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TWENTY-FIRST YEAR OF PUBLICATION

CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. VI.

OTTAWA, APRIL 30th, 1903.

Vol. XXII—No. IV.

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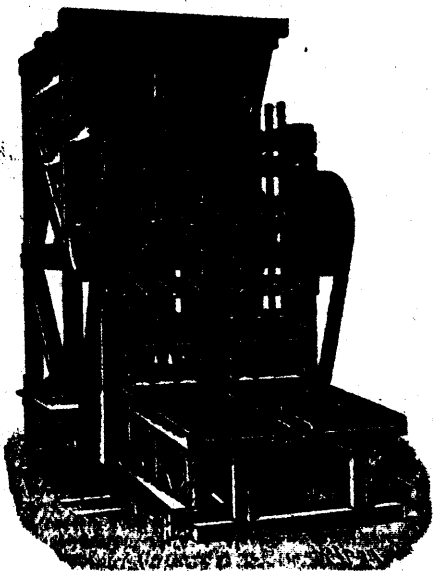
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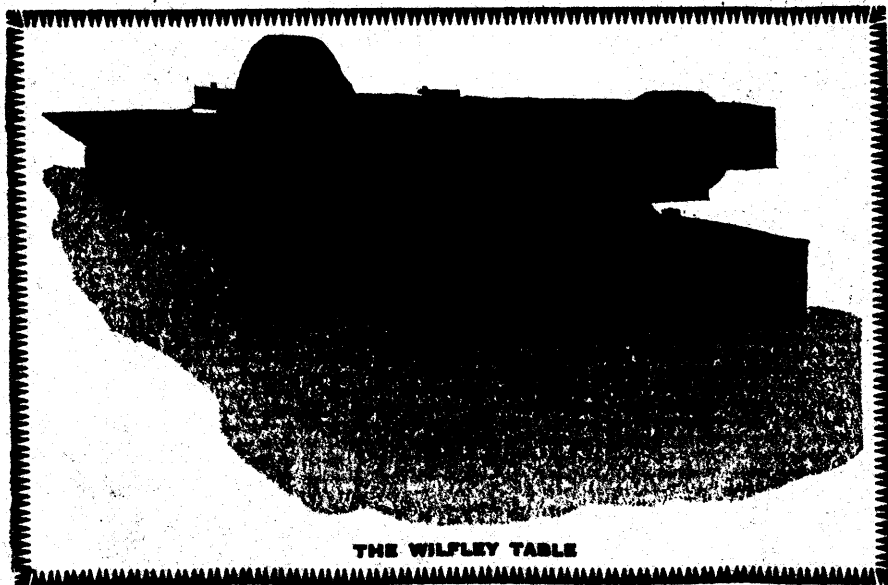
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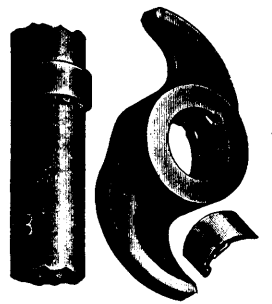
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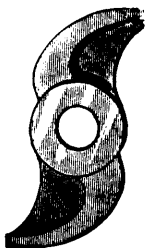
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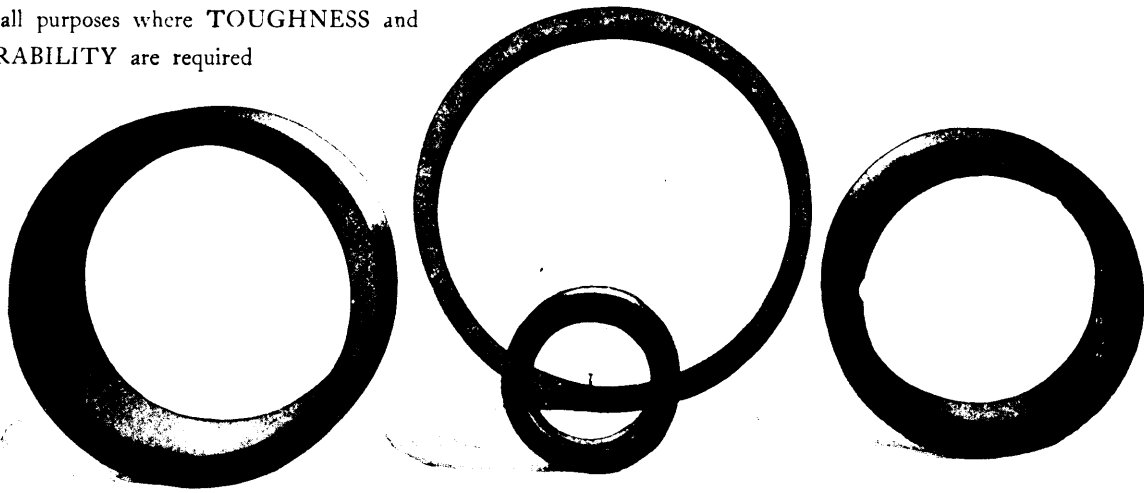
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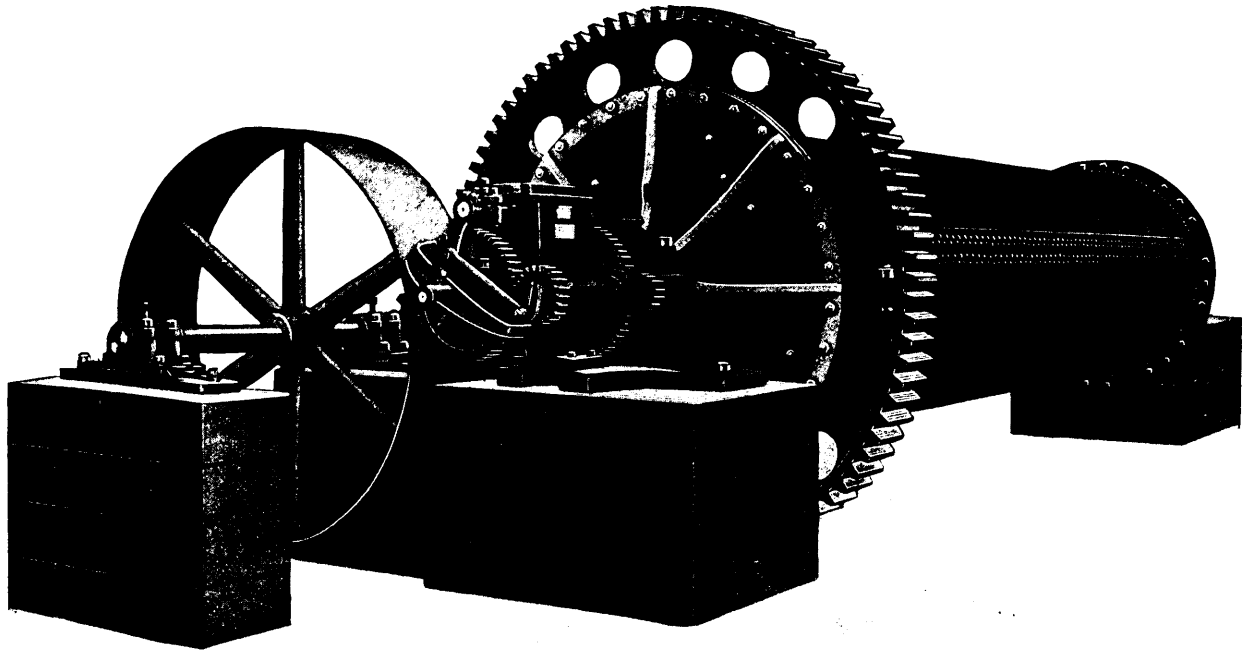
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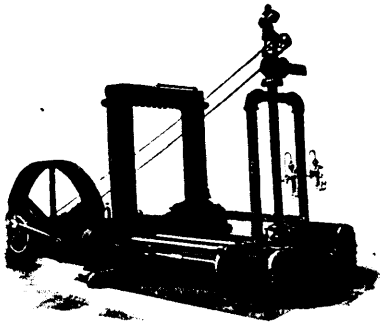
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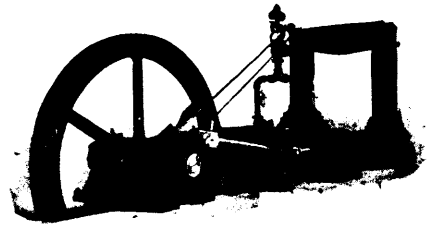
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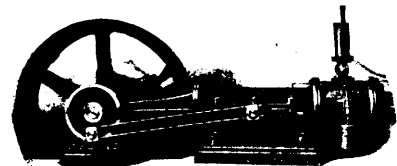
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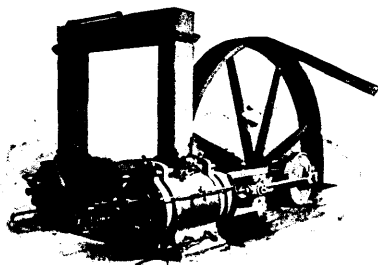
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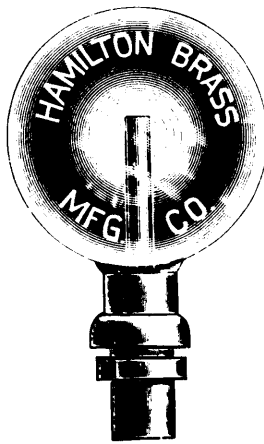
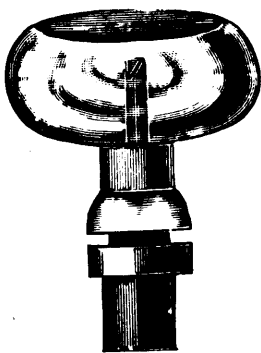
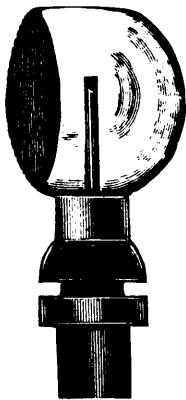
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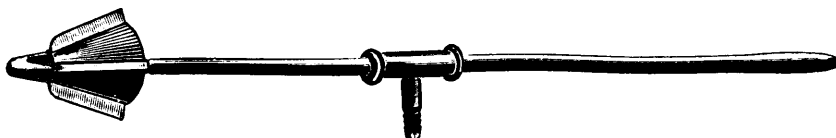
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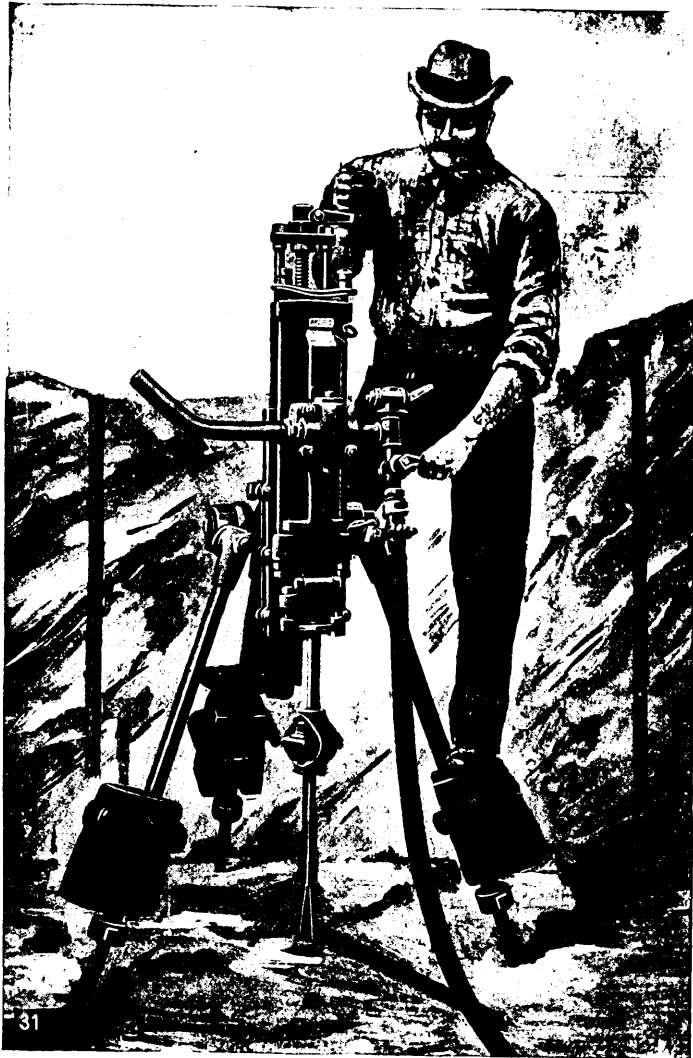
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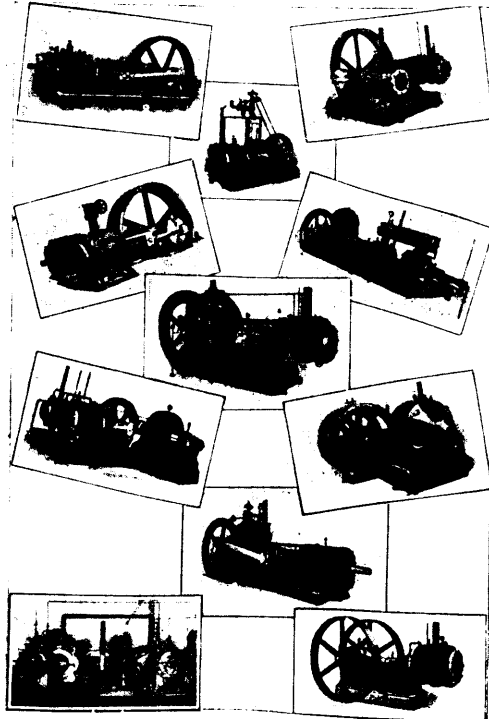
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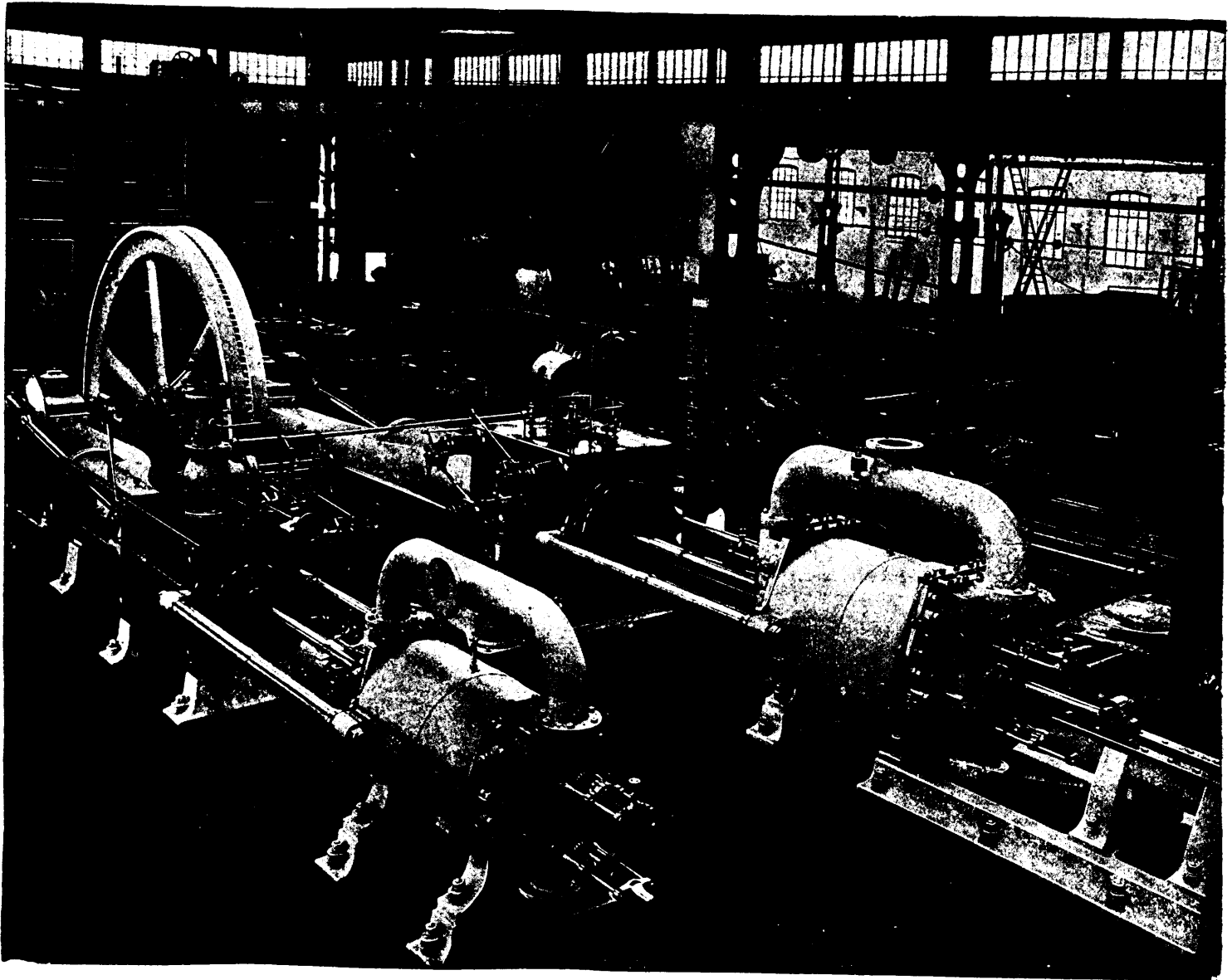


