenced on May 5th. At Bear Creek a great quantity of gravel has been moved by the steam shovels.

A new order in council has been passed pertaining to the reservation of certain rights by the crown upon mineral lands to which crown grants have been issued, amending section 53c of the quartz mining regulations to the following effect: That patents conveying the surface as well as the under rights shall reserve to the crown forever such right or rights of way and of entry as may be required under any regulations in that behalf now or hereafter in force in connection with the construction, maintenance and use of works for the conveyance of water for use in mining operations.

On Sulphur Creek active preparations are being made for busy winter working on claims from 56 above to 98 below discovery. The work will be chiefly carried on by individual miners working on lays.

Mr. W. L. Breeze, of New York, who recently effected the consolidation of a number of hydraulic properties on Bullion Creek, in the Alsek district, intends to work them on an extensive scale and is purchasing supplies in large quantities, most of which are being procured at British Columbia coast cities in order to save the duty, the claims being located in Canadian territory. Mr. Breeze has some 125 men at work and intends to do a large amount of preparatory work during the winter, such as the erection of a sawmill and sawing of lumber for flumes. He has now on the property, or *en route*, some 80 head of horses which will be employed in freighting from Whitehorse to Bullion Creek. The survey of claims from No. 1 above discovery to No. 84 below inclusive has meanwhile been staked.

At some of the mines near Dawson sluicing is still in progress. Never before in the history of the camp has sluicing continued so late in the season, the weather having been quite exceptionally mild.

A strike recently reported on Bunty Creek, between Stewart and Pelly, and on a tributary of Rosebud, created a considerable stampede to that locality. Men went from Dawson and other distant points, hurrying a hundred miles over barren wastes of snow, up and down hills and through a wilderness of timber, but many have since returned bringing reports that the alleged discovery was relatively unimportant.

A number of miners are doing winter work on Miller and Glacier creeks. Highatt, however, promises to be the busiest

creek in the upper Stewart district this winter. Recent advices from that section are to the effect that ten or fifteen claims on the Highatt will be worked this winter. The claims, it is stated, are not more than 10 to 15 feet deep. No. 105, on Highatt was sold not long ago for \$3,500. The creek was first worked in the summer of 1903.

Messrs. J. B. Tyrrell and F. J. McDougall have made application for 2,000 inches of water from Australia and Melba creeks. The water is stated to be required for use in connection with the mining by hydraulic or other methods of the McConnell and Croteau concessions, both being on Indian River some distance below the mouth of Sulphur. Each concession is two miles in length up and down the river and a mile in width, one being on one side of the Indian River and the other directly opposite. Winter work is now well under way in the Paradise Hill section. There being much activity from 40 to 80 on Hunker Creek, where a very busy season is anticipated.

MINERAL PRODUCTION IN OCTOBER.

The Nelson *Tribune*, which goes to much pains to secure reliable data in respect to Kootenay mineral production, publishes the following report for October:

During the month of October the mines of the Kootenays and the Boundary district produced over 91,000 tons of ore that was treated at Canadian reduction works. The total is slightly less than that for September, due to partial stoppage of Granby work for a brief period. The shipments were divided as follows:

SILVER LEAD.		Tons.
Payne, at Sandon	107	
Slocan Star, at Sandon	359	
Reco, at Sandon	63	
R. E. Lee, at Sandon	15	
Joe-Joe, Slocan district	20	
Rouse, Slocan district	20	
Idaho, at Three Forks	107	
Ivanhoe, at Sandon	118	
Comstock, at Silverton	42	
Cripple Creek, at Slocan City	20	
Kilo, at Slocan City	20	
Nee-pawa, at Ten-Mile, Slocan Lake	20	
Ottawa, at Slocan City	131	
Bad Shot, Lardeau district	32	
Old Gold, Lardeau district	10	
Silver Cup, Lardeau district	125	
Paradise, Windermere district	71	
Alice B., East Kootenay	23	
St. Eugene, at Moyie	1,731	
North Star, at Kimberly	1,061	
Antoine, at McGuigan	21	
Bismarck, Slocan district	21	
Last Chance, at Sandon	62	
Majestic, Slocan district	25	
Mercury, Slocan district	15	
Mountain Con, at Cody	37	
Red Fox, at McGuigan	16	
Silver Glance, at McGuigan	25	
Winona, Slocan district	15	
Zuni, Slocan district	15	
ZINC.		
Payne, at Sandon	135	
Ivanhoe, at Sandon	98	
SILVER-COPPER.		
Silver King, at Nelson	97	
IRON-GOLD.		
Iron Mask, at Kamloops	469	
GOLD-SILVER.		
Arlington, at Eric	87	
Hunter V., at Ymir	950	
Canadian King, at Eric	20	