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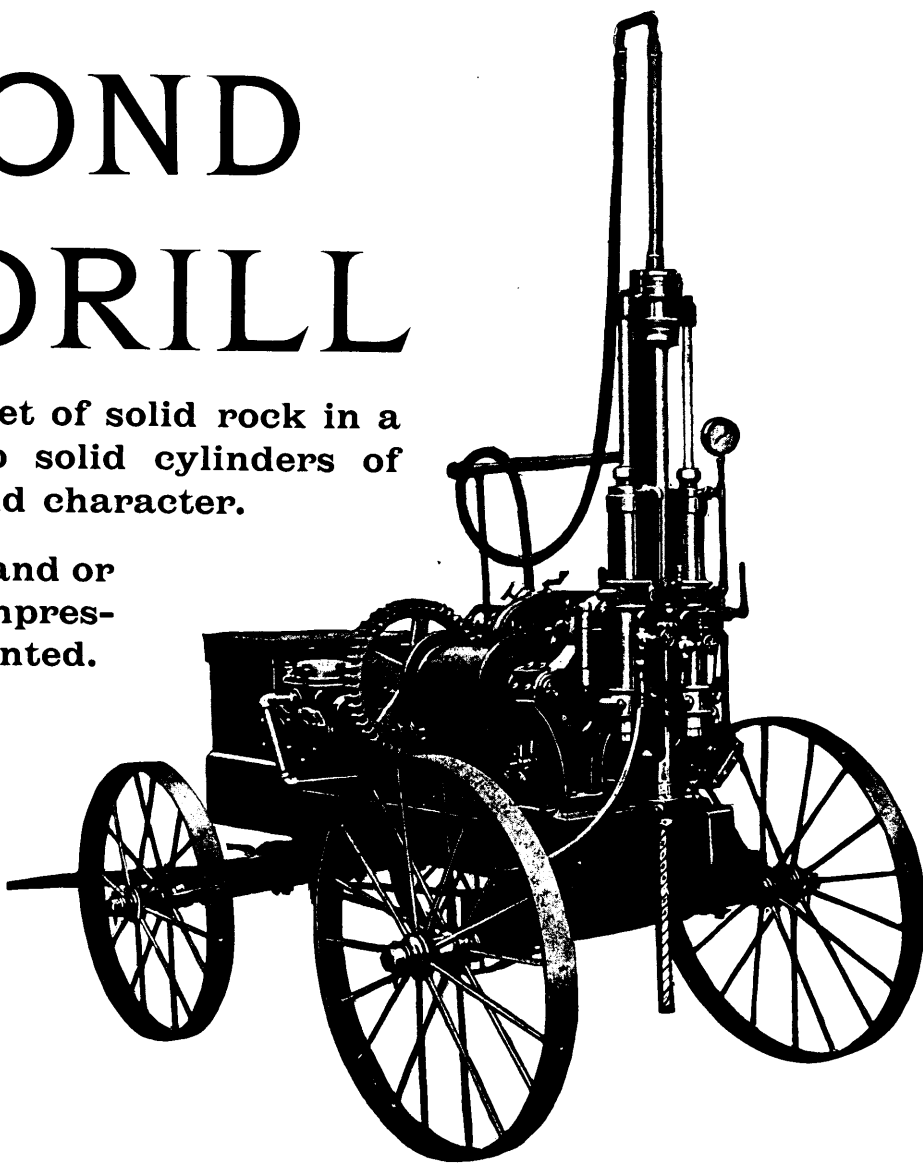
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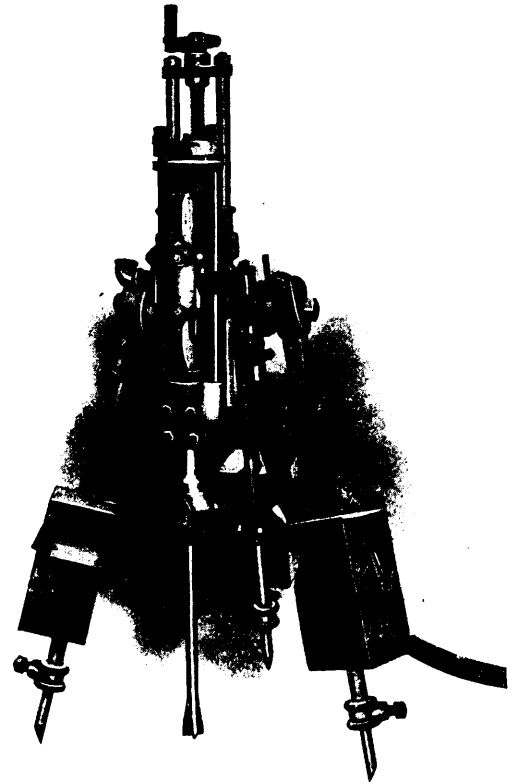
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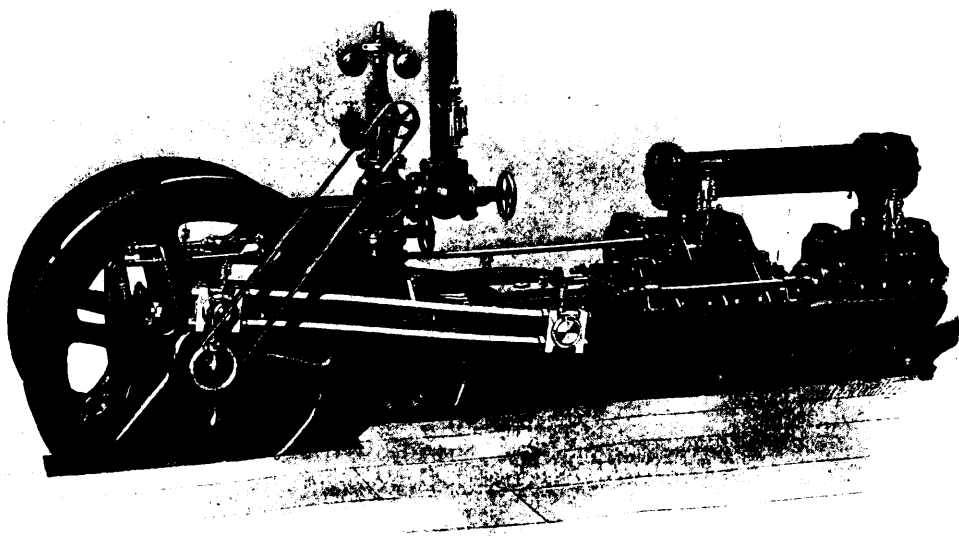
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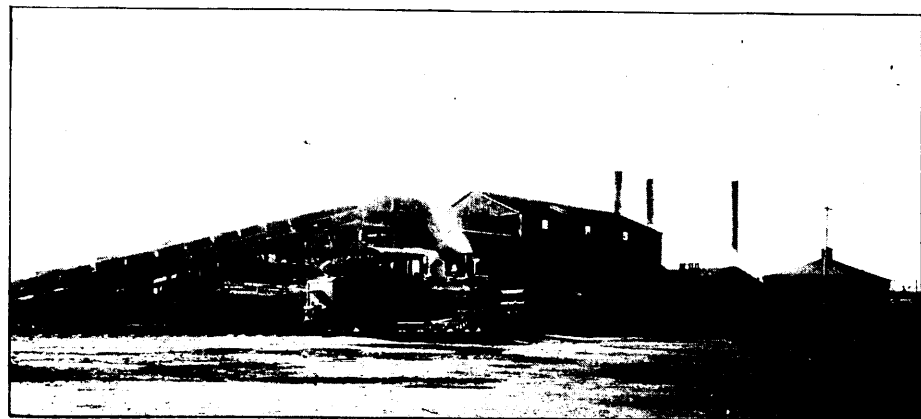
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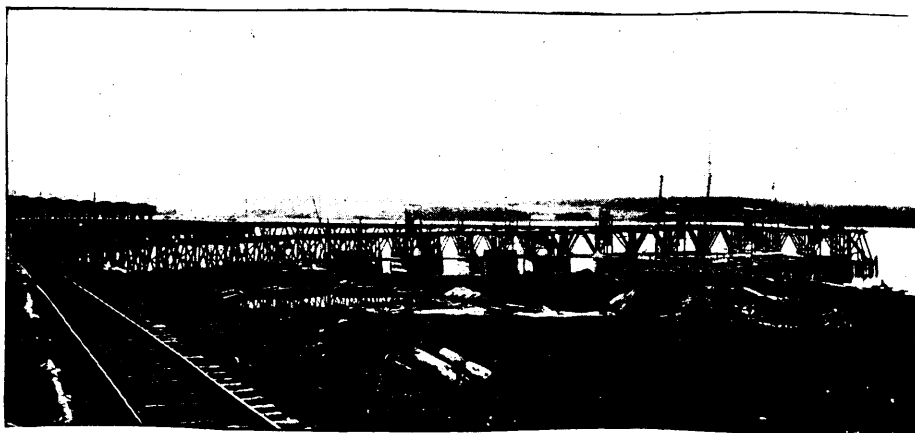
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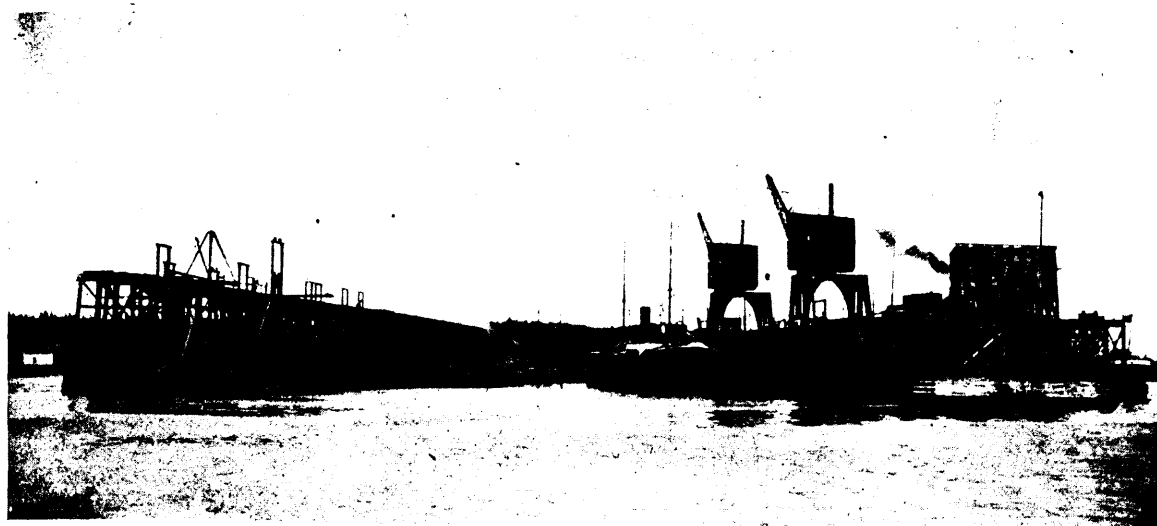
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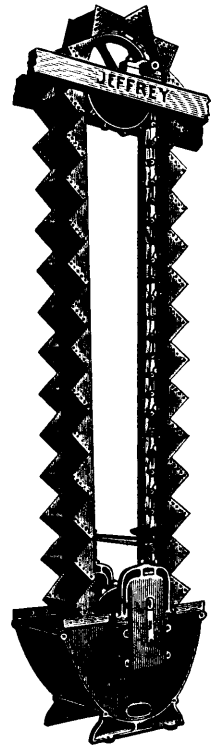
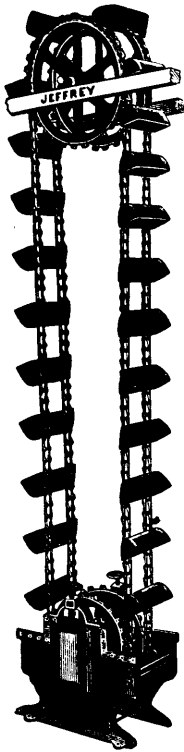
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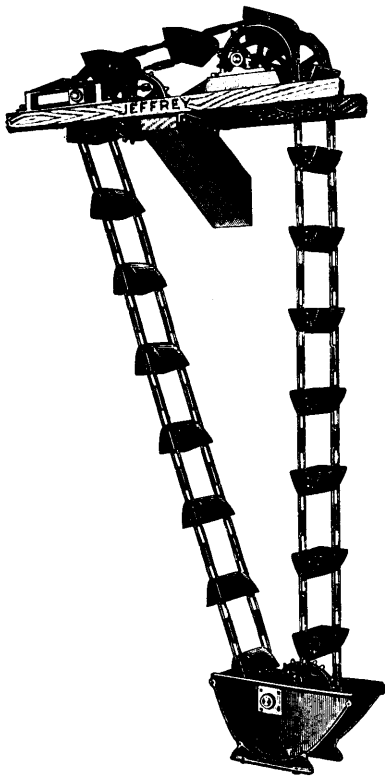
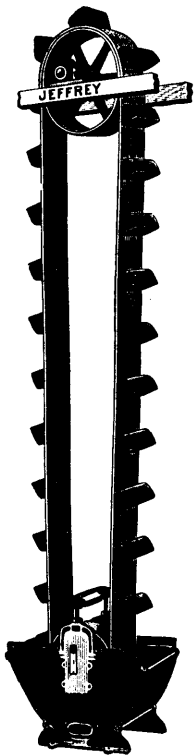
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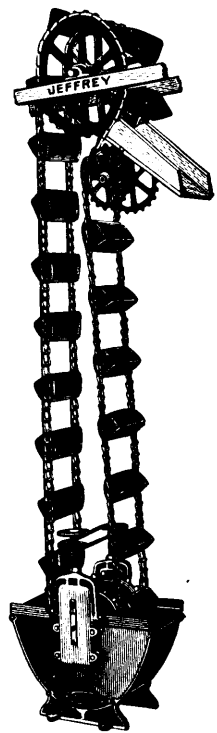
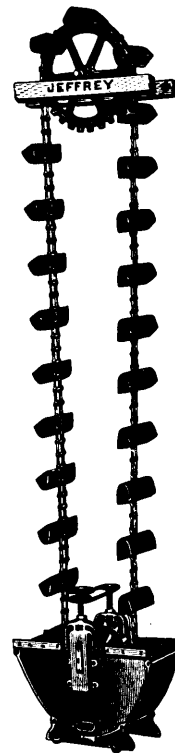
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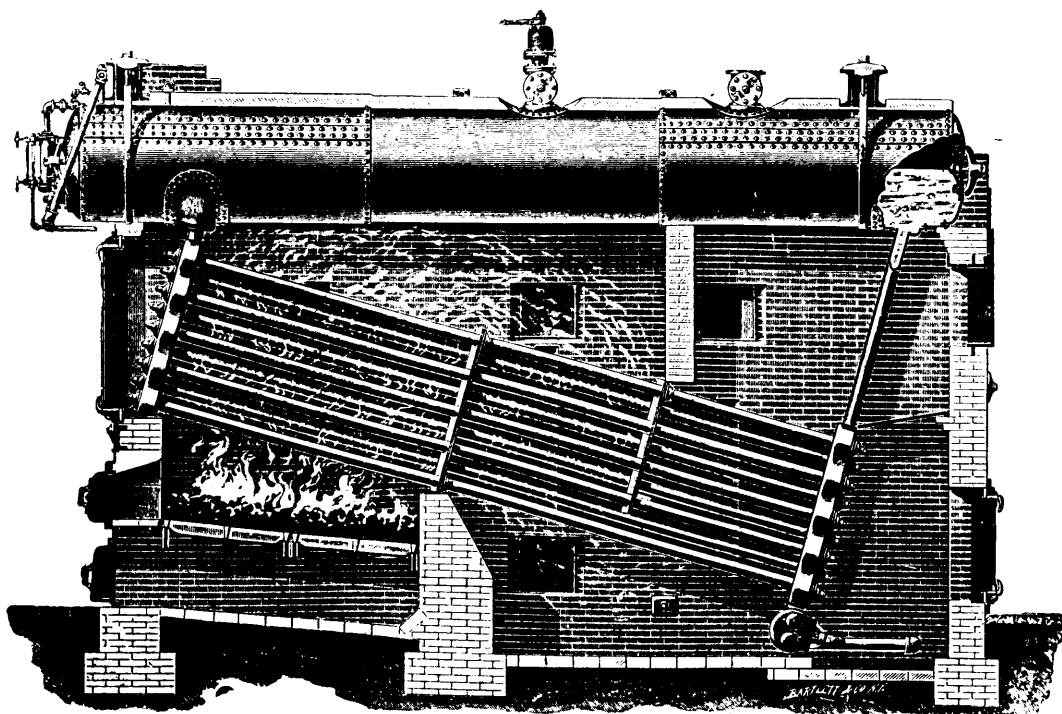
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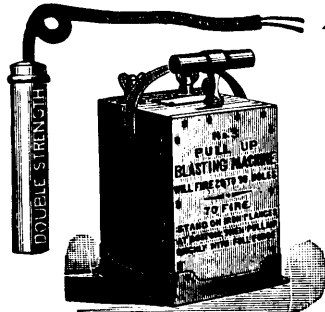
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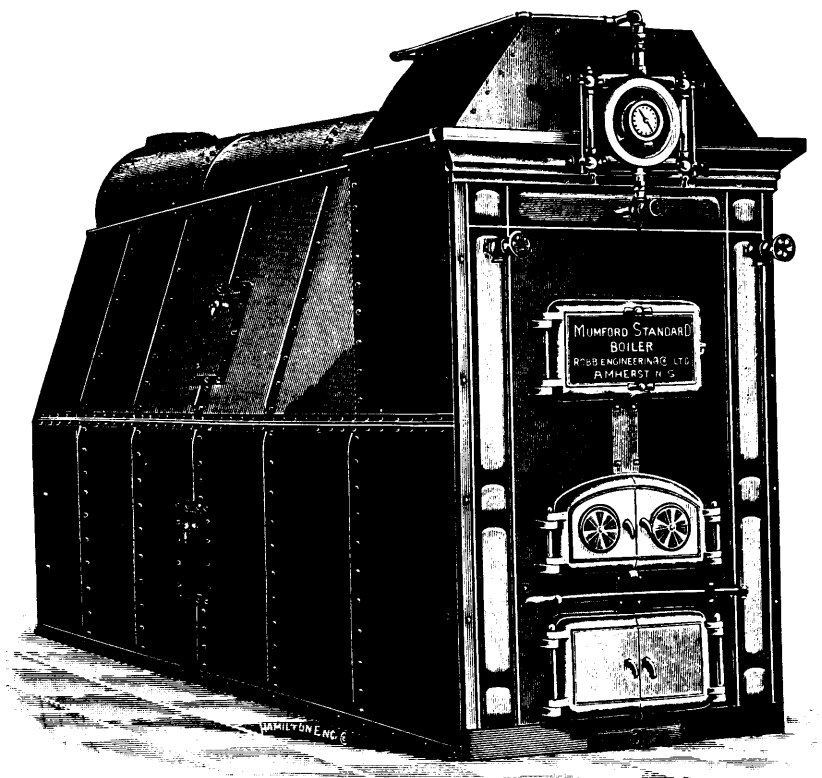
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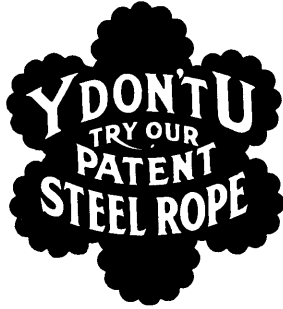
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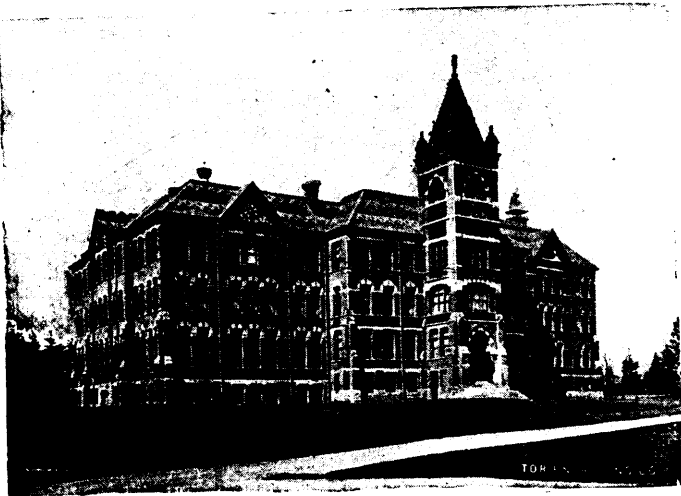
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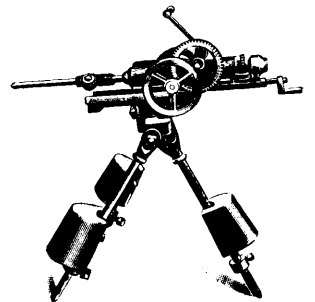
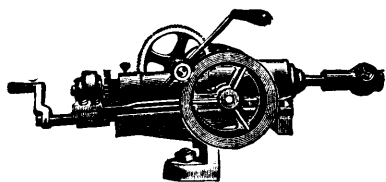
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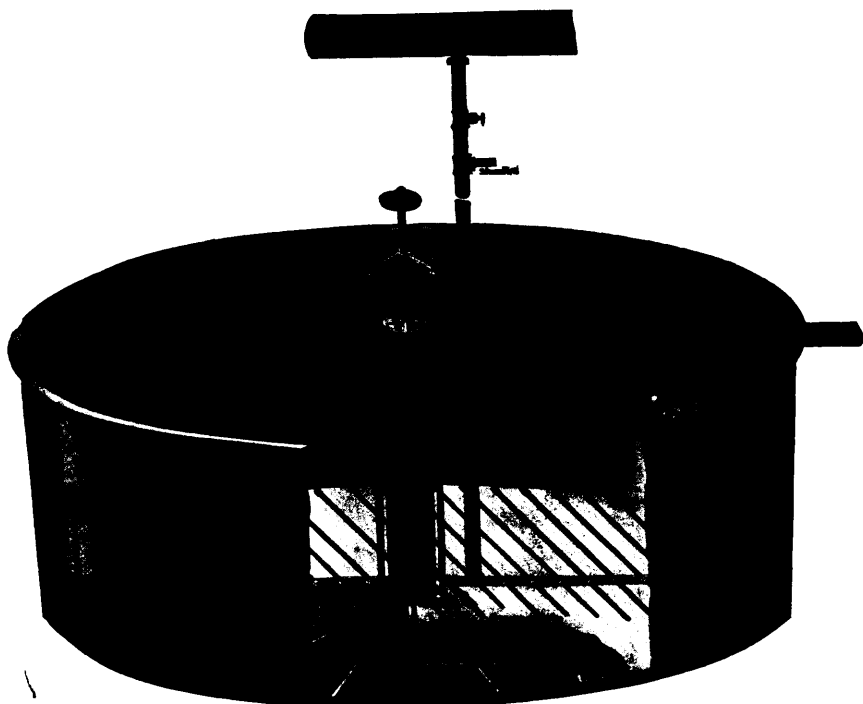
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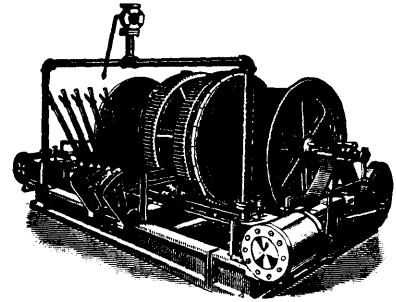
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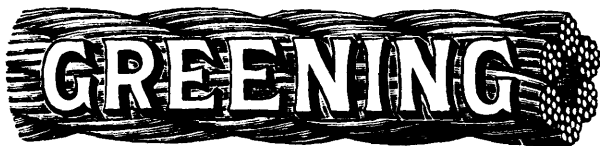
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Should only be used on special large wheels and drums.

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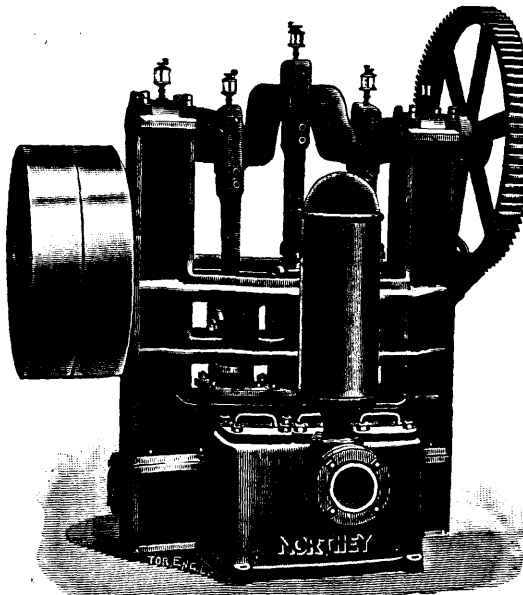
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Pumps for Mine Work Triplex Power Pump

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

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We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

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Limited, Toronto, Ont.

21st YEAR OF PUBLICATION.

The CANADIAN MINING REVIEW

Established 1882

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

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

Published Monthly.

OFFICES {Orme's Building, Ottawa;
Windsor Hotel, Montreal.

VOL. XXII., No. 4.

APRIL, 1903.

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The Dark Hour of the Dominion Iron and Steel Co., Ltd.

The Dominion Iron and Steel Company has certainly had a full measure, pressed down and flowing over, of the trials and tribulations incidental to the launching of a new enterprise on a large scale. These troubles have fallen thickly and heavily lately, and as a natural consequence have raised doubt and distrust in the minds of the investing public. A strong "bear" attack on the stock by Boston operators, precipitated, it is said, by the foolish attempt of the President's son to "bull" it (for which his father ought to soundly spank him when he gets back from the Mediterranean) succeeded beyond the expectations of the originators of the movement. The securities of the company collapsed like a pack of cards. No rescue came from the Directors and their associates. These gentlemen, who for their own selfish ends had forced the common stock up to a fictitious value and had gulled thousands of small speculators throughout the Dominion into buying thereat, stood by and allowed the "bears" to do their worst. It is even said that some of them (Directors of the Company at that) joined in the game and made much money by selling "short." The common stock fell 20 points in an incredibly short space of time and the bonds and preferred stock shared in the "slump." On the top of this came the unfortunate fire at the Dominion No. 1 Colliery of the Dominion Coal Co. which the "bears" made the utmost use of to renew their savage attacks on the stocks of both companies. And as if this was not sufficient, our old friend, Mr. Cornelius Shields, the 2nd Vice-President of the Steel Company and General Manager of the Coal Company, who had been looked upon as the "strong man" destined to save the situation, suddenly and without warning threw up his appointment. Viewing his action in leaving Sydney for a higher salary at the Soo, side by side with what some of his associates on the directorate have done in looking after themselves, Mr. Shields can hardly perhaps be severely blamed, but he certainly chose a very inopportune time for bettering himself.

It is small wonder then that the common stock tumbled over 30 points. And yet after all we need not blame the present state of affairs altogether upon the causes above mentioned.

An intelligent observer, who has carefully and dispassionately followed the somewhat meteoric career of the Dominion Iron and Steel Company, might justifiably conclude that if the gentlemen who some 18 months ago assumed the task of guiding the destinies of the company, had paid closer attention to a businesslike and economical working out of the proposition, and less time and thought to newspaper "puffing," and to the manipulating of the securities of the com-

pany on the stock markets of Montreal and Toronto, it is more than probable that order instead of something akin to chaos would to-day prevail at the Sydney works. And as a further and most important consequence, the investing public would not now be bewailing the loss of many millions of dollars, and saying nasty things of some of the Directors. A somewhat fierce light has latterly been thrown upon the management, or rather mismanagement of the Steel Company. It would appear as if one of the soundest and most promising business propositions ever laid before the public had been brought perilously near to absolute failure by a series of almost incomprehensible blunders, perpetrated by men whose reputations stood high in the commercial and industrial world. No industrial undertaking had ever been launched—in Canada at any rate—under fairer auspices. Here, after many years of conjecture and hope, was at length to be fulfilled the dream of developing our own great natural resources, and of placing Canada among the great iron and steel manufacturing countries of the world. The location of the works at Sydney seemed to be an ideal one to command the assembling together of the requisite constituent raw material at the very lowest possible cost. The venture was generously subsidised by the Dominion Government. It appealed to the imagination and patriotism of our people throughout several provinces and they eagerly poured their subscriptions for stock into the treasury. Our New England friends, following the lead of the man whose genius has already done so much for Cape Breton, were almost equally enthusiastic. The scheme deserved and claimed success, but, alas! it is humiliating to compare early promise with fulfillment after a lapse of nearly four years. The company's history has been one of kaleidoscopic changes, of extravagance, vacillation and blundering. South Africa as a graveyard for military reputations finds a parallel in Cape Breton as a place of interment for reputations won in various fields of industry. To attempt to fix the blame for failure would be a disagreeable and invidious task. Let the dead past bury its dead. And yet in bare justice to those who have been swept from power, it is only fair to state that the present controlling influence has done little to justify a change from which such great things were expected. When the control of the coal and steel companies passed into distinctively Canadian hands, there was great jubilation, and great results were prophesied. But the re-action against the alleged weakness and extravagance of Messrs. Whitney, Moxham *et al.* has, for some unaccountable reason, failed to re-act, and Messrs. Ross, Cox and Forget stand arraigned by a bitterly disappointed public for having lamentably broken down on the promises and predictions that were made by them, either personally, or by proxy, in the fall of 1901. If the securities of

the Dominion Steel Co. have earned an unenviable and unsavory reputation as a medium for stock exchange gambling and manipulation, the present controlling interests are to blame. No extravagance that the former management may have had to answer for could have given the enterprise a blacker eye than has been administered by the very questionable methods pursued on the Montreal and Toronto Stock Exchanges by men who are very closely identified with the magnates who wield supreme influence in the affairs of the company. And in this connection it strikes us as unfortunate, to say the least of it, for those responsible for the appointment, that the vice-presidency of the company should have been bestowed upon a gentleman who is a member of the Montreal Stock Exchange, and partner in a firm that is credited with being able to manipulate at will many of the stocks that are traded in on that market.

But apart from this regrettable aspect of the case, the direction of the company's operations at Sydney has been weak and ineffective, where it was confidently expected to be strong and decided. It was discovered very early in the history of the company that certain difficulties had to be met and overcome. These difficulties must have been fully understood when the Canadian control was established, but we have yet to learn that prompt and determined measures were taken to grapple with them. Hence it comes about that to day the output of pig iron and steel is far below what it should be, as a consequence of an inadequate supply of coke. It is almost ludicrous to find that in Cape Breton, of all places, an industry should be hampered and crippled by a lack of fuel.

Any one who has visited Sydney during the past two or three years could hardly fail to be struck by the frequent changes in the official staff of the company, and the feeling of unrest and uncertainty that has prevailed among its employees. This state of affairs still exists and the sooner the office and operating staff is placed upon a definite and permanent footing, the better for economy and efficiency.

If our remarks have been pitched in a pessimistic key it is certainly not because we believe the present situation to be hopeless, or that we have lost faith in the undertaking—far from it—in spite of all that has been done that should have been left undone, and of many things left undone that should have been done. We are convinced that the proposition of making iron and steel at Sydney and turning it out at a handsome profit, is as sound and feasible as it was from the first thought to be. Of the coal end of it there can be no shadow of doubt. The possibilities in this direction are only now beginning to be fairly understood, and we see no reason why, with proper management, the kindred industry cannot be redeemed from its present apparent state of failure.

More than ever before, those in control, in view of recent events, owe it to the company, and to Canada at large, to get right down to business and to bend all their energy and skill to a sound and vigorous policy that will place the undertaking upon the footing its inherent strength and merit entitles it to occupy.

And in the firm belief that this can and will be done, THE REVIEW expresses the hope that the present dark hour is only the darkest one that precedes the dawn of better and brighter things.

Imports of Mining Machinery.

The imports of Free Mining and Smelting Machinery for the first two months of the year amounted to \$107,404, the bulk of the machinery as usual being supplied by American manufacturers. Machinery to the value of \$9,263 was also imported under the dutiable list. Diamond drills (exclusive of Motive Power which is subject to duty) were also imported of declared value of \$3,370.

The Fernie Strike.

Viewed from several standpoints the Fernie strike and its settlement may be classed among the most important events which have yet transpired in connection with labour disputes in the Dominion. At one time or another during the continuance of the strike most of the problems which have arisen in the relations between Capital and Labour on this Continent were brought to the front, and one at least, and that the most important, was satisfactorily solved. Too much credit cannot be given to the gentlemen who formed the Conciliation Committee for their able, tireless and successful efforts, the result of which is not only a triumph for themselves but a far greater triumph for the principle of conciliation in labour disputes; one extremely satisfactory feature of the whole matter is that since the settlement has been effected all parties interested have united in a testimony both to the value of the services rendered by the Committee and to the all round fairness of the terms ultimately agreed upon.

It is not our intention at this late date to make a *resumé* of the whole dispute, most of the features of which are now matters of common knowledge. But there are certain aspects of the case which are well worth consideration and which fall within our province. On these we propose to comment.

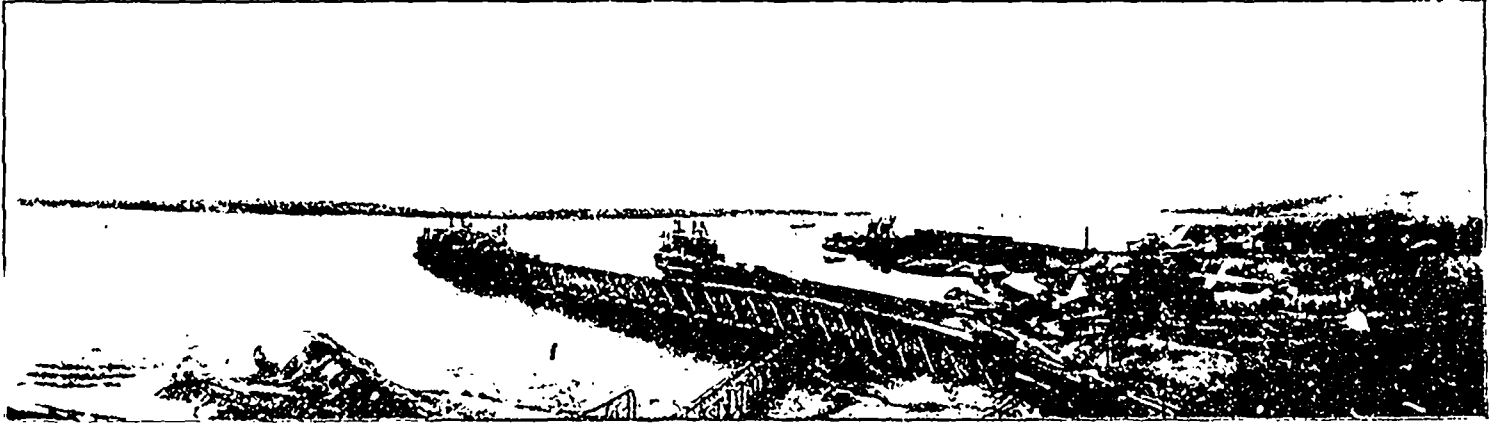
The first point which strikes one now that the whole affair is over is that a strike was totally unnecessary, viewed from every standpoint, and while it is not our intention to apportion blame, it is quite obvious that a little more tractableness and forbearance on both sides would have prevented an open rupture. We can hardly think, in the light of the information elicited by the Committee, that the main cause of the quarrel an authenticated statement was published by the management which showed average earnings of coal cutters ranging from \$4.50 to \$4.70 per day, and, although the accuracy of these figures was disputed, the men were unable to prove their contention that the earnings had been exaggerated. Such earnings, are fairly representative of what men can make under normal conditions and must be considered satisfactory, although it is only fair to point out that they are not excessive compared with the earnings of miners in other coal districts at the time. For instance, Mr. Dunsmuir, in a public statement made last month, in connection with the closing of his Extension Collieries, stated that his miners were earning \$4.60 per day. The Dominion Coal Co., advertising for miners, openly stated that they can make from \$3.00 to \$4.50 per day; undoubtedly a miner with \$3.00 per day in Nova Scotia is as well off as one with \$4.50 in British Columbia. At the same time we repeat that such a wage must be considered satisfactory to say the least of it. In the ultimate issue the wage schedule agreed upon at Fernie is, taking it altogether, the same as it was before the strike. The yardage, which only forms a small percentage of the work performed by the miners, has been graded according to its actual value. This item averages a reduction ranging from 50 p.c. to 75 p.c. on previous rates but will not appreciably affect the earnings of the miners. As to cutting rates, which form the real basis of miners' earnings, there are increases of 5 cents per ton at Michel, 10 cents per ton at Morrissey, and a reduction of 5 cents per ton in No. 1 mine at Fernie, the latter, however, being due to the introduction of a better class lamp than heretofore used, which it is claimed by the management does not handicap the miner and therefore entitles the Company to a rebate of 5 cents, the amount originally advanced to miners when lamps were introduced. Mr. Doherty, the President of No. 6 District Union, correctly summed up the result of the settlement as affecting wages by saying that "there was a slight sacrifice on the part of the few for the benefit of the money."



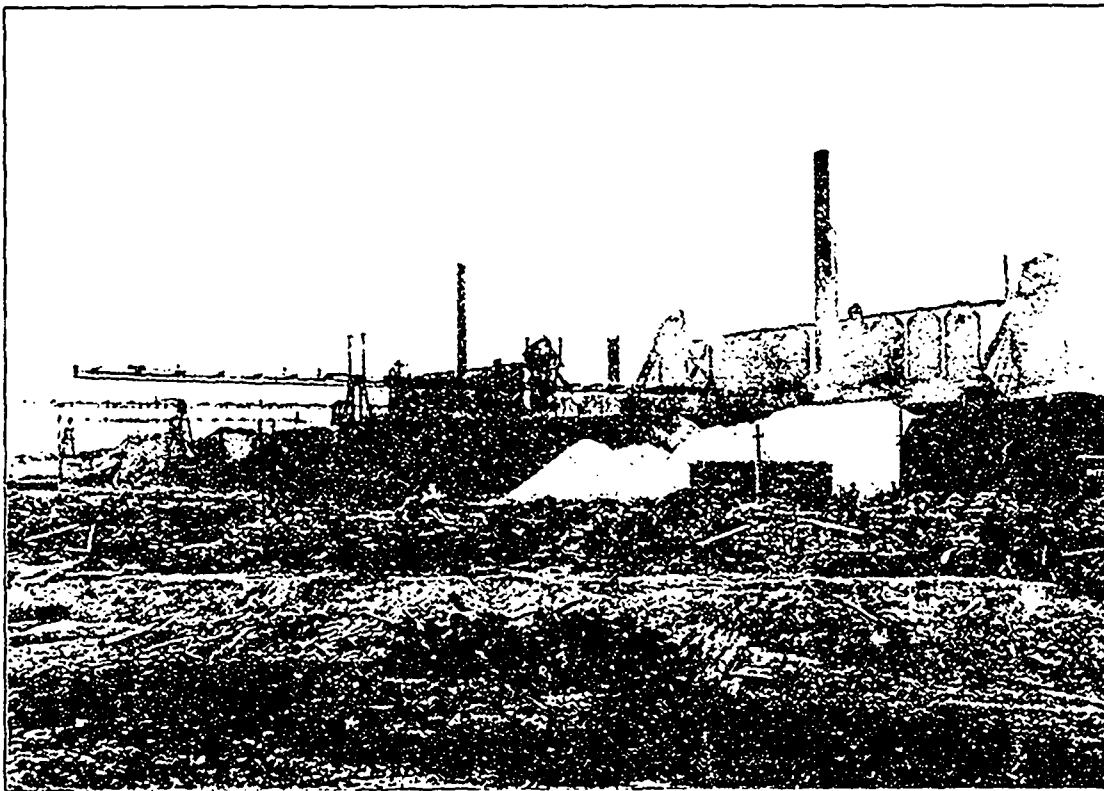
MR. CORNELIUS SHIELDS

Who has resigned the management of the Dominion Coal Co. to take direction of the enterprises of the Consolidated Lake Superior Co. at Sault Ste. Marie, Ont.

DOMINION IRON AND STEEL CO. LIMITED.

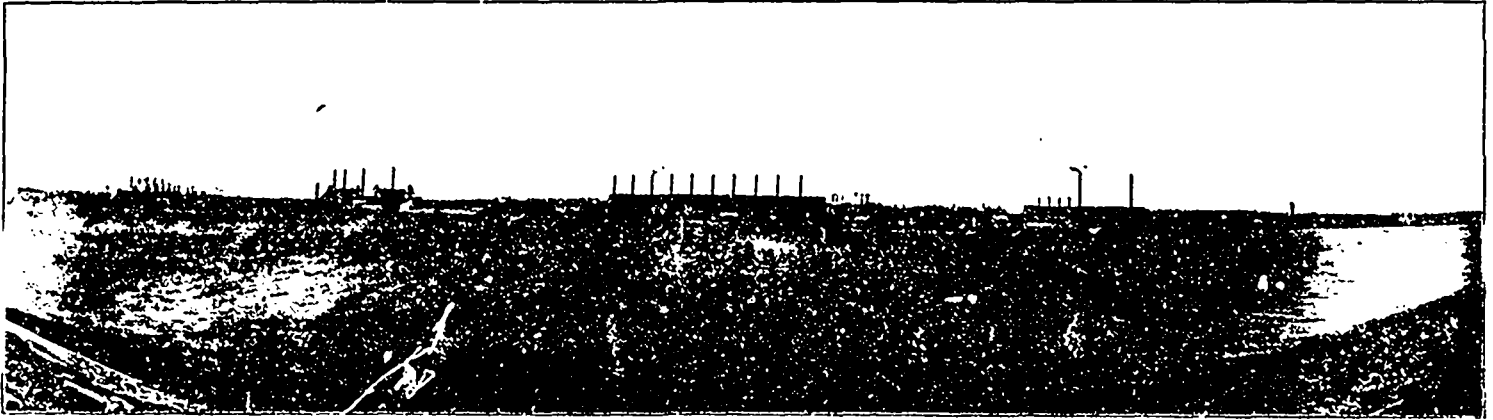


Shipping Piers and Coal-handling Plant at Sydney, Cape Breton.

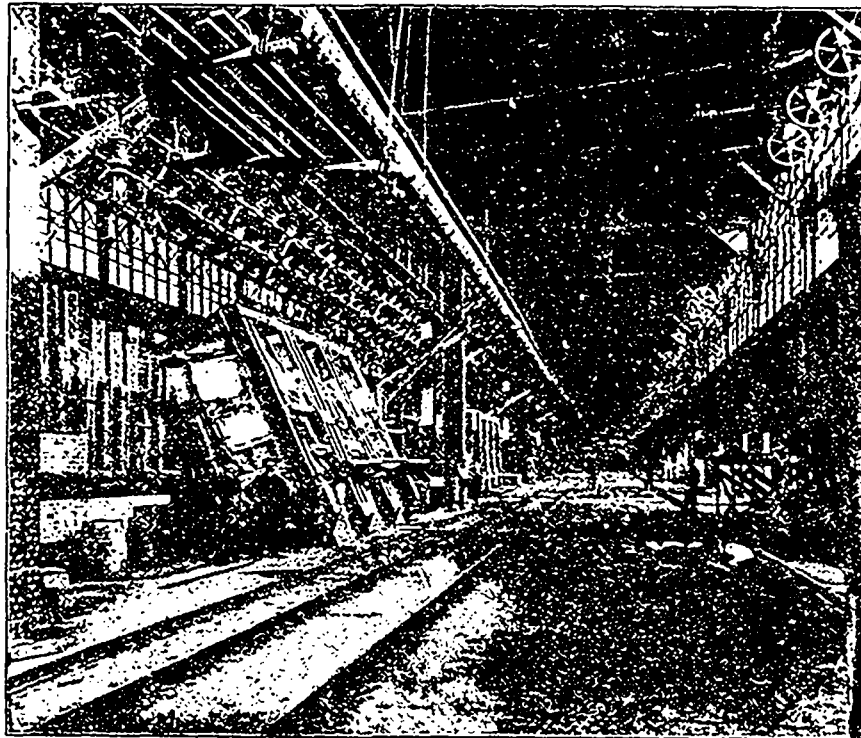


Blast Furnaces—The stacks are 20 ft. diameter at the base and 85 ft. high; diameter of hearth 11 ft. 9 in.; at stock line 14 ft. 6 in.

DOMINION IRON AND STEEL CO. LIMITED.



Panoramic View of Furnaces and Steel Plant at Sydney, Cape Breton.



Interior Open Hearth Plant.



MR. G. H. DUGGAN, C.E.

Who succeeds Mr. Cornelius Shields in the management of
the Dominion Coal Co.

More important than the wages settlement however, which involves so slight an alteration, is the settlement of many vexed questions affecting the relations between the management and organized labour. Probably if the truth were known these were the points which precipitated the struggle, for in the early stages of the work of the Conciliation Committee it was discovered that there was a total lack of confidence between the two parties to the dispute, neither would trust the other, and this estrangement had to be reconciled before progress could be made. It is hardly necessary to say that no permanent success can attend any concern unless the relations between the management and the workers are satisfactory. In this respect the Conciliation Committee were able to bring about a complete change, and to inaugurate what we believe to be an era of peace and prosperity. The refusal of the Company to recognize organized labour, or to meet the accredited Representatives of the Union in the first instance, was long ago seen to be a mistake, equally so the refusal to afford facilities for the Union to erect Meeting Halls; both positions have been abandoned by the Company. The Union is recognized, and a clause has been inserted in the settlement by which the management agrees in future to meet representatives of the Union in case of dispute, so long as such representatives are workmen of the company. They have also agreed to allow the men to acquire lands on which they can erect Meeting Halls, and as the other vexed questions of Company stores was solved during the progress of the strike, by the Company selling out their stores and abandoning the business, there is, so far as we can see, no bone of contention now remaining about which trouble or misunderstanding can arise. The company are to be congratulated on having abandoned an untenable position with respect to organized labour. Whatever may be the regrettable excesses or abuses indulged in by Union men, no sane person will maintain that the "principle" of Unionism can now be antagonized. This position has been taken up by many capitalist corporations but every one of them has met with defeat. The only man to-day who seems to stand by his right to refuse recognition in any form to Trades Unionism is Lord Penrhyn, who has fought the principle all his life and who seems likely to die unconvinced; but so much misery has his attitude caused that there is even at the moment talk of Government intervention, in what would almost appear to be an unconstitutional manner as affecting the rights of property, but the bare proposal that the Government should step in, and by "*force majeure*" compel his Lordship to operate his quarries and settle his labour difficulties, shows the attitude of public opinion on this important matter. On the other hand the very fact that the right of organization has been conceded and the full recognition of properly accredited delegates has been made, only adds to the responsibility of Unionism in enforcing the observation of law and order. While public opinion will not for a moment support an employer in his refusal to recognize Unionism, it will undoubtedly support him to the full extent in his refusal to be coerced, bullied or injured by unreasonable or illegal action on the part of Labour representatives. In this connection we have no hesitation in condemning the "Walking Delegate" as a constant menace to the peace and prosperity of a community and as great a source of danger and loss to Labour as to Capital.

The other point which is emphasized by this struggle and about which we have had occasion to speak before is the absurdity of Canadian Labour Organizations being under the control of American Unions. There is little doubt that the alien element had much to do with the inception of the Fernie strike, and while of course it is the right and privilege of every labouring man to belong to whatever Trade Union he chooses and to submit if he sees fit to the domination and control of alien organizations, at the same time we are convinced that if fully understood all the bearings of the question he would see

that it is both illogical and unprofitable for the Western Federation of Miners to control Canadian Lodges. We hold that the greatest benefit which Labour can derive from international association is by correspondence and periodical Congresses between the leaders, such as those which are held in Europe where there is an annual gathering, sometimes in London, sometimes in Brussels, sometimes in Berlin or Paris with a general interchange of ideas and comparing of notes, but when it comes to a large and wealthy country with different tariff and fiscal laws, geographically placed so that competition in all branches of industry is inevitable, controlling the Labour market of this Dominion, it is obvious that such a condition is one in which all the advantage belongs to the "predominant partner."

In addition to the satisfactory character of the settlement as affecting details, it is a matter of general congratulation that by mutual agreement the present compact exists for two years certain, and for three years subject to sixty days notice. The Kootenays may therefore look forward to an area of prosperity, we trust unbroken by any further disputes, and an opportunity will thus be furnished to the Crows Nest Pass Coal Co. to overtake the rapidly increasing demand for coal and coke.

Bell's Asbestos.

The report of the Directors for the year ended 31st December last. Submitted to the Shareholders on the 20th ultimo, shows a net profit of £4,385. 8s. 3d. To which has to be added the amount brought forward, £2,538. 10s. 8d leaving for appropriation £6,923. 18s. 10d. The Directors recommend the payment on 22nd April, of a dividend at the rate of three per cent. and to carry forward £3,333. 18s. 10d. In the accounts the Company's Mine, Buildings and Machinery at Theiford Mines, Que., is valued at £78,847. 17s. 3d.

Mining Possibilities of the Canadian Rockies.

By BERNARD MACDONALD, Spokane, Wash.

INTRODUCTION.

As its title indicates, the object of this paper is to show the possibilities of the Canadian Rockies, as a mining field.

The scope of mining, referred to here, is intended to cover the mining and production of the precious metals only. And by way of preface to the general discussion of this subject, the important part that a large stock of metallic money plays in the development and commercial greatness of a country, is noted, and, in this connection is also noted that the present money circulation of Canada is inadequate, and the means of obtaining, and the advantage of possessing a larger money circulation are suggested.

It will be shown by inference that in the region of the Canadian Rockies, the mineral resources of which, are as yet, undeveloped, lies the source of an enormous supply of the money metals. In proof of this, reference is made to the enormous production of gold and silver from such portions of the Rocky Mountains as lie within the other countries of North America, and the deduction is made, that there being no general difference between the geological structure of the portions of this range of mountains within such countries and the portions of them within Canadian territory, equal production should result from the latter portion when explored and developed to an equal extent.

A large production of precious metals within a country is an object of great national importance, for these furnish the home supply of gold and silver coin, which is recognized as the money of ultimate redemption in the monetary systems of the civilized nations. All other

forms of money come under the head of the promissory or token class, and their recognized, or negotiable value, is based on the probability of their ultimate redemption in standard coin or bullion, at their face denomination. Gold and silver coin, or bullion is, therefore, to be taken as the basis of all current standard money. The proportional size and soundness of the monetary system of any nation, will be in direct ratio, other things being equal, to the size of the metallic base upon which it rests. And, it is a generally recognized fact that the volume of the business that any country is capable of sustaining, is measured by the volume of the stock of current money in that country; while the amount of successful business transacted in a country, is the true measure of its prosperity and commercial greatness.