Queen, at Salmo (concentrates)	44
Relief, at Eric (concentrates)	20
Wilcox, at Ymir (concentrates)	20
Ymir, at Ymir (concentrates)	146

GOLD-COPPER.

Le Roi No. 2, at Rossland	2,019
View, at Rossland	85
Centre Star-War Eagle, at Rossland	12,193
Spitzee, at Rossland	30
Jumbo, at Rossland	1,406
Athelstan, Boundary district	890
Brooklyn, at Phoenix	7,750
Emma, at Eholt	6,166
Stemwinder, at Phoenix	60
Sunset, at Eholt	102
Granby, at Phoenix	39,300
Oro Denoro, at Eholt	340
Mother Lode, at Greenwood	14,310
Elkhorn, Boundary district	22
E. P. U., Boundary district	20
Providence, Boundary district	23

Total

In addition to the above are the shipments from Rossland mines to the smelter at Northport, about 10,000, and the ore that is milled at mines like the Ymir, Queen, Wilcox, and the mines at Camborne, say 5,000 tons more. The smelter at Grand Forks, besides treating British Columbia ore, received during the month 654 tons from the mines at Republic, Washington.

As compared with October, 1903, the total shipments show an increase of 2,118 tons.

The product of the smelters for the month as compared with the same month last year show a decrease in shipments of 778 tons of copper matte, an increase of 31 tons of blister copper, a decrease of 386 tons of lead bullion, and an increase of 496 tons of pig lead. The pig lead shipped went to Montreal, Toronto, and London (Ontario).

COAL MINING NOTES.

Fire broke out in the No. 4 mine at the Cumberland colliery during the month, but thanks to the energetic measures taken, it was successfully checked before much damage had been done.

According to reports received through the Canadian commercial agent in Japan, the Japanese naval authorities are experimenting with Comox high grade bituminous coals with a view to their use on Japanese men-of-war. The coal is held to be equal to the best Cardiff coal, being practically smokeless and in every respect an excellent steam coal.

The discovery is reported of a promising seam of coal six feet in thickness, near Enderby, arrangements for the development of which have been already made.

Twenty inches of good coal was encountered during November, at a depth in the shaft of 334 feet, at the Kamloops Coal Mines Company's mine on Coal Hill. It is proposed to continue sinking in the expectation of striking a larger seam. The coal is said to be of excellent quality.

Mr. A. R. Wilson, mine superintendent of the Michel collieries, is reported as stating that there are now 600 men employed at these mines, and an output of about 1,800 tons of coal, 700 of which is made into coke, is being maintained daily. Mr. Wilson anticipates a busy and prosperous winter season at Michel. Meanwhile the Nos. 3, 4, and 5 mines have been closed down, but operations at Nos. 8 and 9 are being more actively prosecuted.

An explosion of gas occurred at the No. 1 mine, Morrissey, on November 18th, resulting in the death of fourteen miners. The main level leading to the No. 1 incline and to the parallel level was found to be badly wrecked.

The International Company's collieries at Coleman are being very actively developed, and are now equal to pro-

ducing 1,000 tons daily, nearly one and three-quarter miles of development work having been accomplished since operations were commenced rather over a year ago. Besides the main entries which have been driven on the coal, a slope 500 feet in depth has been put down, and 50 rooms are in readiness for coal breaking directly the new tippie is completed, by the first of next month.

LEAD STATISTICS.