These premises being true, it follows that the prosperity of any country is in direct ratio to the volume of metallic money, or money metals, constituting the base for its currency circulation. And, as prosperity ministers best to the wants, and otherwise contributes to the happiness and greatness of the people of a nation, it is the plain duty of governments, acting through wise legislation, to provide means and measures, under the operation of which, the people may accumulate a large volume of metallic money.

If the industrial conditions of Europe, during the closing years of the 15th Century, when the stock of gold and silver money then existing in that continent, is estimated to have been only \$193,000,000, be contrasted with the industrial conditions at the present time, when the stock of gold and silver is about 20 times as great, the improved conditions that now exist will go to prove these conclusions. Moreover, on careful investigation, I think it will be admitted, that the improved industrial condition and modern prosperity of the world in general, is due, in a very large measure, if not entirely, to the influence of the money metals that have been mined, coined, and put into circulation since the close of the 15th Century.

Illustrating the valuable effect a prosperous mining industry has on a country, the following reference to the results in the United States for the year just ended, is quoted:

To make clear this wonderful product of things under the earth, this illustration may be given: If the wealth of the nation was wiped out, if its farms were destroyed, its manufactories annihilated, its railways torn up and cast into the sea, its ships sunk—if every vestige of the nation's wealth were to perish and leave only the mines—the mining industry at the rate of last year's (for 1902) return would rebuild the entire structure in 70 years, for its production in that single year, \$1,360,344,247, which including the coal, iron and petroleum, was sufficient to have more than paid the national debt. This statement could not be made of any other country on the earth.

THE PRINCIPAL GOLD AND SILVER MINING FIELD IN THE WORLD.

The main source of the precious metals, mined within the last three and a half centuries, has been in the Rocky Mountain Regions. The portion of these mountains within Mexico will be referred to as Mexican Rockies, the United States as the American Rockies, in Canada, as the Canadian Rockies.

The history and progress of mining on this continent from its beginning to the present time, may be briefly summarized as follows:

Early in the 16th Century, shortly after the discovery of America, the regions of Mexico, and the Central and South American countries penetrated by the Rocky Mountains, were invaded by the Spaniards, who found large stores of silver and gold in possession of the Aztec and Indian Aborigines of these countries. After these people were conquered, and their stores of precious metals confiscated and shipped to Spain, the invaders began to search for the mines from which these metals were obtained. These were found scattered through the mountain regions of these countries. The work of mining was then

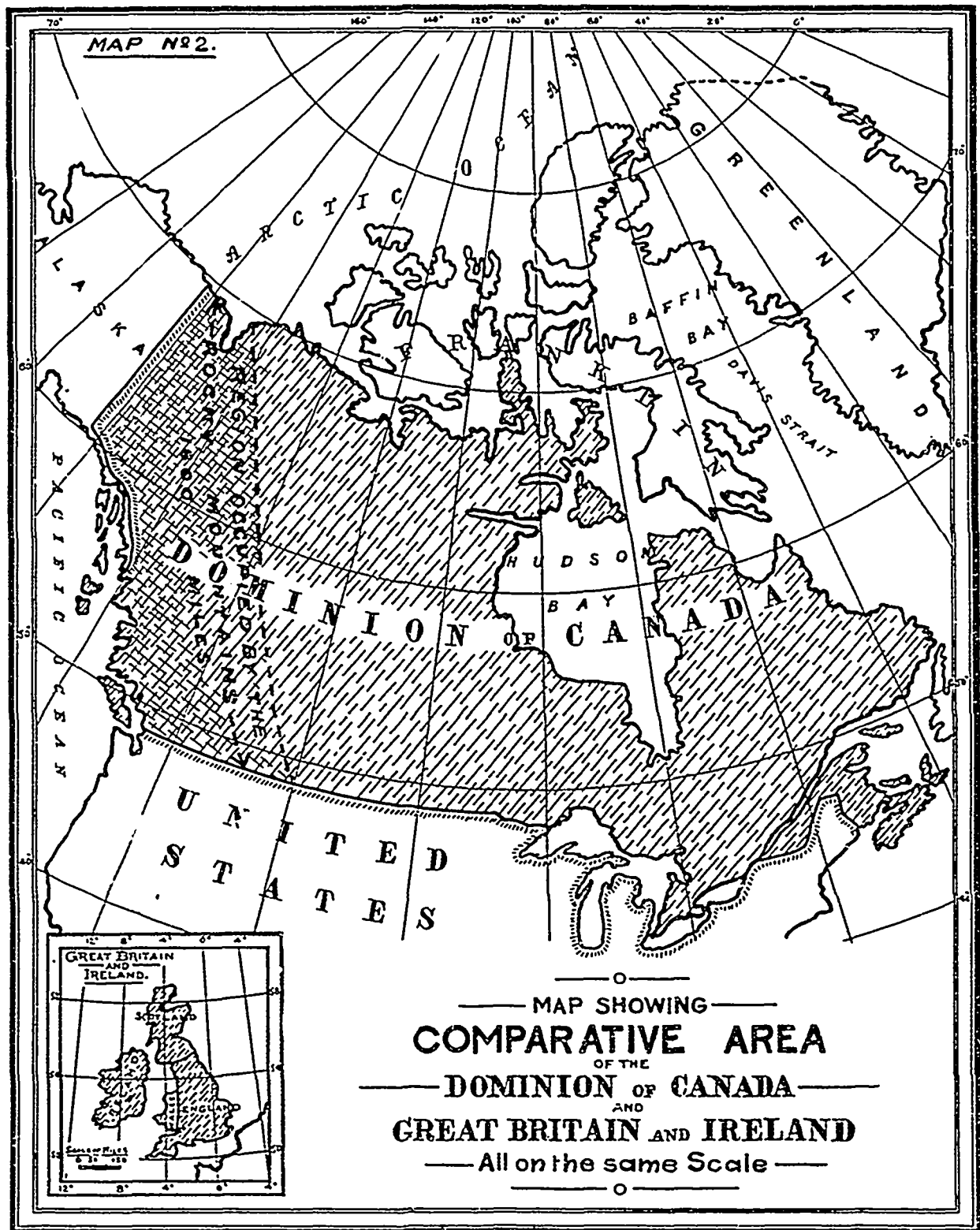
begun by the Spaniards, who pressed into slavery for that purpose, the conquered Indians. From that day to this the output of the precious metals from these countries has been continuous, increasing or diminishing, from time to time as the domestic conditions of the countries permitted, and as the genius of the inhabitants was able to solve the problems of economic production.

The total production of gold and silver from these countries from that time to the present, is enormous. The coining value of these metals produced in Mexico to date is estimated by statisticians to be about \$5,500,000,000. A similarly enormous production has been obtained from the Rocky Mountains in the other Spanish American Countries, but for the purpose of this paper, it will be necessary to consider, only, the production of the neighboring countries in North America through which the Rocky Mountains run.

As stated, Mexico has produced in the past 350 years, the sum of \$5,500,000,000, which makes an average annual production of \$15,714,285, during that time. As there are about 1750 miles, in length, of the Rocky Mountains within that country, the average production for each such mile of these mountains, was \$3,142,857. The annual production seems small if compared with modern results, but when the small population of that country at this beginning, and for years afterwards, the total lack of modern facilities for mining, the absence of mining and metallurgical knowledge, and the insecurity of property rights, that have existed at times during this period, are fairly considered, it will seem as much as can possibly be expected. At this place, it will be interesting to note that the coining value of the gold and silver produced in Mexico, during last year (1901) amounted to a total of \$65,479,940. This, compared with the average yearly production of the preceeding 350 years, shows an increase of 400 p.c. and proves in the light of past production the inexhaustible mineral resources of the mines of the Mexican Rockies.

PRODUCTION OF GOLD AND SILVER IN THE AMERICAN ROCKIES.

For 300 years after the production of gold and silver had commenced in the Mexican Rockies, nothing was done towards the systematic exploration of the northerly extension of this chain of mountains, within the territory now occupied by the United States. After the discovery of placer gold in California in 1849—53 years ago—numerous expeditions of gold seekers started from the Eastern States and other sections of the world, for California. At this time, the intervening plains, then the "Great American Desert," now the most fertile country in the world, lay between, swarming with hostile bands of Indians, while beyond these plains towered the snow-clad Rockies, pathless and unknown except to the fierce tribes of Indians who contested the advance of this invasion. These natural obstacles were soon overcome by the determination of the gold seekers, but when they reached the mines, they knew nothing about mining or metallurgy and could not even recognize the common ores of gold and silver. In addition to this lack of technical knowledge, the regions were inaccessible, for there were no roads or even trails. Under these conditions, progress was at first slow. As years went by however, mining and metallurgical knowledge was being gradually acquired and crystallized into science, in the hard but efficient school of practical experience. Transportation facilities were improved, mining machinery invented, and the production of the metals grew accordingly. From such a beginning, 53 years ago, the production of gold and silver from the American Rockies, increased year by year until it reached a coining value of about \$155,000,000 in the year 1902. This amount brings the total production up to \$4,500,000,000 for the 53 years since the commencement of mining, being an average annual production of nearly \$85,000,000, or \$3,401,539 for each mile in length of the American Rockies.



It will thus be seen, that from a country in which the production of the precious metals was practically nil, 53 years ago, the United States, in its production of these metals for 1902, has surpassed that of every other country. This has been made possible only by the vigorous exploitation of that inexhaustible source of gold and silver—the Rocky Mountains.

PRODUCTION OF THE CANADIAN ROCKIES.

The Rocky Mountains, in their northerly course, after passing through the States of Montana, Idaho and Washington, enter into the provinces of British Columbia and Alberta in Canada, and extend northward through these provinces, and the Yukon and Northwest Territories till they pass into Alaska or terminate on the shores of the Arctic Ocean, in the neighborhood of the mouth of the Mackenzie River. Within Canadian territory, these mountains have an approximate length of 1600 miles, by an average breadth of from 500 to 800 miles, and possess the same general structural features, as they do in their southerly extension into American and Mexican territory. For this reason, it is fair to assume, that as already indicated, the Canadian Rockies will yield a quantity of the precious metals equal to that produced by them in American or Mexican territory—mile for mile of their length, when equally developed.

The production, therefore, that may be expected of the Canadian Rockies, in the future may be seen from a study of the following table:

COUNTRY.	Miles of Rocky Mount'ns	Av. production per mile.	Total production
Mexico	1700	\$3,142,857	\$5,500,000,000
United States.....	1300	3,461,538	4,500,000,000
Canada	1600	103,750	166,000,000

In extenuation for the unfavorable contrast shown by the production of the Canadian Rockies in the past, it may be stated that the climatic conditions prevailing in these mountains, are less favorable, than those prevailing in their extension through the countries south. While admitting that the climate, to some extent, hinders production, undue weight should not be given to this factor, for placer mining operations, which are more readily affected by cold than lode mining, being outdoor work, are carried on successfully in the Klondike, which is practically under the Arctic Circle.

Since the discovery of placer gold in the Klondike region at Dawson City in 1896, the total coining value of the gold produced by that camp, including 1901, has been \$76,500,000 or .46 p. c. of the value of the total production of the Canadian Rockies to date.

That the discovery of other mining camps in these mountains, equally as productive as the Klondike, waits only on the chance efforts of individual prospectors, or the systematic exploration of organized companies cannot be denied. Neither can anyone place a limit on the number of "Cripple Creeks," or "Klondikes" or "Rands" that lie hidden away in the recesses of the 1600 miles of rocky mountains in Canadian territory. A comprehensive, systematic exploration extending over years, only can fully answer this question.

A mining camp may be considered a geological accident, occurring, no man knowing why or wherefore, here and there throughout the Rocky Mountains, and generally occupying an area of not more than a few miles in extent, while, perhaps a hundred miles or more of barren country may intervene, before another paying deposit of mineral occurs. The discovery of these mineralized areas, always limited in extent, and hidden away in the mountain fastnesses, at considerable distances apart, and usually covered by debris or vegetation, and during the winter months by snow, is no easy matter. The

desultory efforts of individual prospectors, without training or experience, may fail indefinitely to locate these treasure vaults. The problem should be attacked systematically by a well organized corps of prospectors, operating under the direction of trained geologists. Prospecting in this way could be done only by large private corporations, properly financed, or by the Dominion Government, in the manner outlined below.

The inefficiency of the desultory efforts of a few prospectors working on their own account to discover the mineral deposits hidden away in so vast a field will be apparent, when it is born in mind that these mountains, averaging 1600 mile in length, by at least 500 miles in breadth, cover an area of more than 800,000 square miles—8 times the total area of England, Ireland and Scotland (see comparative areas shown on map 2).

Any plan for prospecting for the mineral deposits in this range of mountains, in order to be effective and reasonably successful, should be conducted under the auspices of the Dominion Government, or, of strong private corporations. Whether by the government, or by private corporations, the general plan of the campaign should be similar, except as to its scope, which in case of government control should be more extensive than if conducted by private corporations.

Every corporation undertaking to put a prospecting party in the field, should be adequately financed, to carry on the campaign extending over at least 5 years, employing during the prospecting season—6 months—of each year a large force of prospectors. Such a force should be under the general supervision and direction of a field manager, who should be the Geologist in Chief of the party. The working force should consist of say 60 men and be divided into sub-divisions or posts of 6 men each, and these should be encamped in suitable locations in the mountains at say 6 or 10 miles distant from each other, moving camp from time to time as the possibilities of the discovery of paying deposits of mineral in one location became exhausted.

Each post should consist of 3 prospectors, 1 assayer, 1 cook, and 1 geologist, or practical miner. The latter should be superintendent of the post and have immediate charge and direction of the explorations, subject to the general control and instructions of the Field Manager. The duty of the entire force of a post, except the cook, would be to thoroughly explore the mountain areas surrounding their camp. All the rock deposits occurring in these areas, suspected of containing the precious, or valuable metals, should be analysed on the spot, with blow-pipe, by the assayer. When greater accuracy would be required, the rock would be tested at the assay plants of the party, of which there should be at least two, to be carried along as the party proceeded, at equal distance apart, or at convenient positions, so as to afford the greatest accessibility from either end of the line. The assayer of each post, besides his technical duty, should occupy the position of Assistant Superintendent, and besides doing a share of the regular field work, should help to make the sketch maps, reports, and should keep the records and accounts of the work accomplished by his post. The responsibility for the proper execution of such work would, however, rest with the superintendent. The cook, besides the work of cooking, should act as general roustabout of the post, keeping watch over the pack animals, of which, there should be three at each post.

When deposits of pay mineral were discovered by any post, all the land on which such discoveries were made, would be located for the benefit of the corporation, with such interests reserved for the members of the force as should be agreed upon at the outset. Distributed and operating in this way, the advance of the party would cover a line 90 miles in length, and large areas of the Rocky Mountains would be thoroughly prospected during the life of the campaign and the

reports of the officers covering the result of the work, with maps of the portions of the country explored, would be the exclusive property of the corporation. It is scarcely possible that a campaign of this kind would fail to discover one or more areas of paying mineral.

The discovery of one such area during the life of the campaign would pay the corporation probably one thousand fold on its outlay in the enterprise. As an illustration of the industrial potentialities and creative power of a mining camp, a brief description or history of the industrial results of Cripple Creek District will serve.

That district is less than 6 miles square and has been the theatre of fortune makers on whose stage poor men have developed into multi-millionaires, in which several towns have arisen as if by magic, have been burned to the ground and rebuilt on smoking embers to modern cities of steel, stone and brick. Its hills are gridironed with steel rails, and dotted with the shaft houses of 100 mines in which men work night and day in the production of gold. This camp discovered in 1891, had a total recorded production at the end of 1902, amounting to \$143,458,100, with the last annual production up to \$25,000,000.

Notwithstanding the present activity and prominence of this district, it is interesting to remember that the mineral indications on its surface had been passed over unheeded by prospectors for years. This is another instance, which shows that the unorganized efforts of prospectors failed for years to recognize surface indications of one of the greatest mining camps of the world, a fact which could hardly occur under the more thorough methods of a prospecting campaign as outlined above.

PRIVATE CAPITAL NOT LIKELY TO UNDERTAKE THE WORK
IN THE MANNER SUGGESTED.

A corporation undertaking a 5 year prospecting campaign, as proposed, would require an available capital to be paid up within that time of \$150,000 to \$200,000. It would be difficult to assemble this amount of money by subscription from men who are absorbed in their own ordinary business pursuits, and who have given no study to the possibilities of mining enterprises, except to the extent of "Taking a Flyer" in some stock speculation. Moreover, all the capital of business men is generally required to meet expansion in their own special lines of business, and, there would be little or none available to go into an enterprise of this kind.

In the Dominion of Canada, the per capita circulation of all classes of money, is estimated to be about \$15. This amount is totally inadequate to properly sustain the necessary current business of its people, for which there should be, at least, a money circulation of \$40 per capita. But not having much over one-third of this amount, the consequence is that the home accumulation of idle capital, that can be safely withdrawn from the ordinary commercial pursuits, is not sufficiently abundant to finance such industrial enterprises, as are required to develop the country's natural resources. As a result, a large portion of the Canadian youth emigrate to find employment for their brain and muscle, while on account of the lack of home capital, even the choicest natural resources of a country remain undeveloped, or fall as plums to foreign capital. As it is a part of the object of this paper to indicate how the money metals held by Canada, as the basis for its Monetary system could be increased, thereby incidentally increasing the per capita circulation which would ultimately result in accumulations of home capital that would be available for the development of the country's natural resources, that subject will now be briefly discussed. The increase of the money metals in the country might be brought about in two ways:

1. By selling to foreign countries merchandise of greater value than would be purchased from them, thereby securing what is known as a favorable balance of trade.

2. By mining and retaining in the country as coin or bullion, the money metals mined from its territory.

The former method involves the complex intricacies of internal and international commerce, and has only a subsidiary bearing on the purpose of this paper which is, in the main, to point out the possibilities of the National Mining Field—the Canadian Rockies—and the best method of developing its resources.

HISTORY OF RECENT DEVELOPMENT IN THE CANADIAN ROCKIES.

In the early '90's, the province of British Columbia which covers about 800 miles in length of the Rocky Mountains, had a very satisfactory code of Mining laws. At about this time, prospectors coming over the border from the mining region to the south, discovered the mineral deposits in the Slocan, Rossland, and other districts along the International boundary. They were shortly afterwards able to sell their finds for remunerative sums. The news spreading over the country induced a large emigration of prospectors, miners and capitalists to come into the mining camps of the province, and the vigorous exploration and development of the region was proceeding.

When everything was thus promising well for the future, one ontoward event after another interposed, and progress was checked. Some of these were circumstances over which the people of the Province had no control. But the most damaging to the mining industry, was the enactment of laws, unfavorable to it by the Legislature of British Columbia. Against the protest of the mine owners, and the business men in mining communities, the Legislature continued to pass laws annually, for several succeeding years, that affected the Mining Industry, more or less, unfavorably.

Not knowing where the end of such legislation might be, the agents of the capital seeking mining investments, were called away from the Province, and prospectors, not finding purchasers for their discoveries left also, so that, at the present time, it is doubtful if there are more than 200 *bona fide* prospectors at work in the vast area of the 400,000 sq. miles of the Rocky Mountain Cordillera that lie within the Province. For this reason, few, if any, discoveries are being made in British Columbia, and few, if any, new mines are being developed, mining operations being confined to the development or extraction of ore, from the mining properties that were purchased some years ago.

These effects, due mainly to bad Provincial legislation, were first felt in the towns and mining camps, then at the more distant business centres, and finally at the coast cities. The general falling in business, which has taken place all over the Province, appears in strong contrast with the general prosperity existing in the other Provinces of the Dominion, or in the Mining States of Mexico, or in the American Mining States just across the International border.

In these States the Rocky Mountains are swarming with prospectors, new mineral areas are being discovered, capital is flowing in, the Metal output is increasing, and prosperity abounds.

It is believed that the conditions that have thus far contributed to destroy the prosperity of the Province, will be corrected so far as possible, at an early day, for the people are now thoroughly awakened to the exceptional condition of their Province, and are demanding such legislation as will encourage and protect capital seeking mining investment. Therefore the repeal of the obnoxious laws now existing on the Statute Books, and the substitution therefor of a new code of mining laws that will be favorable, or at least, fair to the mining industry, may be confidently expected.

But the agents of capital have left the Country, and so have the prospectors. These people are profitably engaged elsewhere and now the great question to be solved, is, how to get them to return? Confidence must be restored in some unusual way to be effective within a reasonably short time.

INDIVIDUAL PROSPECTING INEFFECTIVE.

The situation demands that immediate steps be taken along lines already suggested and to be further referred to later in this paper, to carry on the work of prospecting, under the direction of strong comprehensive organizations, on private account, or, by the Dominion Government. A strong movement of this kind, would do more than anything else to induce the tide of emigration to flow towards these regions once more.

Everybody, including the prospectors themselves, is aware of the inefficiency of unorganized individual prospecting.

Year after year, individual prospectors go for a few months, each season, into the mountains to search for the indications of mineral deposits. Having no records of past efforts of this kind to guide them, they may spend the entire season going over the same ground that had been fruitlessly examined, perhaps for each of the several previous seasons, by other prospectors. In the same way, the same ground may absorb the efforts of other prospectors in succeeding seasons. This waste of effort will continue until the exploration of the Canadian Rockies is undertaken in a more intelligent way.

No one knows how many "Rands" "Cripple Creek" or "Homesakes" lie hidden away in these mountains, but no one can fail to see how, under existing conditions and by existing methods, such deposits might remain undiscovered indefinitely, unless the work of exploration is taken up systematically by private corporations, or the Government.

GOVERNMENTAL EXPLORATION NECESSARY.

Systematic exploration could be most effectively carried on by the Dominion Government, the concessions for the temporary occupation of the territory of British Columbia, if any were technically necessary, could be readily secured from that Province. Under the auspices of the Dominion Government, a prospecting party, 5 times as large as the one outlined for private corporations, should be placed in the regions for a campaign of exploration extending over a period of 5 years. The result could hardly fail to be successful. 300 men exploring a region with military precision, under the direction of the best executive talent, advised by the best geologists, would certainly result in finding some of the hidden wealth in these regions. If exploration were undertaken in this way, immigration and capital would follow quickly into these fields.

Once a government prospecting party was in the field, there would be hundreds, if not thousands, of camp followers. Discoveries would be rapidly made, and developed, and the metal output would soon come up to that of the American or Mexican Rockies.

Canada would then have the opportunity of accumulating a large stock of precious metals, which, as bullion, or coined, would warrant the increase of its *per capita* money circulation to a sum equal to that of the United States. Accumulations of home capital would follow which would be available for investment in enterprises organized for the development of the natural resources of the country.

WAYS AND MEANS.

If the exploration of the Canadian Rockies were undertaken by the Government, the first thing to be considered, would be the methods of finance and provision of means for the proper supervision and administration of the undertaking. These details might, doubtless, be accomplished in a number of ways, but the following seems to the writer to be most expedient and effective.

1. The creation of a Department of Mines and Mining, the head of which would be a member of the Cabinet.

2. To finance this department, the Dominion Government would make a Note Issue of \$5,000,000, and place this sum at the disposal of the Minister of Mines.

3. The Minister of Mines would purchase bar silver in the open market from time to time, as it could be coined at the Government Mint hereinafter provided for.

4. The 10,000,000 ozs. of silver that could, presumably, be purchased with the \$5,000,000 Note Issue, would coin into at least \$10,000,000 of standard half dollars or subsidiary coin.

5. The \$10,000,000 thus created, would constitute the funds available for the Minister of Mines to carry on the work of this department, which would include.

6. The erection of a Government Mint Building at the National Capital for the coinage of the nation's metallic money.

7. The erection and suitable equipment of a building at the same place to be known as the Department of Mines and Geological Survey Building.

8. The appointment of a Department Board, or Mining Commission, of say three persons who should act as assistant secretaries to the Minister of the Mines. The duties of this Board or Commission, their official capacity, as aides, assistants and advisors of the Minister of this department would be to study the requirements of the mining industry in matters of National and Provincial Legislation, transportation, reduction and refining works, labour troubles, etc. and advise wherein, in their judgment, the Industry could be benefited by change or modification of existing conditions.

GOVERNMENT PLAN.

Organized in this way the Dominion Government would be thoroughly equipped to carry on, systematically and effectively, a comprehensive plan of exploration of the Rocky Mountain regions within its domain.

The plan, while following the same general lines, as that proposed for private corporations, would, in some particulars, be essentially different, inasmuch as the exploration carried on by the Government, would be for the benefit of the whole people, and not for the discovery of mines to be worked for private gain.

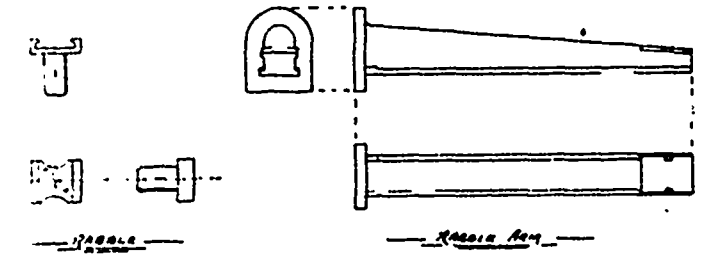
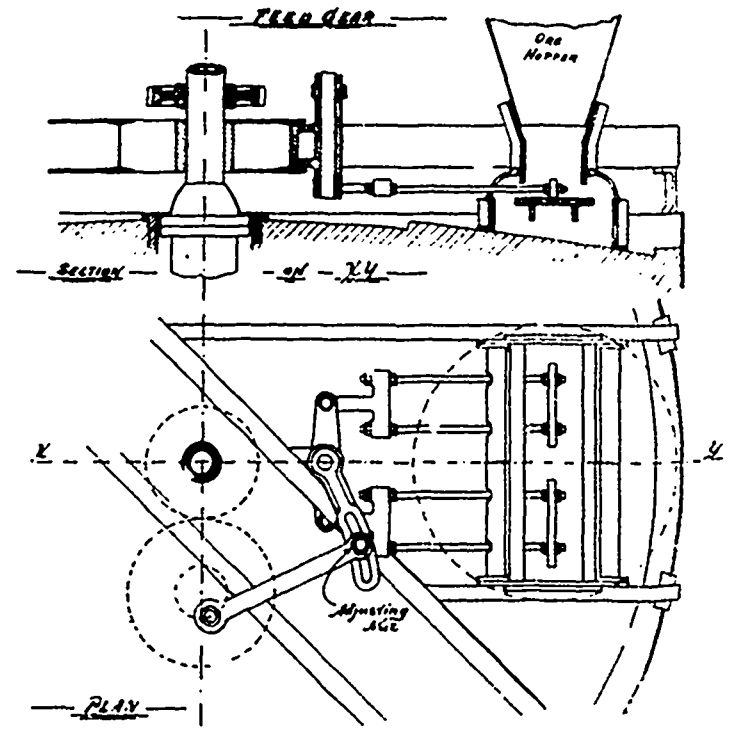
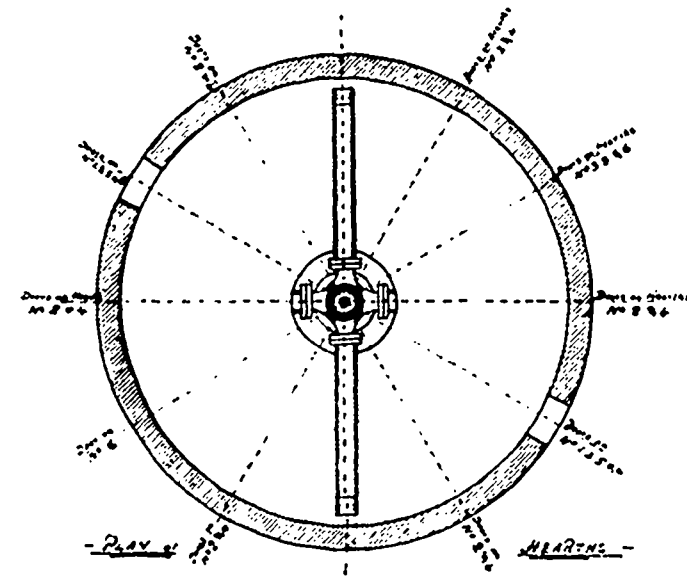
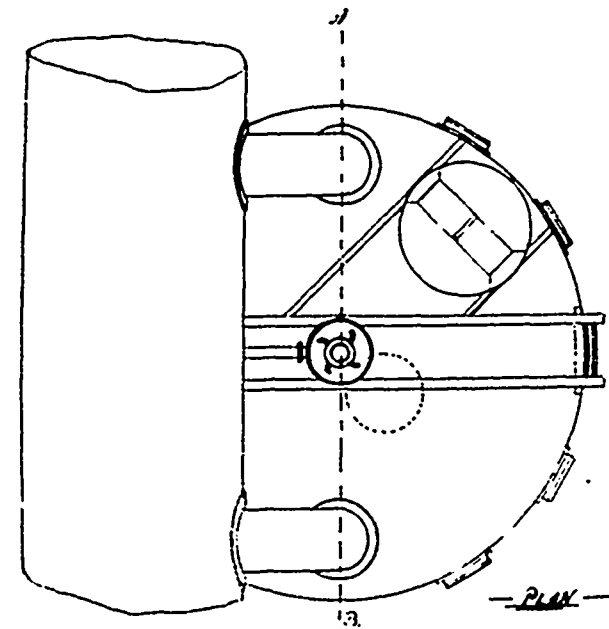
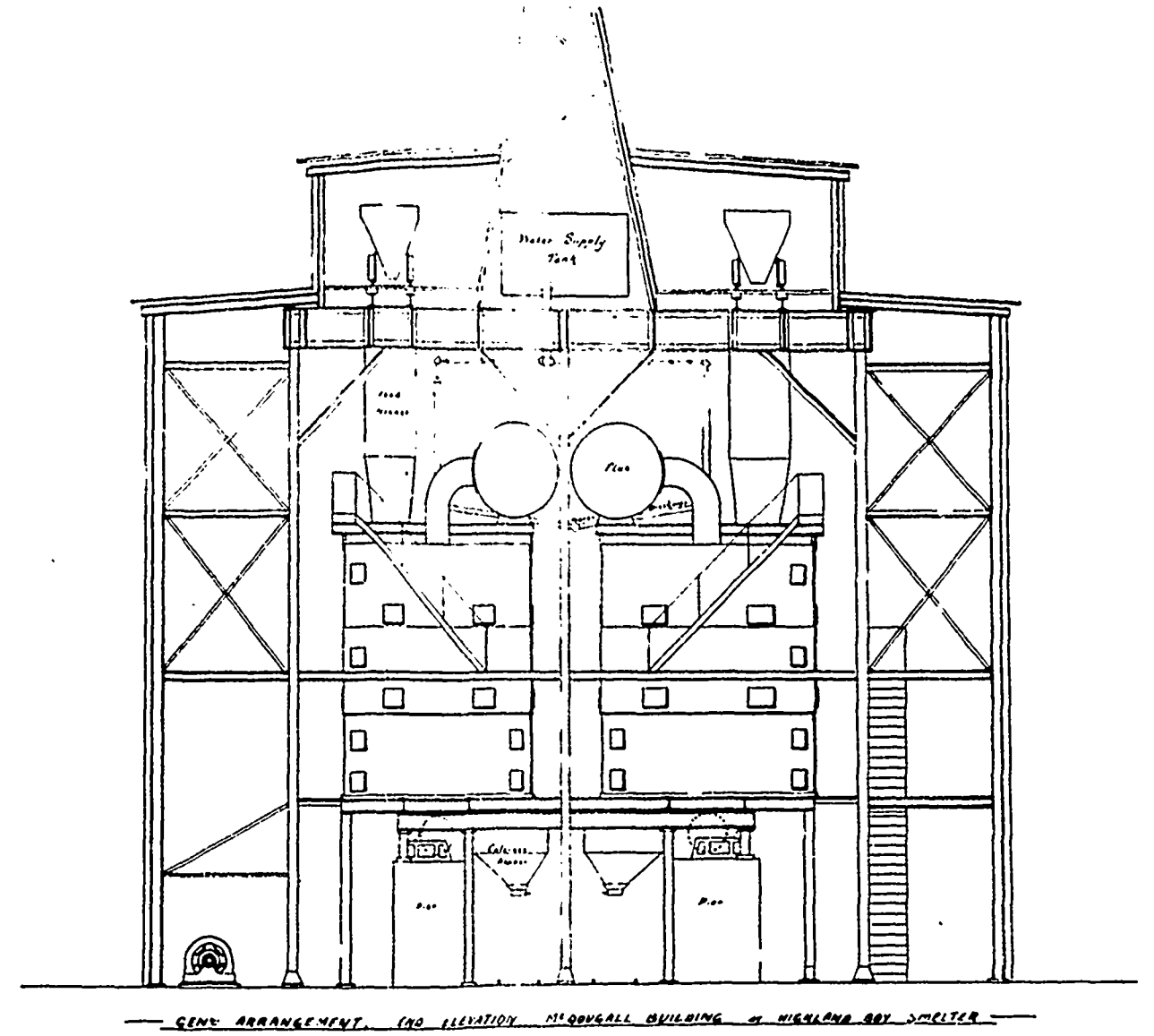
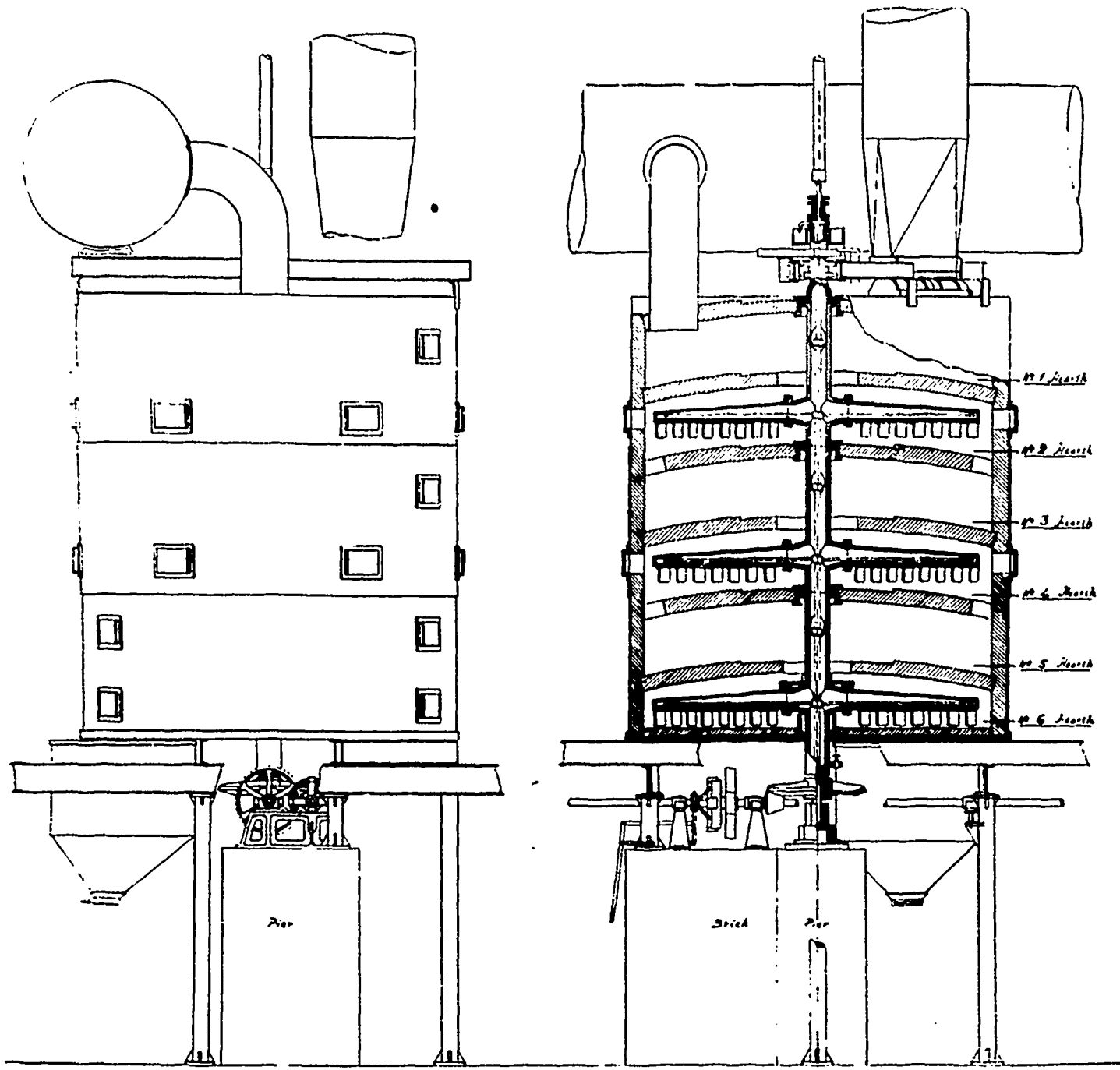
When a discovery would be made, it should be publicly announced through the proper channels, so that, the general public would have equal opportunity of locating claims on the public domain in the neighborhood of the discovery.

For a prospecting campaign of this kind, it would be easy for the Government to recruit abundance of volunteers from among the people of every province. As remuneration, all that would be required would be transportation expenses, board, and a small salary, with the privilege granted to each of the party of locating, say two claims, on the choice of the discoveries made each season. The fault would lie with the man himself if this opportunity to him as member of the Government Exploration Party failed to make him a fortune. Excepting the claims to be thus located by the members of the Government party no other private appropriations should be made from the Government discoveries.

They would be for the benefit of the public, or such portion of it as would interest itself in the acquisition and development of the mineral resources.

It is probable that the plan outlined for the creation of a Department of Mines and Mining in the Government and the method suggested for financing it, would meet with some opposition. This is to be expected. Any departure from the dusty precedents of the past, innovations or progressive measures of any kind are always thus assailed. However, it is believed that anyone who takes the time and patience to fairly consider the conditions and opportunities presented, will come to the conclusion that the method proposed would hurt no one, and benefit all. The results would be of great national importance, as the undertaking of the enterprise by the Government would be almost certain to inaugurate an area of permanent national prosperity.

The note issue of \$5,000,000 would be a very small strain on the credit of the Government—it amounts only to the cost of one armored cruiser.



MCDUGALL CALCINERS
 (Klopfer & Evans)
 HIGHLAND BOY SMELTER
 to illustrate
 "NOTES ON CONSTRUCTION & WORKING OF
 MCDUGALL ROASTING FURNACES"
 by
S. Austin Brown
 (MEMBER)

The 10,000,000 ozs. of silver, which this issue would purchase, when coined into \$10,000,000, of subsidiary coin, would add only \$2.00 to the per capita money circulation of the Dominion, and, with the note issue, would bring it up to \$18.00, which would still be less than half what it should be.

The funds, thus placed at the credit of the newly created department, would be sufficient to finance all its operations for the five years campaign. During this time these funds would work their way into the general circulation of the Dominion, through the payments made for the labor and supplies used in the construction and equipment of the buildings proposed for the offices of the department, the salaries of the regular and special staffs, the expenses of outfitting and equipping, and the labour of the prospecting corps.

CONCLUSION.

The writer has endeavored, and what has already been said, to show his belief in the mining possibilities of the Canadian Rockies and has stated the reasons for the faith that is in him.

The method suggested for their exploration is the one that, to him, seems most feasible, and certain of success, and was formulated after study, for a number of years past, of different ways that might be adopted for that purpose. The method proposed may seem visionary and impracticable to some, at first sight, and while admitting that all the details of the plan for financing the undertaking are not warranted by established custom, nevertheless, there does not appear to be any good reason why it could not be adopted, as it would in no way injure the national credit.

It may be alleged that the importance of the advantages that would be gained, by carrying out the undertaking, have dwarfed all the obstacles that interpose, and, that the conclusions arrived at, were reached because the ends justified the means. If there can be any better way devised, than that proposed, the writer would be only too glad to have it adopted. But some vigorous steps should be taken for this purpose by the Dominion Government, for, the success of the mining industry, affects not merely the camp, district, or province in which the mines are located, but all parts of the country, and stands highest among all the factors in the upbuilding of the nation's prosperity. The establishment of a Department of Mines and Mining, by the Dominion Government, would be a proper recognition of the importance of this industry, which is as yet in its infancy, and it would have inspiring practical effects in attracting emigration for the development of the resources that now lie dormant and useless.

In no department of industry can Government aid and supervision be of such direct and immediate benefit. By systematic exploration of the Rocky Mountains, many areas of payable mineral will be discovered, that would otherwise, long remain unknown. The reports of the progress and results that would be accomplished by the Government exploration party would direct the efforts of thousands of prospectors; save a vast amount of labour and expenditure now devoted to useless ends and leading only to disappointment, thereby creating an erroneous impression of the mineral possibilities of this field.

The desire to increase the production of the precious metals should not be considered as a narrow, local, or selfish one. The beneficent effect of a large production of the precious metals reaches beyond the interest of the miner who mines it, the railroad that transports it, or the locality in which it is found. The success of the mining industry stimulates every other industry, aids commerce and civilization and bring general prosperity. As such, it is entitled to Government recognition and aid, for, to encourage and protect the productive industries of the people must be considered the highest type of statesmanship, under any form of Government.

That the Canadian Rockies, with an area equal to either the American or Mexican Rockies, and with geological conditions as favorable for mineral deposits, should be allowed to fall so far behind

these countries in the production of the precious metals, is not credit to the people of the Dominion.

As an excuse for any discrepancies that may be found to exist in the figures or statistics used by the writer, it should be understood that the paper was written at odd times, and mostly at places where no books of reference were available.

The figures and statistics used were taken from notes recorded over a considerable period, and from various sources, but should be approximately correct for all practical purposes.

If this paper attracts the attention that the mining possibilities of the Canadian Rockies deserve and leads to the adoption of some comprehensive plan for their systematic exploration, it will have served the object of the writer.

Some Notes on Roasting with McDougall-Furnace.

By S. S. SORRESEN, Murray, Utah.

Having had occasion to give some time recently to the study of the working of a set of eight McDougall calcining furnaces at the Highland Boy Smelter, Utah, I have just put together a few notes which with the kind permission Mr. R. H. Channing, General Manager of the company, I now beg to submit to the Institute, in the hope that they may be of some interest or use to some of the members.

I am specially indebted to Mr. Channing for the valuable information and figures relating to the performance of these roasters and for his kindness in allowing me to carry out the few special tests and observations I have made in studying their working.

Though called "McDougalls" these furnaces are of improved design got out by Mr. F. Klepetko, and embraces several points covered by patents issued to Messrs. Klepetko and Evans. The Herreshoff furnaces, which are considerably advertised are of the same general arrangement though differing in important features. And there are several other variations in details affecting this type of furnace for which U. S. patents have also been issued, as for instance those of Wright and of Meech.

There being only comparatively few plants as yet at which this style of calcining furnaces has been installed and only one of these, as far as the writer is aware, in Canada, it may not be out of place if I begin with a general description of the plant at the Highland Boy smelter. The accompanying drawings are perhaps the most lucid and time-saving description to which I need only add a few words of explanation.

At the Highland Boy the furnaces are contained in a building 100 ft. x by 64 ft., and are placed in two rows of four, the rows being 21 feet apart C. to C. Longitudinally they are set at 18 ft. C. to C.

The furnaces themselves are of the vertical cylindrical type 16 ft. dia x 18 ft high and are divided horizontally into six chambers or "floors" by means of flat brick arches having circular openings at the centre of each. Through the vertical axis of the cylinder there is a hollow built-up cast iron column or shaft to which are bolted two diametrically opposite hollow cast iron arms in each chamber. These arms are set at 90 degrees at each successive floor. Seven and eight removable cast iron rables or ploughs are mounted on opposite arms respectively. The central shaft extends through the bottom of the furnace and is carried by a footstep bearing above which sits the bevel gear-wheel for driving it. At the top, the shaft also extends beyond the crowning arch and is supported in a journal-box attached to steel girders which span the furnace. On the shaft above this journal is the gear-wheel which drives the feed mechanism. And above this again the annular trough which receives the circulating water discharge from nozzles in the extension of the shaft.

One of the special features of this design of furnace is the water

cooling in the central shaft and radial arms, and it is for this purpose that these are made hollow. The circulation is provided for thus. About 8 ft. of 6 inch pipe is fixed to the top of the cast iron shaft as a head or pressure pipe. This is suitably reduced down and connected with the down conduit or duct inside the column which has branches leading off independently to the end of each arm. Cold water is thus forced under the above head down to the bottom of the shaft and to the end of each arm whence it returns carrying off the superfluous heat from the castings and discharges by the nozzles before mentioned. This cooling secures the strength and endurance of the castings. It does not, however, apply to the rabbles themselves. They are not water cooled. Simplicity and cheapness and convenience in shipping on or off are the chief aims in their design. It is thought that the complications of water cooling the rabbles would outweigh the advantages to be gained thereby, whereas the rabbles as used are very readily removed or replaced.

The shell of the furnace is made of light rivetted boiler-plate, lined with 9 inch brick work.

The cast iron sectional bottom, supported on steel I-beams resting on cast iron foundation pillars, are 14 ft. above the ground level to give room for the steel hoppers for the calcines which discharge through bottom doors into the 4-ton tram cars.