We have received from Mr. Julius Matton, of London, a compilation of lead statistics for the years 1901-1903, from which we extract the following tables:—

The world's production of pig lead (according to latest reports obtainable) in English tons:

	1901.	1902.	1903.
United States	260,059	259,780	266,691
Spain	166,792	174,936	172,521
Germany	118,862	136,703	141,558
Australia	95,000	104,000	93,500
Mexico	85,000	95,000	95,000
England	35,134	25,504	30,958
Italy	25,415	25,350	22,239
France	20,690	18,522	19,500
Belgium	18,444	18,650	20,015
Greece	17,502	13,840	13,075
Austria-Hungary	12,009	13,307	13,953
Turkey	2,200	3,622	7,493
Canada	10,300	8,335	8,121
Japan	4,000	4,000	4,000
Sweden	968	826	661
Russia	400	300	400
South America	2,125	225	150
Africa and East India	100	100	165

Total 875,000 903,000 910,000

Monthly average prices of "soft lead," 1903:

	London. per ton.	New York. per lb.
January	£11 6 2	cents 4,12 ¹ / ₄
February	11 14 2	4,12 ¹ / ₂
March	13 4 7	4,48
April	12 8 2	4,62
May	11 16 0	4,37 ¹ / ₂
June	11 8 9	4,26
July	11 7 7	4,21
August	11 2 11	4,23
September	11 3 4	4,41 ¹ / ₂
October	11 2 3	4,50
November	11 2 3	4,37
December	11 3 8	4,32 ¹ / ₂
For the year	11 11 8	4,33 ¹ / ₂

SURVEYING AND LEVELLING INSTRUMENTS.

THE third edition of this notable work, by William Ford Stanley, of the well known London firm of opticians and manufacturers of surveying and drawing instruments has reached us. The volume, which contains 19 chapters, and is well illustrated with drawings and diagrams, deals in the most comprehensive manner with a subject to which the author has devoted forty-seven years of his life in the practical study. The book was originally prepared in consequence of numerous queries that came before Mr. Stanley for reply relative to functional parts of surveying instruments, which bore most frequently reference to optical and magnetical subjects, to the qualities and action of spirit level tubes, and also occasionally to graduation and the qualities of clamp and tangent motions. These matters are fully discussed; the plans of construction of instruments in general use are selected for illustration, and certain constructions that are liable to failure are pointed out. In the third edition of the book note is taken of the recent improvements

made in surveying instruments, consequent upon the greater perfection of modern machinery and the use of aluminum alloys, by which the weight of many parts of instruments is reduced to one-third; and many of the latest types of instruments are here described for the first time.

MACHINERY CATALOGUES.

Mr. W. Stanley Lecky, Canadian representative of the well known British firm of Fraser & Chalmers, Limited, informs us that he has ready for distribution the following catalogues, any of which he will be pleased to supply on request:—General or Index Catalogue, 1904; Steam Boilers and Accessories, No. 203, 3rd ed.; Compressors, No. 202; Baling Tank, No. 206; Roasting, Smelting and Refining, No. 3, 5th ed.; The Frue Vanner; Stamp Mills and Accessories; Crushing Machinery; Winding Engines and Appliances Technical Notes—The Concentration of Ores by Oil; Screening and Concentration.

NEW DREDGER FOR INDIAN GOVERNMENT.

Messrs. Wm. Simons & Co., Ltd., Renfrew launched during the past month, complete with steam up ready for work, the twin screw light draft bucket ladder hopper dredger "Manar," built to the order of the Secretary of State for India.

The vessel is fitted with two sets of triple expansion surface condensing engines, supplied with steam from two steel boilers constructed for a working pressure of 160 lb. per square inch, and powerful manoeuvring winches are placed at bow and stern for manipulating the dredger when at work. Independent hoist gear is provided for controlling the bucket ladder. Ample accommodation is also provided for officers and crew.

The "Manar" has been constructed under the direction of Sir A. M. Rendel, K. C. I. E., Consulting Engineer for the Indian Government, under the direct superintendence of Mr. Seymour B. Tritton, M. Inst., C. E. London, assisted by Mr. Gaze, Resident Inspector.