The ore is run in at the top of the building, some 50 ft. above the ground level, and dumped into feed pipes 4½ ft. dia. and about 10 ft. long, which are tapered off on two sides at the lower end to fit into the rectangular mouth of the feeders. The feeding is automatic and the mechanism is a simple and efficient contrivance. Immediately below and 3 inches lower than the nearest part of the throat there is a horizontal shelf subtending the said opening. It is of the same length as the throat opening but wider. The edges thus extend beyond the angle of repose of the ore. A positive definite feed is obtained by two cross-bars or pistons mounted on horizontal rods which are given an adjustable reciprocating movement alternately pushing the ore over the farther edge of the said shelf and pulling it on its return stroke over the nearer edge. The length of this stroke determines the amount of feed and is regulated by altering the radius of the lever where it is attached to the connecting rod.

Now to trace the progress of the ore through the furnace. The position of the delivery of the ore from the feeder is near the outer circumference of the top or No. 1 Floor. The rabbles on this floor are set at an angle which causes the ore to be moved towards the centre. The opening at the centre on this floor is large affording an annular space between its inside edge and the centre column through which it falls continuously as it is pushed over by the innermost rabble. On the second floor the ploughs are set oppositely so as to move the ore from the centre to the circumference, where there are six drop-holes through which the ore drops to No. 3 floor, and so on alternately till it is discharged through two drop-holes into the calcines hoppers above referred to.

Each furnace is driven through a friction clutch affording both independence and a measure of safety in case of obstruction.

In working these furnaces on Highland Boy ore, running about 35 per cent. sulphur, no fuel is used except for warming up when starting, though on the same ore in a straight-line type of furnace, in which half the output is roasted, coal to the extent of 10 tons per diem is being used. This is due to the construction of the McDougalls:

- (1) enabling the supply of air to be closely regulated;
- (2) preventing the suction of unnecessary cold air into the furnace;
- (3) causing ALL the air required to flow against the stream of the ore so as to be progressively heated by the radiation and combustion, first from the more inert nearly roasted calcines at the bottom, up to the floor of maximum oxidation activity, above which, though then poorer in oxygen, it is still chemically able to efficiently remove the more unstable atom of sulphur, and finally, physically to carry off the moisture in the raw ore;

(4) preventing loss by radiation, the outside surface being small relatively to the cubic contents, all of which is efficiently used while the whole of the shell is lined by not less than 9 inch brick-work; and

(5) when once fairly started obtaining from the heated brick-work in shell and arches an excellent thermal fly-wheel.

The average duty on crushed ore is about 35 to 40 tons per diem at which rates the sulphur is reduced from about 35 per cent. to 6 to 9 per cent. respectively. The time taken for the ore to pass through the furnace proper is 2½ to 3 hours with a consequent small lock-up of the ore. There are, in fact, only from 25 to 30 tons contained in each furnace at one time (including contents of feed and calcines hoppers, using a good average depth of ore bed on the floors for the above stated grade of calcines.)

From the above description it will be seen that there are two elements in the thorough and rapid roasting of the ore, viz., (1) the constant gentle stirring by the rabbles, the maximum speed being about 44 feet per minute, (at one revolution of shaft per minute) and, (2) the successive falls of the ore from one floor to another in fine showers through the ascending heated current of air. At the same time these falls secure a complete turning over of the ore.

I have attempted by a series of tests to determine accurately the relative effectiveness of these two agencies. The results obtained were marred by obviously faulty samples, owing to the difficulty experienced in taking samples from the centres without getting them "salted." I do not, therefore, submit the figures, but may state it as my general conclusion that the "showers" appear to be almost as effectual in oxidizing as the rabbling.

As a guide to the nature of the product dealt with, to which these remarks and figures relate, the following is the average of several sizing tests of the ore so charged.

Held on	8 inch screen	40 per cent.	} 22.5 per cent.
"	6 "	5.5 "	
"	4 "	13.0 "	
"	2 "	13.2 "	} 29.3 per cent.
"	.07 "	16.1 "	
"	20 mesh	7.3 "	} 48.2 per cent.
"	.40 "	13.7 "	
"	.80 "	13.1 "	
Through	.80 "	14.1 "	
		100.0 per cent.	100.0 per cent.

This product is obtained by passing all of the ore as it come from the mine through an oscillating jaw crusher, screening through a 1½ inch hole trommel screen and passing the over size from the latter through a pair of rolls.

The corresponding calcines sized as follows:

Held on	4 inch screen	16.6 per cent.
"	.07 "	19.3 "
Through	.07 "	64.1 "
		100.0 per cent.

Comparing ore and calcines considerable difference is noticeable. This is the result of decrepitation and crumbling. It serves the same as finer crushing and is an aid to good roasting.

With regard to the all important question of costs Mr. Channing informs me that for the year 1902 the average total costs of roasting in the McDougalls was 34 cents per ton. This includes everything but interest on capital invested, viz., direct charges for repairs, power, supplies, tramming ore and calcines, and a proportionate share of all indirect and general expenses. The item of repairs was exceptionally heavy during last year on account of extensive alterations to the main flue leading to the common dust chamber. This makes the costs for the year abnormally high. The actual operating expenses, exclusive of such special items and general charges are more nearly 23 cents per ton.

The cost of crushing, which is not included in these figures, is about 5 cents per ton.

Two furnace-men with two helper per shift run the furnaces, and with some slight alterations in the general arrangement of the plant, which experience has indicated this number could be reduced or could be reduced or could attend to more furnaces. The principal work is keeping the drop-holes clean and barring down accretions which form on the roofs. Mr. Klepetko introduced scrapers on the top of the rabble arms, but these have not proved altogether successful. The scrapers themselves are soon cut by the crusts and then they seem to have more of a burnishing than a scraping action. They serve however to remove the softer crusts and keep the more inaccessible parts of the roof free from obstruction. These crusts consist principally of iron. They are formed by very fine particles of the iron sulphides igniting in the ascending currents of air by which they are carried up and thrown in a molten state against the roof, where they adhere. The remedy that suggests itself would be to reduce the draught or increase the area of the openings. But while the latter is unalterable for a given furnace the former can only be applied at the sacrifice of capacity. The most, then, that can be done is for the attendants to keep the drop-holes and centre holes quite clear.

The power required to drive them is small, being less than one and a half horse-power per furnace.

Repairs at the Highland Boy have been an important item of the working costs. In a large degree this has been attributable to a poor water supply which forms a heavy scale, chokes the passages and so causes trouble. Apart from the ordinary wear and tear of the driving and feed gears, which is normal, the parts most subject to renewals are the arms. These are gradually eaten away by the acid and sulphurous fumes. Parts in contact with the ore at its hottest seem to undergo a replacement action, the metallic iron being replaced by pyrite and chalcopyrite. The places where most waste occurs is between the rabbles and the arms. Moisture from the air and, on the top floors, from the ore is probably condensed on the comparatively cool surfaces of the arms and, with the acid from the gases, becomes a strong solvent and attacks the iron. Were it not for this corrosion the arms would apparently last indefinitely. The rabbles themselves form a very small item of the costs.

The circulating water at the Highland Boy has to be pumped, which adds a little to the costs. The heat carried off by this water is practically negligible being equivalent to the combustion of about 100 pounds of good coal per furnace per hour. Where water is scarce it can, of course, be cooled and used over again.

For an ore in which the sulphur is too low to maintain heat enough for its own combustion auxiliary fire-boxes can be attached and connected with one of the lower floors.

Summarising the chief points in the working of these calcining furnaces which to my mind commend them I would place them in the order of their importance:—

1st. **THEIR SIMPLICITY.** They are simple in design and simple to run. No need of expert furnace-men or "born-mechanics" to man them. Ordinarily intelligent labour with good supervision gives quite satisfactory results. There is a minimum of gearing, no elevators with their complications, no forced draughts nor fans with their dust. There are no strains from sudden or unequal expansion and contraction from alternate heating and cooling of parts. And a minimum of parts and patterns for spares need be carried.

2nd. **THEIR ECONOMY.** They are saving in fuel, labour, and in power, as well as in interest on capital locked up.

3rd. **THEIR EFFICIENCY.** They produce a good grade of calcines for the purpose required, i.e. matte smelting, viz: low sulphur, high ferrous with low ferric iron. And they do this with but little waste in flue-dust or otherwise and in quick time.

Economic Geography.

By JAMES WHITE, F.R.G.S., Dominion Geographer.

Geography has been defined by Dr. H. R. Mill as "the science which deals with the forms of relief of the Earth's crust and with the influence which these forms exercise on the distribution of all other phenomena." Economic Geography may be defined as the compilation of the results of the study of this science whether by maps, diagrams, letter-press or by means of a commercial museum. It is evident that the wide scope of this subject debars its treatment in detail and I, therefore, propose to present a sketch of its possibilities as far as it affects our country glancing, in passing, at what has been done, what it is proposed to do and what should be done.

1. *Maps.*—The value of good maps is obvious. If our plenipotentiaries when negotiating the Treaty of Versailles had had even fair maps before them we would now own a large portion of eastern Maine and the boundary line, instead of following Pigeon and Rainy rivers to the Lake of the Woods, would have been carried up the St. Louis to the Mississippi and thence westward on about the parallel of 48°. If the British and Russian plenipotentiaries had attached accurate maps to the copies of the treaty of 1825, the boundary line would undoubtedly be shown as going up what is now known as Behm Canal, to the 56th parallel. Now that the war in South Africa is over and we know the approximate cost, it would be interesting to compare the saving in dollars and cents, that would have been effected if we had had good surveys of the theatre of operations. They would not have prevented the war but would certainly have shortened it by several months. To the miner and prospector good topographic maps are invaluable. They should show all surface features such as lakes, streams, etc., all artificial works such as railways, roads and buildings, also the relief of the surface either by contours or hachuring, preferably the former. If the rough and unsettled nature of the country prevents the topographer obtaining this detailed information he should, at least, give all possible information respecting the routes of travel.

The Department of the Interior and Geological Survey have done a great deal of map-making, the former principally in the North-West Territories and "Railway Belt" of British Columbia and in the Dominion as a whole, while the operations of the latter have extended over nearly the whole of the mainland of Canada. Other departments have published maps but as all, or nearly all of them, have been reproductions—usually on a larger or smaller scale—of those produced by the Interior or Geological Survey, they may be ignored. It is note-worthy that, with the exception of one Manitoba and a few British Columbia and Yukon maps none of these sheets show what I have emphasised as of great importance viz, relief of the surface.

While the number and accuracy of these maps—considering the methods that the topographer and geographer have, perforce, used—are worthy of all praise, there is no use shutting our eyes to the fact that undue delay in publication has occurred and is occurring and that geographical information which, if published, would be invaluable to the mining and other interests of the country, is locked up in note books and plotting sheets. No one, not conversant with the methods that the geographer in Canada is forced to adopt in compiling topographical sheets, can understand the disadvantages under which he labours, disadvantages which result in the needless expenditure of money and in loss of time while, geographically, the results are far from satisfactory. I can not do better in this connection, than quote from a memorandum by Dr. Dawson, late Director of the Geological Survey.

"The difficulty met with in the compilation of such maps arises largely from the number of sources from which information must be

sought rendering it practically impossible for the compiler of a given map—probably pressed to complete his work at a certain date—to consider, collate and familiarise himself with all. Thus, in the North-West Territories, within a comparatively limited district, surveys made under the following branches may have to be included—Topographical Surveys and Timber & Mines branches of the Department of the Interior, Geological Survey, Department of Railways, Indian Department etc. In the older provinces this is additionally complicated by surveys under Provincial Government auspices, surveys by the Public Works Department and by railway companies, charts of the coast by the Department of Marine and the Admiralty and other minor surveys not necessary to particularise. All of which have to be consulted for recent additions and changes before maps with any claim to represent the actual state of geographical information can be drawn.

The remedy for this state of affairs is admirably outlined by the recommendation of the Civil Service Commission of 1892 as follows:—

“Your Commissioners find that maps for various purposes are prepared in several Departments and, by the evidence produced, it is shown that differences frequently occur in maps of the same district when issued by more than one Department. To prevent this, and to promote accuracy and security, it is recommended that a special cartographic branch be created and that the duty of this branch of the public service should be to issue reliable maps of the various parts of the Dominion.

2. *Museum of Economic Geography*.—Although the establishment of such a bureau in Canada can not be looked for in the immediate future, a short description—summarised from an article by Mr. V. V. Branford, in the *Scottish Geographical Journal*—of a similar institution, the Philadelphia Commercial Museum, is of interest. In 1893, Dr. W. P. Wilson, now Director of the Museum, conceived the project of retaining some of the exhibits of the Chicago exhibition to form the nucleus of a permanent collection of the World's industrial projects and persuaded the city of Philadelphia to vote \$10,000 for this purpose. With this modest sum as a basis he founded an institution that covers upwards of 16 acres and has an annual income of \$200,000—\$115,000 from the municipality and \$85,000 from other sources—which has 100,050 correspondents and agents in all parts of the earth and which practically compiles a systematic catalogue of the world from the American exporter's point of view.

It has three main departments (1) The Museum proper (2) Laboratory (3) Bureau of Information.

The collections in the Museum proper are, in a general way, divided into Geographical collections where the articles are grouped according to country of origin and into Monographic collections of different varieties of the same material, of wools, cottons, minerals, oils, dye stuffs, etc. which are augmented and renewed from time to time. As the aim and object of the Museum is essentially commercial, full details as to the cost of production, wholesale and retail prices, cost of transportation, statistics of imports and exports, information respecting the financial standing of the principal firms in foreign cities etc. are furnished to subscribers.

It has also endeavoured to improve the teaching of Commercial Geography in schools and colleges by the distribution of type collections of produce accompanied by printed and pictorial descriptive matter illustrating commercial processes and products. Teachers and students can visit the Museum at regular intervals for study under the officials. The collections are open to the public; general reports and more important items of commercial news are distributed gratuitously and it also answers, without charge, the thousands of domestic and foreign letters of enquiry. For \$100.00 a year it also gives a regular

service of information respecting current commercial events, the world over.

In the Laboratory, chemistry and the microscope are utilised to determine the amount of cotton in “all wool” goods, of copper in an ore etc.

The principal sources of information are as follows:—

(1) Trade journals of various countries, some fifteen hundred in number, from which the principal facts are culled and indexed by the card system, any matter calling for immediate attention being brought to the notice of the manufacturers interested therein.

(2) Consular and other official reports of the United States and foreign governments which are treated in the same way as the trade journals. As the results of reporting to the Museum are manifest, it is said jestingly, that American consuls sometimes report to Philadelphia and ignore Washington.

(3) Special representatives who study trade conditions in foreign countries in the interests of American exporters and endeavour to bring foreign governments and dealers into touch with the Museum.

5. *Economic Atlas*.—The Department of the Interior proposes to undertake, as soon as the results of the last Census are available, an Economic Atlas on much the same lines as the Atlas published by Finland—a unique publication, no other country in the world having attempted anything as comprehensive as the Finnish work. As the necessary information is not available we will not be able to undertake anything as detailed or elaborate as the Finnish atlas but do propose to present a diagrammatic summary of the domestic material assets of our country. It will include:—

(a) Topographical map of Canada on a scale of 35 miles to the inch showing the principal mineral occurrences, forest, agricultural and dairy resources.

(b) Geological map of Canada—scale 100 miles to the inch.

(c) Hypsometric map showing elevation of land surface.

(d) Map showing telephone and telegraph lines and canals, with statistics of mileage of telephone and telegraph lines and of tonnage of freight and vessels through, size of locks, depth on sill, length etc. of canals.

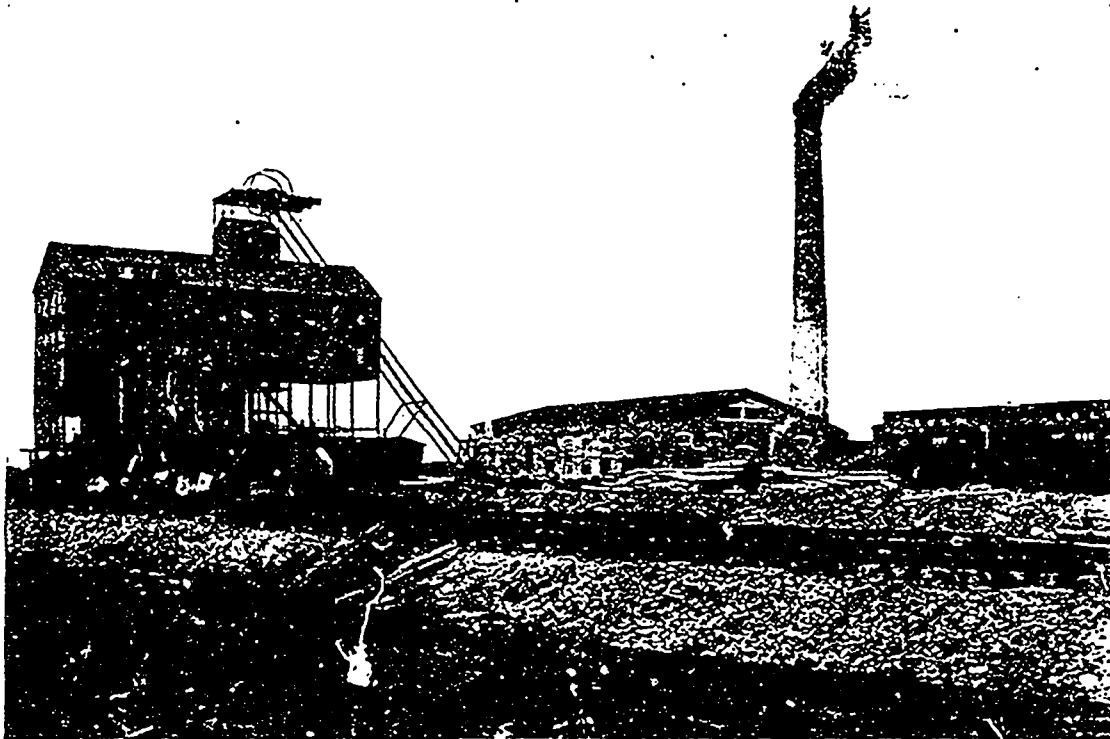
(e) Meteorologic maps showing isotherms and isobars for months and year, snowfall and rainfall.

(f) Map showing limits of trees, shrubs, cereals and general culture.

(g) Diagrams illustrating population statistics, for census years, of number, density, proportion of sexes, population according to age, sex, urban and rural, civil state (married, unmarried, widows, widowers, and divorced); degree of education, vital statistics and population by profession and origin: financial, as revenue, expenditure, exports and imports—with special diagrams for principal articles of production and export—and trade per head as compared with other countries; diagrams illustrating growth of industries which have made great advances as mining, manufactories and agriculture: navigation, tonnage, freight, number of passengers carried and vessels entered at principal ports.

It is desirable that a water-power map be included but the available information is of too fragmentary a nature to justify the attempt. In the Finland atlas the position of the falls and rapids is indicated by a red line the length of which is proportional to the fall and by a green circle of area proportional to the horse-power. The importance of the miner and manufacturer of data relating to the discharge and fall of streams can hardly be overestimated. Many thousands of dollars wasted in installing plants where sufficient power is not available might have been saved if the necessary information had been obtainable. In addition to the commoner uses for water-power its use in connection with the production of electricity for electro-chemical processes is of

DOMINION COAL COMPANY.



Bank-head Dominion No. 1. Colliery where the recent fire took place and which is now being flooded.



The Reserve Colliery of the Dominion Coal Co. where several men lost their lives this month by an explosion.

increasing importance. In coal-less provinces, like Ontario and Quebec, we must look for its substitute to the innumerable streams that descend in a series of rapids and falls from the great Archæan plateau that forms the northern portion of their area and which carries what is, probably, the greatest spruce forest in the world. The value of water-power will undoubtedly be much greater in the future than in the past, and will determine the localisation of great manufacturing centres. As the water supply depends entirely upon the rainfall it is evident that a study of the latter in connection with the hypsometry of the country will be of great importance and in this connection additional meteorological observers will be required in the more thinly-settled districts.

When in Washington last fall, I investigated the methods used by the hydrographer, Mr. Newell, and found that he has succeeded in securing a maximum of result at a minimum of cost. For instance, on the smaller streams if there is no suitable log in place, a tree is felled—usually near a road bridge—with one end in the water and the other on the bank, a flat surface cut on one side and divided into a scale that represents feet and tenths of vertical height. As the logs lie at a considerable angle with the vertical, the divisions are some distance apart which renders it easy for unskilled observers to read. Daily readings are taken by an observer—usually a store-keeper or farmer who lives in the vicinity, or a school teacher whose route leads past the observing station. The observer receives \$35.00 to \$60.00 a year and, once a month, fills in the results on cards supplied for the purpose, which are then mailed to Washington. When establishing the station the stream is cross-sectioned and the velocity measured with a current meter. With this data and with additional measurements of velocity taken at different stages of the water, the discharge can be readily calculated. For large streams gauges of a more expensive and more elaborate pattern are used.

Hypsometric maps are valuable as the form of the land determines the direction and strength of the winds that blows over it and the abundant rainfall, or lack of it, in any district, is the direct result of the guiding action of the elevations and depressions of the surface. Professor Saunders of the Experimental Farm informs me that in the North West he finds the matter of altitude has much influence—sometimes more than latitude—in regard to the trees and shrubs under trial.

Diagrams showing population and other statistics gathered from the Census, Trade and Navigation and other reports will show at a glance the distribution of every condition that is dealt with and enable the reader to follow, decade by decade, the progressive development of the country and to study for each census the relation between the various conditions.

Among the points that will be specially emphasised in the Economic Atlas are.—The immense mineral wealth, as the coal-fields of the Maritime Provinces, the North West Territories and British Columbia, the gold-fields of Nova Scotia, British Columbia and Yukon, the asbestos of Quebec, nickel of Ontario, silver, lead and copper of British Columbia, etc.; that our mineral production has increased from \$13,221,225 in 1886 to close upon \$70,000,000 in 1902; that comparing on the basis of population, our external trade is \$13 per head, three times that of the United States; our exports of manufactures, one and a half times as great; that we have more miles of railway per head, then any other country in the world and stand eighth as regards total mileage; that, in the last ten years, our trade has increased faster than that of any other country, viz 90%; that, in the same time, the balance of trade against us—the excess of imports over exports—has decreased from upwards of \$1½ millions to less than half a million, and the assets of our chartered banks, have increased from 29½ millions to 625

millions; that—to take one item of dairy products in which we have made great advances—our exports of cheese increased from 49 million pounds in 1881 to 196 millions in 1901, while in the same period the exports of the United States decreased from 148 millions to 40 millions; that barley, oats, wheat, and all hardy vegetables have been grown at Dawson, only 150 miles from the Arctic Circles; that the total imports of wheat into Great Britain aggregate 160 millions while our surplus for exportation was 10 millions in 1900, 30½ millions in 1902, and in a few years will be sufficient for the needs of the mother country, thus making Canada truly “the granary of the Empire.”

At first sight, the great development of the arable land in our North West may appear to have comparatively little effect on mining, and to be of comparatively little interest to mining engineers, except as patriotic Canadians, but settlement brings railways with greatly increased facilities for the transportation of mining supplies, and of the product of the mine, while the mines furnish a valuable local market for the farmer and stock raiser.

At the present time three railways, the Canadian Northern, Grand Trunk Pacific, and Trans-Canada are either actually under construction or have engineers in the field locating transcontinental roads that will cross the mountains by, probably, the Yellowhead, Pine and Peace River passes, all very much lower than any pass traversed by similar lines in the United States. The Yellowhead Pass line will, in all probability, traverse the Cariboo country. What this means is best illustrated by the remarks of Mr. Hobson, Manager of the Consolidated Cariboo Hydraulic Mining Company, at a recent meeting of the Mining Association of British Columbia. He said, “During the time we have been engaged on construction work we have used as high as 150,000 lbs. of oats, 100,000 lbs. of hay, and 60,000 lbs. of beef. This is the farm produce consumed by one mine. Now, gentlemen, what would two or three hundred such mines do for the farmer? We have made expenditures in cash of from \$60,000 to \$70,000 annually for miners’ wages: \$25,000 to 35,000 for teamsters for hauling provisions from Ashcroft to the mines, and even as high as \$50,000 during the progress of development work; \$30,000 to \$60,000 has been expended annually in Victoria and Vancouver for miscellaneous stores and provisions, including hardware. In addition to the above we consume annually explosives costing from \$30,000 to \$50,000—all purchased from Victoria manufacturers.

Every pound of goods that we get delivered at the Consolidated Cariboo Hydraulic mine is drawn a distance of two hundred miles and costs 5 cents, or \$100 a ton. We of course suffer for lack of railway transportation facilities; but I think transportation facilities will eventually come. The mountain regions lying to the east of the Cariboo and Horsefly districts are now known to contain extensive bodies of argentiferous galena and copper ores, the same as you have in the Kootenay and Slocan country. Railway transportation facilities are required to encourage and hasten the development of the mineral industry of the Province, and railways will no doubt be built as soon as it is known that business will warrant their construction.”

We are on the eve of the greatest period of expansion and development that the world has ever seen: 25,000 Americans crossed the border last year, and 50,000 will cross this year despite the endeavours of agents of United States railways and land companies; the tide of European immigration that has hitherto poured into the great republic to the south of us will now undoubtedly turn Canada-wards and the marvellous development of the American West and the North-West will be duplicated in our Territories. In the United States, the territory of Oklahoma increased from 78,000 in 1891, to 398,000 in 1901, and we have room in our southern territories alone, for nine Oklahomas.

In conclusion I wish to enter a mild protest against the popular idea that a geographer is a map-maker and nothing more. A proper conception of his functions is admirably outlined by Dr. A. J. Herbertson in his paper on "Geography in the University." (Scottish Geographical Journal for March, 1902)

'A geographer is at once a patriot and an internationalist, keenly alive to the necessity of stimulating the full development of local activity and resources, yet world-wide in his outlook and sympathies. The one is essential to the other, for each part of the World is now so closely linked to every other part, that healthy progress in one is favourable for all. The geographer is a student of the world of peace as well as of the theatre of war—the exponent of the environment to be dealt with in any venture, commercial or military, political or missionary. He must have time to travel, and in return, the fruits of his observations and his thoughts should be given to his pupils and to the world. It seems to the writer that one of the most important duties of the geographer is to show forth sympathetically the conditions of other countries to the younger generation in the university, and on occasions to the public, and thus help to remove prejudice and foster good feeling which is so essential for the rapid harmonious development of this complex world in the twentieth century.'

Mineral Production, Canada and United States.

By GEORGE JOHNSON, Dominion Statistician, Ottawa.

The statistics of mineral production in Canada and the United States for 1901, having been published we have the means of comparing the development of the two countries in the production of mineral wealth.

Both countries classify their mineral production into metallic, non-metallic and miscellaneous, though the officials of the Geological surveys in both countries differ in their assignments, according to the proverbial saying about our good friends the doctors of medicine.

Let us re-arrange our Canadian list so as to make it correspond with that of the United States Geological Survey, not because the distribution of the Washington savants is any better than the one devised by our own wise men, but simply because there are fewer changes in the selected re-adjustment than would try our patience if we adopted the alternative.

In the general division of metallic, non-metallic and miscellaneous, the value of the production of each country in 1901 was:

	Metallic.	Non-metallic.	Miscellaneous.	Total.
United States...	\$524,873,281	\$566,351,996	\$1,000,000	\$1,092,224,380
Canada	42,309,202	24,103,506	300,000	66,712,703

The first fact that presents itself is the comparative smallness of the Canadian output, just about one-sixteenth of that of the United States. Taken on a per capita basis the United States produce \$14.12 per head of their population, and we \$12.42, a difference of \$1.70 per head. Put in this way the difference does not appear to be so unpleasantly great. Still we do not produce as much per head as our neighbours, although we have as great an area of country and are equally well endowed with mineral wealth. It is some consolation that we are catching up. In 1900 we were short \$1.97 per head. This is reduced in 1901 to \$1.70. If we make the same relative increase we would produce the same per head value as the United States by 1908. Canada was \$6 per head behind in 1891 and only \$1.70 behind in 1901. The United States increased its per head output in 1901 as compared with 1891 by \$4.20 and Canada its by \$8.50.

The first column in the above table shows the value of the metallic production of the two countries. This includes antimony, copper,

gold, pig iron, lead, mercury, nickel, platinum, silver and zinc and the same in the United States with the addition of quicksilver and aluminum for the latter country.

In the United States this metallic production forms 48.05 per cent. of their whole mineral production while in the case of Canada it forms 63.42 per cent.

In every \$100 of mineral wealth produced in the United States \$48.05 comes from metallic sources and \$51.95 from non-metallic and miscellaneous.

In Canada in every \$100 produced, \$63.42 comes from metallic and \$36.58 from non-metallic and miscellaneous.

This was not always the case in Canada, for in 1891 Canada's metallic production was only \$29 in every \$100.

In 1891 the output of Canada had to be multiplied by 55 to bring it up to the output of the United States, but in 1901, 12½ would be the multiplier, and to that extent Canada has decreased the distance between herself and her big neighbour in respect to metal production. Canada was 55 miles in 1891, and in 1901 she was only 12½ miles, in the rear, at which rate it will not take her long to catch up and pass.

Notwithstanding the large increase in production in the United States—in 1891-1901 over 224 million dollars—Canada has gained upon her neighbour to the extent indicated.

The increase has been, therefore, more emphatic in Canada than in the United States, marked as the development has been in the latter country.

In the United States by far the largest part of the increase is due to the enlarged production of pig iron. In 1891 the production was 8,279,870 tons, and in 1901, 15,878,354 tons, an increase, taking values, of 88 per cent. against a general increase of 64 per cent. in the other articles belonging to the metallic class.

Canada made no such progress in the same period. In 1891 she made \$368,901 worth of pig iron, and in 1901, \$1,212,113. Relatively this is a greater development than that of the United States: but \$46 in every \$100 worth of the metal production of the United States was derived from the furnaces which melted the iron ore, while in Canada not more than \$2.80 was due to the production of iron.

The equipment of iron and steel works and the encouragement given by the Government in the shape of bounties has resulted in a great development of the production of iron, but the development does not show in the year under review, which is the latest for which the statistics of the two countries are supplied.

In Canada in 1901 very much the largest part of the increase is due to the greater production of gold. In 1891 the gold produced was valued at \$930,614 and in 1901 at \$24,128,503. In the case of Canada this was 57 per cent. (in 1901) of the total metallic production. In the United States in the same year the gold produced was about 15 per cent. of the total production of metallic substances.

As already stated the United States returns include most of our articles and in addition quicksilver and aluminum, while we have nickel, which appears in the United States returns in very small quantity, if it has any right there at all.

Of aluminum we could produce immense quantities, for we have the material in abundance.

Seemingly we do not need it in sufficient quantities to make it worth while to provide ourselves, and we, therefore, import about \$10,000 a year, \$8,700 of which is in ingots and the remainder in manufactured forms. The world produces about 6,700 short tons of the value of \$3,590,000, and of that the United States has a production valued at \$1,920,000, or more than one half.

Of quicksilver the world's production is about 3,470 tons, about one thousand tons of which come from the United States. Spain and the United States producing about the same quantity. California is the great quicksilver State.

Of tin neither country produces a pound. Canada may have it, but it has not been found. There is a good deal of it needed for the world's uses and whoever succeeds in discovering it in Canada may count upon a fortune following the find. In the meantime we import in various forms about \$2,500,000 of tin annually.

Reference has been made to gold and iron as two of the most important of our metals.

The production of gold increased every year for a long time, till 1901, when there was a drop in the quantity.

In 1892 the value was \$907,600; in 1893, \$976,600; in 1894, \$1,128,690; in 1895, \$2,083,700; in 1896, \$2,755,000; in 1897, \$6,027,000; in 1898, \$13,775,420; in 1899, \$21,261,584; in 1900, \$27,908,153, and in 1901, \$24,128,503.

The development of the production of gold is of course, primarily due to the discovery of the metal in the Yukon Territory.

Altogether from all sources, Canada has added to the world's store of the yellow metal \$160,879,000, of which \$70,000,000 or \$43 in every \$100 have come from the Yukon Territory and practically all of it since 1897.

The production of gold, however, has been developed in other parts of the country. In 1891 the yield of gold in Canada, exclusive of the Yukon, was under \$900,000, and in 1901 it was (without the Yukon's contribution) \$6,130,000, or a gain of \$5,230,000.

In the United States the production of copper stands next in value to pig iron. Its value in 1901 is \$6,400,000 more than the value of the gold yield of that year and amounted to \$86,630,000. This is over \$11,000,000 less than in 1900. The production of copper in Canada in 1901 was \$6,097,000, a gain of over \$3,000,000 in 1901 as compared with the previous year, and of \$4,947,000 as compared with 1891.

Of course in the production of nickel Canada surpasses the United States and all other countries. The chief producers of the world are Canada, Germany and France, in all in the neighbourhood of \$7,750,000, of which Canada produces \$4,600,000. The nickel produced in the United States was under \$4,000 in 1901.

The non-metallic division of both Canada and the United States includes fuels, structural material, abrasive materials, chemical materials, pigments and miscellaneous.

Fuels include coal, natural gas and petroleum. Of these in 1901 the United States produced a value of \$442,190,754, an increase of 86.5 per cent. over the production of 1891. In 1901 Canada produced \$14,581,540 worth, an increase of 78 per cent. on the value of the production of 1891. The production of the United States in 1892 was 30 times more than that of Canada, and in 1901 it was about the same, Canada holding her own.

In 1868 Great Britain produced 115,500,000 tons of coal and the United States 31,500,000 tons. In 1878 the production was: Great Britain, 148,500,000 tons; United States, 57,800,000 tons; 1888, Great Britain, 190,500,000 tons; United States, 148,500,000; 1898, Great Britain, 226,333,000 tons; United States, 219,900,000 tons.

In 1900 the United States for the first time had a greater production; the figures being, Great Britain, 252,000,000 tons, United States, 269,700,000 tons; still further increased in 1901, when the United States production reached 293,300,000 tons, against Great Britain's 245,300,000 tons.

In 1868 the British Isles' production was 36 times that of the United States, and in 30 years (1898) the United States produced within 7,000,000 tons of Great Britain's production.

We have the coal. The demand for it is increasing, and there is no reason why Canada should not be one of the greatest of the world's coal producing countries.

In structural material such as stone, tiles, clay for brick, cement, the United States produced \$85,202,715 in 1901, an increase of \$15,597,789 over 1900. Canada obtained from her own resources \$6,803,756 worth in 1901, as against \$6,372,901 worth in 1900. Canada's increase is about 7 per cent.; the United States increase is over 22 per cent.

Among these articles is cement of which Canada uses about 1,100,000 barrels a year. The quantity produced in Canada was 500,000 barrels, the remainder being imported. There has been great expansion in this industry in Canada, and undoubtedly in the near future the demand which is likely to be greatly increased will be supplied from home resources.

Chemical materials include borax, bromine, fluorspar, gypsum, marls, phosphate rock, pyrites, salt and sulphur, according to the United States list. Of these our Geological Survey takes cognizance for statistical purposes of gypsum, phosphates, pyrites and salt.

The production in Canada of phosphates is very small. From 31,700 tons in 1890 it has gone down to 1,033 tons in 1901.

The production in the United States in 1901 was nearly 1,250,000 tons, which is an increase over 1891 of 895,000 tons, though between those dates the quantity produced was in many years equal to that of last year.

The exports to the United Kingdom by the United States of phosphates to the value of over half a million dollars in 1901 shows that there is still a market for American phosphates, but there is none for Canadian phosphates. We have abundance. Why did we not hold what trade we had? The reason must be known. Is there anything to be done that will restore this phosphate industry to its former position or must we resign ourselves to abandonment of the business altogether? Seemingly this point will bear investigation. Possibly the application of electricity in the production of phosphorus would give an impetus to the business.

Of sulphur we do not appear to produce any quantity as yet. There was a statement, that the companies at Sault Ste Marie, Ontario, intended to make it from the pyrrhotite ore of Sudbury for use in the manufacture of sulphite pulp for paper making, but the statistical returns do not yet show record in this respect.

Among miscellaneous material may be mentioned asbestos of which we produced in 1901, 40,217 tons valued at \$1,259,759. Of this article the United States produced 747 tons valued at \$13,498.

Canada is a maker of arsenic to the value of \$41,676, an increase \$18,951 over the previous year. It is produced as a by-product of the gold milling operations by the Canadian Gold Field's Co.

In a general way during the five years 1897-1901 we produced \$248,160,323 of articles classed under the heading of mineral production, and we exported in the same period \$104,078,270 leaving, for home use about \$144,000,000.

In the five year period 1890-94, we produced \$2,334,626 and exported \$27,677,270 leaving \$54,657,356 for our home use.

This would show an increase of 122 per cent. in our utilization of our mineral production.

Of course, considerable of the increase in production is due to the very great development of our gold production. In 1897-1901 we

produced gold valued at \$93,100,676 against a production in 1890-94 of \$5,093,282.

It will be instructive to see how we stand if we eliminate the gold from the exports. The exports of 1897-1901 would then be \$55,819,815 leaving minerals to the value of \$192,340,608 to represent home used. The exports of 1890-94 would be \$25,583,819 leaving \$66,780,807 to represent home used. This shows an increase of 188 per cent. in our utilization of our mineral production and points to a very great development in the home industries which depend upon the mineral output. It also shows that in various forms and ways we utilize more and more the gold supply of the country within the country instead of exporting it.

Thus in 1890-94 we retained \$3,000,000 of our gold product and exported \$2,093,000, making a total output of \$5,093,000.

In 1897-1901 we retained \$44,842,221 and exported \$42,258,455 making a total output of \$93,100,676.

A wide field of usefulness is offered for many of the minor metals in connection with the electrical furnace. The manufacture of carbundum and calcium carbide in the electro-chemical industries, of aluminium, of sodium, of zinc, of manganese and phosphorus by electrical process, has already attained considerable proportions in Canada without the results appearing in the returns of the Geological Survey.

Mining in Newfoundland.

By MR. J. P. HOWLBY, F.P.S., St. John, Nfld.*

The total value of the mineral products for the calendar year 1902, according to the figures now in my possession, amounted to the sum of \$1,217,686, which, in comparison with that of the preceding year, shows an increase of \$6,395. In reality, however, the increase is somewhat more, as I find I was misinformed as to the value of pyrites shipped in 1901, which was less by \$8,891 than the figures given in that year's report, so that the actual increase was \$15,286. This result is very satisfactory, considering the poor market conditions that prevailed, principally owing to the great depreciation in the price of metallic copper, which fell from 16 to 12 cents per lb., making a difference in the value of the copper output alone of \$94,284.

It is true that there was a falling off in the actual amounts of both copper and iron ore shipped during the year. In the former case it was less by 740 tons, and in the latter by 9,485 tons, representing a money value of \$11,335. This would have been amply compensated for by the increase in other directions, the value of the slate alone having nearly doubled, while that of pyrites more than quadrupled the preceding year's output.

The decrease in shipments of iron ore from Bell Island was unexpected, and may be accounted for from the fact that the Dominion Steel Co. did not send any of their ore to foreign markets last year. All they mined was sent to their own reducing works at Sydney, C.B.; consequently their shipments fell off by 92,995 tons. On the other hand, the Nova Scotia Co. increased their output by 87,074 tons.

So far from the mining industry as a whole showing any decadence, at no time in its history was it in a more flourishing condition, several new features having been imported into it during the past year. A lively interest was displayed in the prospecting for minerals, and new and important discoveries were the outcome. Some properties have been taken up by capitalists who are preparing the way for active development, while one or two abandoned mines have been re opened, which promise to become considerable producers in the near future. Pilley's Island pyrites mine, upon which work was suspended a few

years ago, is now under its new management, coming again to the front, its output last year nearly equalling some of its best production. The same company have taken over the old Terra Nova mine at Bay Verte, lying dormant for over forty years, and during the season raised some 3,500 tons of cupriferous pyrites, 350 tons of which was shipped to the United States market.

The pyrites property at Rowsell's Harbor, Labrador, was visited and examined by an expert last autumn, and it is brought the Dominion Steel Co. will commence work upon it during the coming summer.

The York Harbor copper mine, Bay of Islands, has passed into the hands of a strong syndicate, who purchased it not long since. Mr. C. E. Willis, the new manager, is pushing development work during the winter, and this mine bids fair to add considerably to the copper production of the future.

There has not been much done to exploit our valuable chromite deposits as yet, but Mr. Willis, of York Harbor, has had a route surveyed for a tramway to connect the chromite mine, near Benoit's Brook, with the railway at George's Pond. His company intend constructing this branch during the coming summer, to enable them to bring out the ore to a convenient shipping point at Bay of Islands.

Last year witnessed the first shipment of barytes from the country. It was sent to the U. S. market, where, I understand, it sold at a fair margin of profit, and was considered a good quality of ore.

Our brick and slate industries made a decided advance and showed a marked increase in value over the figures of the preceding year. Both are likely to figure prominently in the future. No returns are forthcoming from the slate quarry at Summerside, Bay of Islands. It is not probable any shipments were made, as there is usually a great deal of preliminary work in clearing away the surface debris in such undertakings before the actual manufacturing of slate can be entered upon. Messrs Mitchell and Campbell have optioned their slate property at St. Jones, Trinity Bay, to an English company who will probably begin operations upon it as soon as Spring opens.

Perhaps the most noteworthy feature of the mining industry for the year was the actual commencement of gold quartz mining. The prognostications of several years passed are apparently at length about to be realised. There are now two gold mines in operation in the Island: one at Rose Blanche, on the southern seaboard, and another at Sopp's Arm, in White Bay. As yet mining for the precious metal in either locality is in its first stages. No stamp mills have been so far erected to treat the ores, though they have been purchased and will be placed on the ground early the coming season. I have no particulars of what has been done in the way of development in the former locality, but in the latter some thirty men are engaged sinking on the lead and clearing away the surface. Having visited and examined this property during the past summer I am in a position to state that the prospects here are of a most encouraging nature, particulars of which will be found in my geological report of the district.

The discovery of free gold at this place by Mr. A. Stewart, M.E., gave a stimulus to the search for the precious metal, with the result that several rich specimens have been brought to light. It looks as though a gold mining development of no mean order will become an established industry ere long. That the country would eventually prove auriferous, no person who understood its geological features could doubt.

A use has been found for the peculiar substance agalmatolite, as a paper filler, and for enamelling purposes, and a company has recently purchased the property near Manuels, on the south side of Conception Bay, which they are opening up.

The quarrying of granite and other stone to be used in the construction of the new Court House and Railway Station, as well as for

*Annual Report to the Minister of Agriculture and Mines.

foundation walls and street paving was actively pursued, but it is not easy to get at the full particulars of this industry.

The boring operations for petroleum at Parson's Pond resulted somewhat more favorably than in previous years. One hole was put down to a depth of 2,160 feet when oil was struck in fairly good quantity and of very superior quality. This oil appears to come from a lower set of petroliferous strata not hitherto pierced by the boring drill. It possesses the property of burning freely in its crude state without undergoing any process of refining, giving off but little smoke or offensive smell and is apparently free from explosive gas. The well has not yet been torpedoed, but I learn that eighteen barrels were pumped therefrom without greatly diminishing the quantity present. So far the company has put down five holes all of which have yielded oil, and although the quantity has not been great, still the fact that no dry holes have been encountered is very encouraging. The company are now contemplating the erection of a refinery upon the ground to treat the crude product themselves, and they certainly deserve every encouragement in their enterprise.

The great interest of late manifested in mining, and the search for minerals, can scarcely fail to bring many properties into the productive stage ere long. It is safe to predict, should the market remain firm, that the coming year will witness a largely increased output all around, more especially should the Bond-Hay Treaty become a *fait accompli*.

An attempt has been made to ascertain the number of persons employed in the mining industry during the year: number of accidents and deaths caused by same, with the following result:

	No Employment.	Accidents.	Fatalities
Iron mining	791	19	4
Copper mining	448	3	1
Pyrites mining	225	2	1
Quarrying granite, etc.	168		
do slate	90		
Brick making	44		
Gold mining	30		
Miscellaneous	64		
	<u>1,800</u>	<u>24</u>	<u>6</u>

It will be seen from the above figures that the occupation of the miner is not at all so hazardous as is generally supposed, and will bear a favorable comparison in this respect with any other of the country's industries. The percentages of accidents and fatalities represented above indicate for the former 13 per cent., and for the latter, 3 per cent. In the preceding year, 1901, it was much less, there being only two fatalities in seventeen accidents, or 1 per cent. of the number employed.

I am again indebted to the managers of the various mines for the greater part of the information contained in this report, as well as to several individuals more or less interested in mining enterprises, all of whom, with very few exceptions, have willingly filled in and returned the forms sent them.

I may here state that the publication of these annual mining statistics is drawing considerable attention from outside to our valuable mineral resources, and constant applications are being received for copies. The statistical Department of the Home Office, London, and the publishers of the "Mineral Industry," New York, regularly quote my figures of late years.

The latter publication has perhaps the widest circulation amongst mining people, all over the world, of any work devoted to this industry.

The subjoined tables represent the chief features of the mining industry for the year.

TABLE I.
Mineral Production of Newfoundland for the Calendar Year 1902.