A. C. ELECTRIC TRACTION FROM GAS POWER.

A somewhat unique departure from established methods in electric traction has recently been undertaken at Warren, Pa. The Warren & Jamestown Street Railway Company is equipping an A. C. single-phase electric railway system to operate between Warren, Pa., and Jamestown, N. Y., for which power will be supplied by gas engines operating upon natural gas. The equipment is now being constructed by the Westinghouse Companies at East Pittsburg, Pa.

The power station will be located at Stoneham, Pa., two miles from Warren. The initial equipment will consist of two Westinghouse gas engines, each of 500 Brake Horse Power capacity. They will be of the horizontal single-crank double-acting type, direct connected to two 260 kw. Westinghouse generators furnishing current at voltage sufficient for direct use upon the high tension transmission line. The power equipment also comprises a 55 horse power Westinghouse gas engine for operating air compressor and exciter unit. Natural gas will be used, furnished by the local distributing company. In this district the gas has a calorific value of about 1,000 B.T.U. per cu. ft.

Transformer substations, five in number, will be located along the right of way. These will receive the high tension current from the transmission line and reduce the voltage to such an extent as to render it more suitable for use in single-phase motors. The present motive power equipment will comprise four quadruple sets of Westinghouse single-phase motors, each approximately 50 horse power capacity.

An interesting feature of the system is the arrangement for operating the alternating current motors upon the direct current trolley lines within the city limits of the termini.

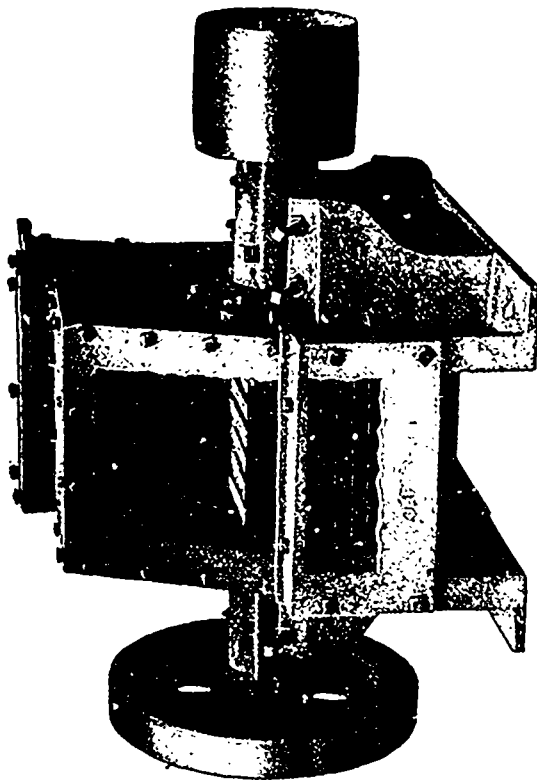
The Warren & Jamestown Street Railway is not a newly

organized system, as it has operated part of the present lines for a period of eleven years. Three years ago the Company began experimenting with the use of gas power, with sufficient success to influence them in the now exclusive adoption of gas engines for their entire power generation. The operation of the new system will be watched with much interest by the engineering public, and its success will mark an important advancement in modern electric railroading.

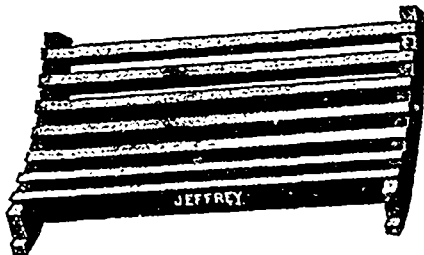
THE JEFFREY HAMMER PULVERIZER.

The manufacture of this type of pulverizer had recently been taken up by the Jeffrey Manufacturing Company of Columbus, Ohio, being made under the Schoellhorn-Allbrecht patents acquired by it.