Product.	Quantity raised	Manufactured or used in the country.	Exported to what market.	Values of ores at mine
Barytes	315 tons		United States	\$ 630
Brick	1,625,000 M.	1,625,000 M.		18,950
Building Stone	5,000 tons	5,000 tons		6,000
Cobble Stone	500 tons	500 tons		500
Copper Ore	74,608 tons		35,947 Eng } 35,538 U.S. }	265,810
Granite	2,955 tons	2,955 tons		17,730
Iron Ore	728,721 tons		107,189 Eng } 204,720 Ger } 328,038 N.S. } 81,920 U.S. }	728,721
Limestone	1,150 tons	3,100 bus.		345
Paving Stone	2,250 tons	180,000 bks.		18,000
Pyrites	26,000 tons		26,000 U.S.	117,000
Slate	3,500 tons	11,000 sq.s.	3,500 G. Br	44,000
Total				\$ 1,217,686

TABLE II.
Showing Increase and Decrease in Comparison with Preceding Year's Output

Product.	Quantity.		Value.	
	Increase.	Decrease.	Increase.	Decrease.
Barytes	315 tons		\$ 630	
Brick	320,000 M.		5,900	
Building Stone			1,000	
Copper Ore		740 tons		94,284 00
Granite		285 tons		1,950
Iron Ore		9 485 tons		9,485
Limestone		150 tons		630
Paving Stone	40,000 blk.		3,872	
Pyrites	19,725		88,763	
Slate	1,500		21,500	
Total			\$121,665 00	\$106,379 00

These tables point conclusively to a steady upward tendency of this important industry. This year's output indicates a *per capita* value of \$5.61, while it represents an average earning power of \$676.49 for for the number actually engaged, being far in excess of either the fishery or lumbering industries.

The proportionate value of the several mineral products to the whole amount will show the relative standing of each individual product during the year:

Iron Ore	59.844 per cent.
Copper	21.829
Pyrites	9.608
Slate	3.613
Brick	1.556
Paving Stone	1.478
Granite	1.456
Building Stone	.492

Gold is not included in any of the above calculations for the reason that the figures are not available. Basing the estimate on former results, and upon such other information as was ascertained some few years ago, *i.e.*, about two ounces per ton of metallic copper, last year's output should yield about 4,760 ounces fine gold. To be well within the mark it may be assumed at 4,000 ounces, worth \$82,680.00. These figures, even if approximately correct, would materially increase the total value and add much to the *per capita* and other percentages given above.

New Gold Fields of British Columbia.—The profit and loss account shows a gross profit of £2,241 5s. 4d., expenditure £2,233 16s. 10d., leaving a net profit for the year of £7 8s 6d. This balance, together with the amount brought forward from last account, *viz.*, £2,240 18s. 3d., gives a total credit balance of £2,248 6s 9d., from which has been deducted £549 5s 3d., for income tax, leaving a net credit balance at date of £1,699 1s. 6d., which with the reserve of £5,000 shown in last year's balance sheet, amounts to £6,699 1s. 6d.

COMPANY NOTES.

Granby Consolidated—The Boston Stock Exchange has placed on the regular list the issued stock of the Granby Consolidated Mining, Smelting & Power Co., Ltd., amounting to 1,336,303 shares out of an authorized capital of 1,500,000 shares.

Condensed balance sheet as of Jan. 31, 1903, is as follows:—

ASSETS.	
338 acres mineral claims	\$12,674,506
Plant and equipment	914,488
Real estate and lands	123,447
Accounts and bills receivable	24,126
Ores on hand at cost	731,723
Inventory supplies	114,347
Miscellaneous	4,999
Total.	\$14,587,549
LIABILITIES.	
Capital stock	\$13,363,030
Accounts and bills payable	660,581
Surplus	563,934
Total.	\$14,587,549

Iowa Lilloet Gold Mining Co.—This company has placed an order with the Wm. Hamilton Mfg. Co., Peterborough, Ontario, for a modern gold dredging plant, to handle at least 2500 cubic yards per 24 hours. The dredge is to work on the Fraser River.

United Gold Fields of British Columbia.—This company operating the Lille Collieries, near Frank, Alberta, is rapidly completing its equipment. The J. H. Montgomery Company, of Denver, Colo., has secured the bulk of the order, including 50 coal cars, screens, track, cables and bull-wheels, for a 3,000 foot aerial tramway. The tramway is to be built up the mountain between Bear and Porcupine gulches, and the coal taken from both of these gulches will be sent down over this tram to the railroad. At the foot of the tram, and on the railroad, coal bunkers, a tripper, and other necessary structures will be erected. The tram, which is a gravity one will be operated and controlled from the top of the incline by a bull-wheel and break. It will be run by a cable, the loaded car descending furnishing sufficient power to pull the empty car up.

Canadian Oil Exploration Company, Limited.—Registered on January 26th, with a capital of £10,000 in £1 shares. Object, to adopt agreements (1) with the Canadian Oilfields, Limited, and (2) with the Maritime and Commercial Trust, Limited, and to carry on in Canada and elsewhere the business of explorers, owners of oil-bearing lands, pipe-lines, rights and property, winners and refiners of and dealers in petroleum and other mineral oils, manufacturers of petroleum and oil products, etc. Minimum cash subscription, 50 per cent. of the shares offered to the public. The management is vested in the Maritime and Commercial Trust, Limited.

Monitor and Ajax Fraction, Limited.—Report for month of February:—

Feb. 28. —Ore shipped and settled for 107 tons	
Crude galena, 89 tons, net proceeds	\$3,802 40
Screenings, 18 tons	298 88
Feb. 28 In transit—	
Crude galena, 15 tons, estimated net value ..	\$700 00
Iron, 6 tons, estimated net value ..	65 00
Feb. 28. —Ore in hand	
Crude galena, 25 tons, estimated net value ..	\$1,125 00
Ore mined during the month—	
Crude galena, 105 tons, estimated net value ..	\$4,500 00
Cost of mining per ton, \$6.65	
Cost of mining per ton, 9.35 previous month.	
Development, 77 feet.	
Cost of development per foot, 7.08.	
Cost of development per foot, 6.05 previous month.	

Mikado Gold Mining Co.—The directors of the Mikado Gold Mining Company, Limited, have issued a circular stating that, as responses to the offer to shareholders of subscribing for debentures of the company in order to provide the necessary working capital have been very small, the Board did not feel justified in going to allotment, and the money subscribed was returned. The position at the present time, however, is such that a considerable sum of money must be provided in order to pay the debts of the company and provide sufficient funds to enable the property to be protected and preserved as a going concern. Accordingly, after deliberation, the Board has decided that it will be necessary, in order to provide the requisite capital, to sell the assets and undertaking of this company for a consideration, payable in partly paid shares of a new company. It is intended that the new company to be formed shall have a nominal capital of not exceeding £75,000, divided into 75,000 of £1 each, and having for its object the acquisition of the assets and undertakings of this company, and the consideration payable to this company will be the payment and satisfaction by the new company, as this company or its nominees of such a number of shares of £1 each, credited with the sum of 13s. per share paid up, in the proposed new company, as this company shall call for, not exceeding in all 75,000 of such shares. If the whole of the 75,000 shares are allotted a sum of £18,750 will be available, but if this company calls for an allotment of a smaller number the cash available will be correspondingly reduced. With a view to carrying out the proposed arrangement the directors have entered into an agreement with Colonel William John Engledue (on behalf of the intended new company), and the directors consider it highly advisable that the shareholders should sanction the above-mentioned agreement, and for that pur-

pose a meeting has been called for the 14th inst., when a resolution will be submitted.

West Canadian Collieries, Limited.—Registered on April 2, with a capital of £400,000 in £1 shares. Object, to carry on in Canada or elsewhere the business of explorers, miners, owners, workers, and prospectors of mines and ground supposed to contain coal or other minerals, ores, or precious stones, etc. No initial public issue. The number of directors is to be not less than three nor more than seven; the signatories are to appoint the first. Qualification, 100 shares. Remuneration, £100 per annum and £50 extra for the chairman. Registered office: Palmerston House, Old Broad Street, E.C.

Big Master Gold Mine—This Gold Mine in the Manitou District of Ontario, has resumed active mining. Mr. George Berry, amalgamator at the West End Silver Mines, has taken charge of the Big Master Mill

Velvet Rossland.—The manager cables:—"Have received the following returns from smelters, namely—450 tons second-class ore yielded 364 ozs. gold, 35,400 lbs copper; net returns from smelters, \$7,877, or an average of £3. 12s. 6d. per ton"

Coke Shipments from the Crow's Nest Pass.—When a settlement of the coal strike was reached at Fernie, there was quite a quantity of coke piled up ready for shipment at Fernie and Michel. A large amount of this has already been sent out to the smelters. The shipments commenced at Michel on April 2nd and at Fernie the following day. Up to yesterday 43 carloads or 983 tons have been sent out of Michel and 57 carloads or 1,311 tons from Fernie, making a grand total of 2,300 tons shipped to date since the commencement of the month. The renewal of the coke shipments has necessitated the employment of more train men by the C. P. R., and a fresh crew of six men has been put on at this point. This crew were laid off at Eholt some three weeks ago but a further force will now have to be employed in the Boundary country, and fresh men will be taken on there probably this week. The coal and coke is passing through Nelson at the present time at the rate of two barges or 700 tons per day. In place of bringing the barges into Nelson from the landing, the boats are unloaded at Proctor and the trains rushed through as expeditiously as possible. The coal company has made a slight increase in the price of coke, raising the figure to \$4.50 per ton or an advance of 25 cents on the price before the strike commenced. The smelter managers are probably not over pleased at the increase, but as they have recourse against the mine managers, the latter will eventually pay the difference.

Trail Smelter After Slocan Zinc.—American buyers of zinc have now a local competitor to meet in the general market for the product of the Slocan mines. The Trail smelter is making an active bid for the Slocan article. It promises to continue an active competitor in the field, so that zinc owners will always find a ready market for their product. Already a number of shipments have been received from the Bosun and Ivanhoe, and others are expected in the near future. The rates being paid by the Trail smelter are very favorable as compared to those offered by the zinc smelters in the United States. On Thursday foundations were started for the construction of a slime treatment plant at the Trail smelter. Silver slimes, somewhat similar to those produced in copper refining, are turned out in connection with the electrolytic refining of lead, and these were formerly shipped to the United States for treatment. They contain the precious metals, gold and silver, combined with arsenic, antimony and other impurities occurring in the lead bullion. When in operation, this plant will turn out pure silver, which goes direct to China and Japan; pure gold, which will be marketed in Seattle and San Francisco; copper sulphate which will be marketed in the territories for washing seeds, and ether metallic antimony or antimonial lead, which will supply the Canadian demand in making babbitts and other alloys. The establishment of this plant places the Canadian miners and smelters entirely independent of the United States institutions. It is estimated that the amount of values handled in this plant will eventually be ten or fifteen thousand dollars daily, depending upon the amount of ores shipped. Two copper furnaces are now in operation at Trail, and it is barely possible that a third will be started in the course of two or three weeks. It is impossible to tell when the lead works will be put in operation again. At present there is practically no lead ore being produced, on account of the very unsatisfactory prices.

Wire Rope Tramway Installations—In addition to the installation of an aerial tramway at the Lille Collieries, mentioned elsewhere, B. C. Riblet, of Nelson, B. C., has closed a contract with the Calumet and B. C. Gold Mines Ltd. for a line from the Eva Mine, in the Fish River Camp, to mill, a distance of 4,200 ft. He has also secured a contract for an important extension to the two miles of tramway at the Silver Cup Mine, near Ferguson.

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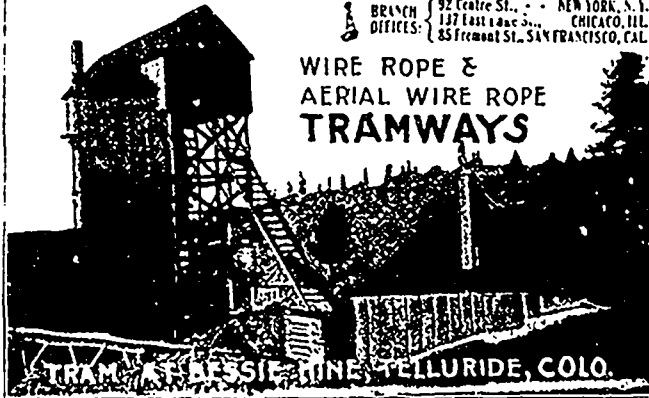
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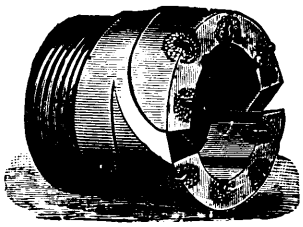
PUBLICATIONS.

Vol. I, 1898, 66 pp., out of print.
Vol. II, 1899, 285 pp., bound red cloth.
Vol. III, 1900, 270 pp., " "
Vol. IV, 1901, 533 pp., " "
Vol. V, 1902, 700 pp., " "
Vol. VI, 1903, 600 pp., now in press.

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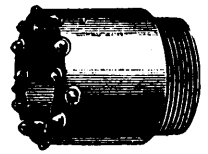
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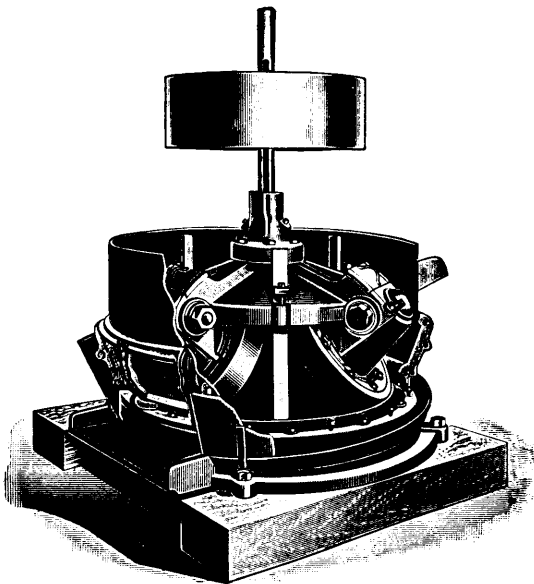
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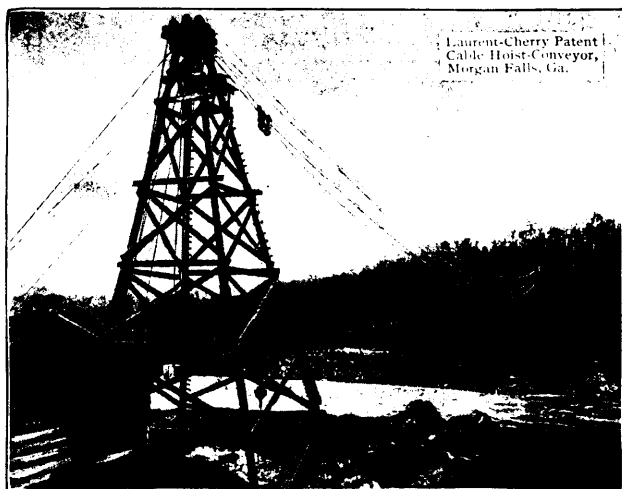
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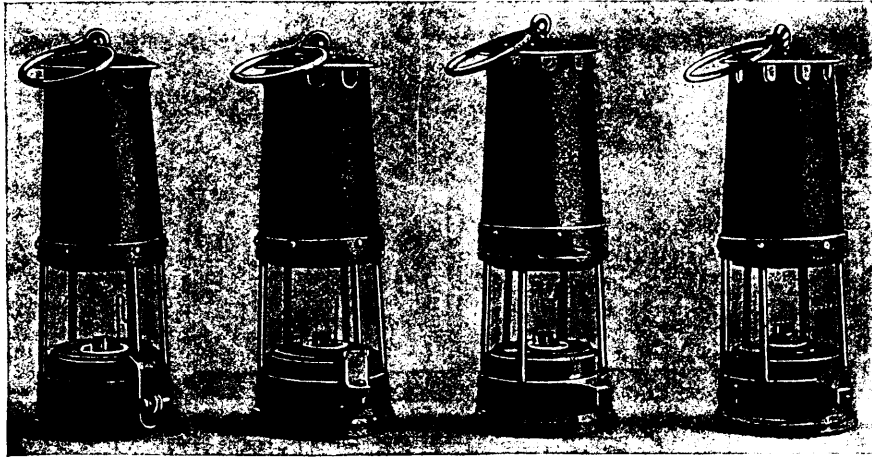
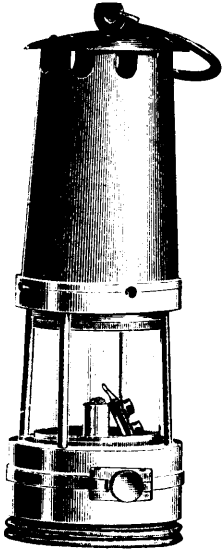
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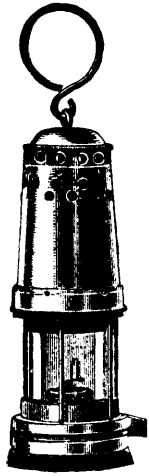
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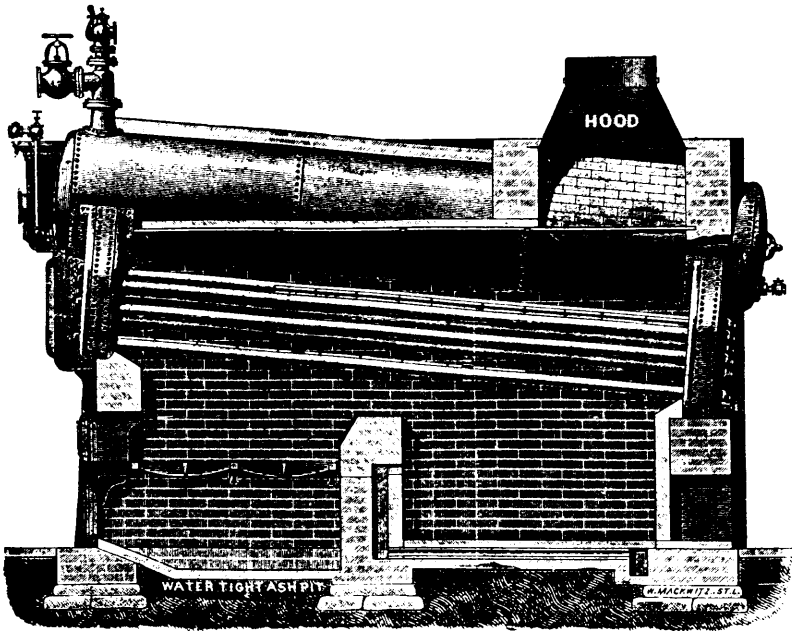
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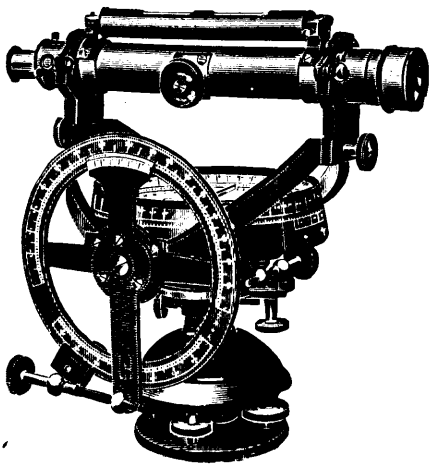


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The Mining Law gives absolute security to Title, and has been
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Mining concessions are divided into three classes:—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

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GOLD AND SILVER.

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

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

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

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

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

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For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

JAMES A. SMART,

Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.

Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite ; copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zinblend, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

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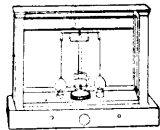
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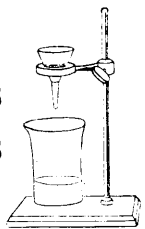
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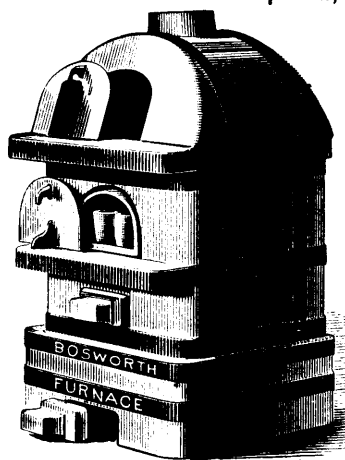
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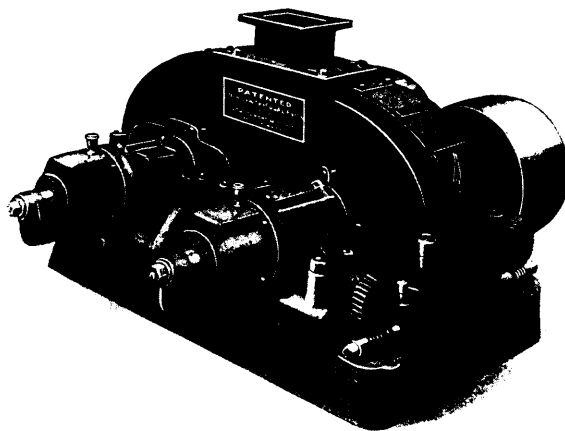
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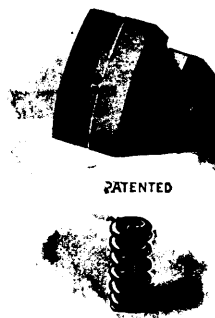
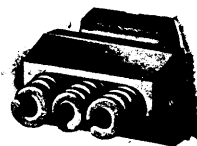
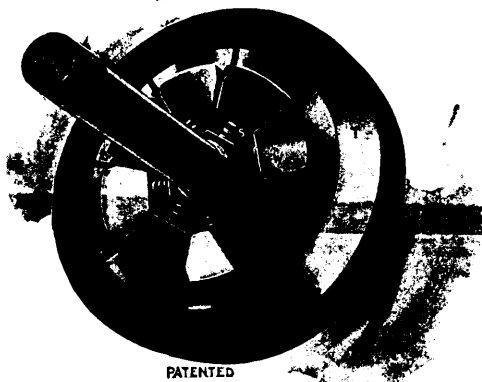
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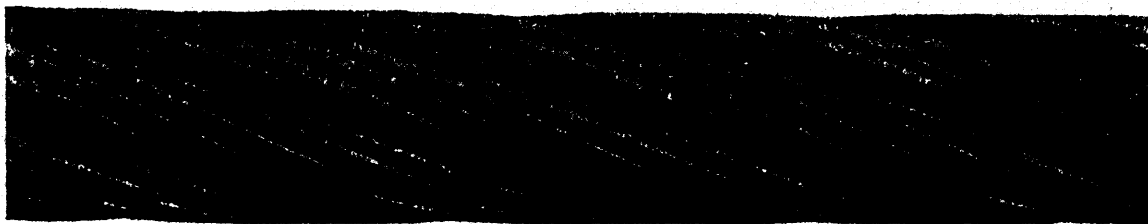
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