The one illustration shows the pulverizer with its interior



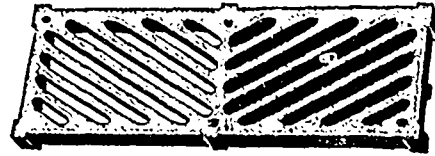
or crushing parts; the other shows the sectional screen frame which is one of the special features in this machine, which is designed for crushing and pulverizing material such as coal, clay, shale rock and many other materials. The manu-



facturers claim it to be the simplest machine of its kind made. Strong features are its simple beater hammer, its "V"-shape bar screening surface, its simple adjustment of the beater arms to accommodate wear, its substantial adjustable dust-proof pillow blocks, its top feed hopper insuring large capacity and permitting material to be partly crushed while in suspension; all of which go to make this machine as nearly perfect as can be made. The accessibility of its inner parts is also one of its strong features. The taking off

of the rear plane and the hand hole plates on the side of the machine make it possible to change the beater arms as well as the screening surface when necessary.

The screening surface is made up in sections, so that it is the work of but a few moments to take out or change from one mesh to another. Many of these machines are in use, so there is no experimental period to be gone through with.



The machine is made in many sizes to suit the various requirements. For instance, in coal the capacity varies anywhere from 50 to 100 tons of coal per hour, depending entirely upon the degree of fineness. In pulverizing material such as rock its capacity is anywhere from ten to twenty-five tons per hour. The Jeffrey Company make free crushing tests for prospective purchasers, thus demonstrating before sale, what the machine is capable of doing. Complete catalogue on this subject can be had by addressing the manufacturers.

ELECTRICALLY OPERATED MINE HOISTS.

THE electric motor is surely and steadily making its way in mining work. It has been used for a number of years for mine lighting and haulage and for operating coal-cutting machinery and drills. More recently, it has been applied with marked success for pumping and draining. But this application of the electric motor to mine hoisting has been retarded by a natural conservatism on the part of mining engineers. In work of this kind, safety and surety of control above all are the points to be considered. Mining engineers have been familiar with the performance of steam-hoisting apparatus, and have, perhaps naturally, felt some hesitation in changing to a new motive power however well this might be recommended. However, within the last year or so, the advantages offered by an electric drive have led a number of manufacturing concerns to turn their attention to this particular class of work with the result that they are now making hoisting machinery, electrically driven, which seems to offer all the surety of a steam-driven plant, and in addition is more economical and more easily controlled. It would seem from this that it should not be long before there will be a goodly number of mining plants operated entirely by electric power.

REPORT ON PATENTS.

(Specially Reported for the MINING RECORD.)

772,569—Conveyor. Orlando King, Denver, Colo., assignor of one-half to Herbert George, San Francisco, Cal.—A conveyor, in combination, moving trucks or supports, receptacles movable independently of and mounted upon said supports or trucks, means for automatically tilting the receptacles while moving, and means co operating with the bodies of the moving trucks or supports during their travel to prevent tilting thereof during the tilting movement of the receptacles

772,389—Ore Drainage and Leaching Tank. Jean F. Webb, Denver, Colo.—A metallurgic filter, an outer imporfated tank separated by an annular space from an inner drainage and leaching tank with perforated sides and bottom covered with suitable filters, and having within its circumference the perforated lower end of a hollow compartment or stand-pipe through which liquids or compressed air may be introduced into said tank and forced by pressure to pass outwardly

through the filters and perforations thereof, and having pipes through which the flow of such liquids or compressed air may be reversed from the said hollow compartment or stand-pipe into the said annular space and be forced by pressure to pass inwardly through the perforations and filters of said tank.

772,723—Blast Furnace. Andrew Batto and James C. Callan, Braddock, Pa.—The combination with a blast furnace, of a conduit communicating with the blast furnace near the top thereof, and a dust collector composed of a curved elbow, a downwardly-extending tube, angularly disposed plates arranged in said elbow and having spaces between the plates communicating with the open air.

772,846—Gas-Seal for Metallurgical Furnaces. Samuel Stewart, Brighton, and Harry Higgs, Woodward, Ala.—A gas-seal for metallurgical furnaces, comprising a plurality of sliding gates tapered at the end to fit snugly together when in the closed position, a series of shafts geared together, and a crank on each shaft pivotally connected to one of said gates, and means for rocking one of said shafts.

772,925—Roasting and Smelting Furnace. Harvey Cockell and William H. Fish, Columbus, Ohio.—An ore roasting and smelting apparatus, a furnace, an outlet for the products of combustion therefrom, an ore feeding and roasting chamber located in said outlet having a separate discharge into said furnace, and a fuel-supply communicating with said discharge.

773,266—Amalgamating Machine. Gerard C. Scott, Columbus, Ohio.—The combination of a substantially horizontal tapered mercury-containing casing closed at its larger end and open at its smaller end with an inlet for its larger end, a steam-jacket for the lower portion of the casing, a longitudinal substantially horizontal shaft journaled within the casing, and a closed amalgamating-body carried axially upon the shaft, tapered with the casing and provided with longitudinal substantially radial blades, means for rotating said amalgamating-body and an inclined tailings-discharge chute located adjacent to the smaller end of said tapered amalgamating-body forming a continuation of the tapered casing.

773,246—Magnetic Separator. John W. Carnoghan, Silvercreek, N. Y., assignor of one-half to Albert B. Chapman, Silvercreek, N. Y.—The combination with a downwardly-tapering mill-hopper, of a magnetic separator comprising a downwardly-tapering funnel, which is seated loosely in the mill-hopper, and separating-magnets supported on the funnel at the outlet thereof.

773,310—Mining Machine. William O. Wood and John H. Miller, South Hetton, England.—A mining machine comprising a stationary principal frame, a sliding frame supported in guides upon the principal frame, means for supplying motive power, means for cutting and a drill, said means and said drill being all mounted on said sliding frame, a drill-spindle, bearings for said drill-spindle adapted to swivel and to be adjusted to any position, a semi-circular guideway and means for clamping said bearings in position in said guideways and a swiveling steadying-block upon the stationary frame for the drill also adapted to be pivotally adjusted to any desired position.

773,809—Coke-Oven. George S. Ramsay, St. Marys, Pa.—A coke-oven having a stack, and provided with a main bottom flue communicating at one end with the stack, front and rear upstanding flues communicating at the upper ends with the interior of the oven, and the independent front and rear bottom flues connecting the upstanding flues with the main flue, the flues on each side of the main bottom flue being independent of the flues on the opposite side and also independent of each other.

774,560—Conveyer. Gabriel Carlson, Springfield, Mass.—A conveyer-belt consisting of two parallel edge strips of flexible material, and separate parallel wires extending from one strip to the other to constitute the supporting surface of the conveyer and means to secure the ends of the wires to said strips in separated relation to hold them against lateral or endwise displacement.

774,304—Metallurgical Process. Martin P. Ross, San Francisco, Cal.—A method of producing steel direct from iron

ore, which consists in subjecting the ore to the reducing action of a hydrocarbon-flame, and at the same time to the combining action of a hydrocarbon vapor.

774,387—Hoisting Apparatus for Blast Furnaces. Harry Heffrin, Pittsburg, Pa., assignor to Thomas H. Martin, trustee, Pittsburg, Pa.—A hoisting mechanism for blast furnaces having in combination a skipway, a constant-speed motor, a car movable along the skipway, and means for moving said car operated by said motor and having a slower speed as the car approaches the ends of its travel than between intermediate points.

774,704—Ore Washing Machine. Gustav Seberg, Racine, Wis.—An ore washing machine, a main receptacle, a sluiceway surrounding said receptacle, the floor and outer wall thereof being formed integral with said receptacle, said floor-section being slightly inclined toward said main receptacle, an inner wall and means to adjustably secure said inner wall above said floor-section.

774,731—Portable Conveyer. Jesse Ainsworth, Lyons, Kans.—The combination of a truck-frame mounted on wheels, a conveyer-frame mounted on said truck-frame, and projecting outward therefrom, a conveyer-belt and supporting-rollers on said conveyer-frame, the outer end of said conveyer-frame being divided and hinged transversely to adapt said outer section to fold over upon the main section, a suspending device connected to the conveyer-frame inside of said hinged section, and means on the truck-frame for driving the conveyer.

774,786—Gold Saving Apparatus. Louis Sachse, Oroville, Cal.—The combination with a tank having upper and lower compartments arranged one above the other and having a floor between them, said compartments inter-communicating through an opening in said floor, means restricting the outflow from the upper compartments, means vertically over the opening adapted and arranged to intercept the precipitates from such liquid through the opening into the lower compartment, and means for supplying a current of water in opposition to the downward current of water above said opening in said floor.

775,147—Ore-Roasting Furnace. Andrew P. O'Brien, Richmond, Va.—A roasting furnace comprising a casing, a hollow shaft mounted therein, vertically arranged parallel flat partitions dividing the shaft into vertical compartments, rabble arms extending into said shaft and through the compartment walls, the said rabble-arms having internal air-passages for leading air from one compartment in the shaft through the rabble-arms to another compartment in the shaft.

774,788—Charging Apparatus for Blast-Furnaces. Karl Schneider, Koblenz, Germany.—The combination with adjacent blast-furnaces, of apparatus adapted to supply both of said furnaces from a single hoist, said apparatus consisting of combined charging-receptacle and conveyer receiving the charge of material from the hoist and normally occupying a position above the top of one of the furnaces, and a runway for said receptacle-conveyor leading to a corresponding position above the top of the other furnace.

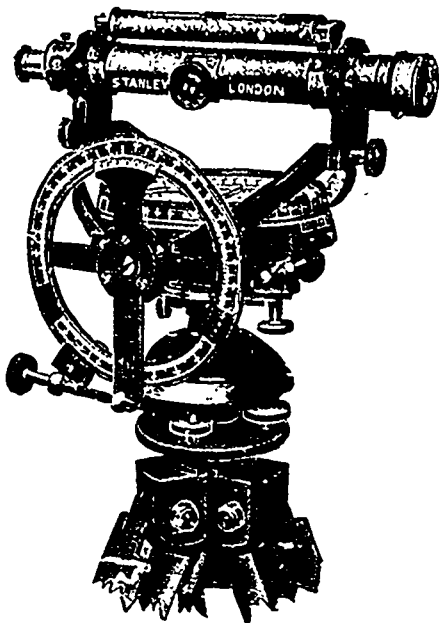
The problem of long-distance transmission of electric power has come down to the question of insulators for supporting the wires. Very rapid strides have been made in this work during the past year or two, until 40,000 is a common voltage, and now 60,000 is being successfully applied, one such line being in operation in the State of Washington, while another is being installed in California, in both instances bringing water power many miles to the consumer in the form of electricity, to be distributed at a low potential for electric lighting, traction, and general power purposes. The electrical experts are now looking to see the 100,000-volt current in practical and economical service before a great while, which will mean that power may be transmitted from 800 to 1,000 miles. Electric machinery is ready to furnish this voltage to the wire, and to step it down to commercial voltages at the other end. Everything, says *The Iron Age*, is in readiness but the insulator.

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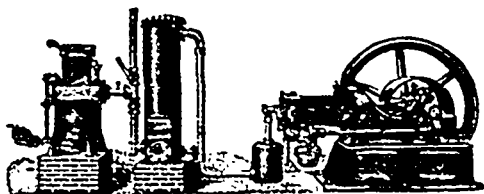


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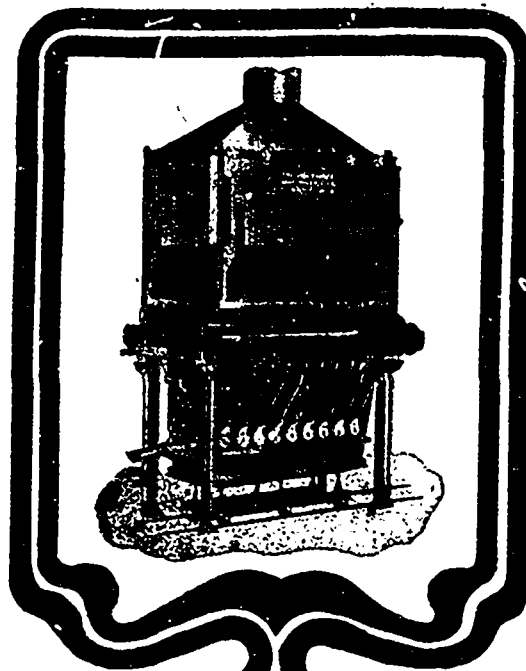
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